Chapter 4
To Achieve a Green Growth Nation to Lead the World

As described in Chapter 1, one of the themes of Rio+20 is the green economy in the context of sustainable development and poverty eradication. In 2011, the United Nations Environment Programme (UNEP) published *Towards a Green Economy*, while the Organisation for Economic Co-operation and Development (OECD) published its Towards Green Growth. Furthermore, articles on the green economy and green growth are described in the G20 Seoul Summit Document, the APEC Leaders' Growth Strategy (2010), and the G8 Deauville summit declaration (2011), indicating that efforts to achieve a green economy and green growth have now become a global trend.

Based on this international movement, Section 1 of Chapter 4 provides an overview of the current status of green innovation around the world and in Japan, while the remaining sections look at Japan's initiatives towards creating a low-carbon society, sound material-cycle society, and symbiotic society.

Section 1 Green Economy and Green Innovation

1 What is Green Innovation?

Environment and economy are closely related. It is vital to recognize this relationship as being one that produces a sustainable and positive cycle, rather than trade-offs. As described in Chapter 1, the great driving force for achieving these social systems is green innovation: in other words, innovation in the energy and environmental sectors.

At present, individual countries define their mid- to long-term ideals and goals for the environment, economy, and society as state strategies, while promoting policies for achieving green innovation (Table 4-1-1). For example, Germany has set forth guidelines under the Energy Concept (2010) for reducing their "Green House Gas" emissions by 80-95% (compared with 1990) by 2050. At the same time, Germany has set a goal of meeting 60% of its final energy consumption needs with renewable energy by 2050. China has set a goal of a 17% reduction in 2010 carbon dioxide emissions per GDP by 2015 under its Twelfth Five-Year Plan (2011). From 2011-2015, China plans to invest about 468 billion dollars in environmental industries. Korea has released a vision for low-carbon green growth, setting goals in three directions and ten detailed sectors. Korea has defined a vision that creates 141-160 billion dollars in spillover effects for production and 1.56-1.81 million jobs in green industries.

Japan has defined three goals to be achieved by 2020 under its New Growth Strategy (approved by the cabinet in June 2010) by promoting green innovation and a comprehensive policy package: creating over 50 trillion yen in a new environmental market; creating 1.4 million new jobs in the environmental sector; and reducing global GHG emissions by 1.3 billion tons or more using Japan's technological strengths in the private sector (equivalent to Japan's total emissions per year). At the same time, three projects have been designated as key national strategy projects for promoting these efforts: renewable energy and its rapid dissemination, by introducing a "Feed-in Tariff System;" "Future City" initiative; and "Forest and Forestry Revitalization Plan."

Table 4-1-1 Green innovation initiatives by country

Country	Initiative	Details
United Kingdom	Low Carbon Industry Strategy (2009)	• Offering action plans to strengthen the UK's industrial competitiveness in a variety of sectors, including renewable energy (e.g. offshore wind and tidal power generation), low-carbon vehicles, and promotion of the low-carbon chemical industry. • Creating 400,000 jobs by 2015.
Germany	Energy Concept (2010)	• Formulating guidelines for reducing GHG emissions by 80-95% by 2050. • Goal to meet 60% of final energy consumption needs with renewable energy by 2050.
United States	American Recovery and Reinvestment Act of 2009 (ARRA)	• Economic stimulus package adopted in February 2009. Appropriates 94 billion dollars out of a total 787 billion dollars of investment to environmental sectors (e.g., energy saving, renewable energy, water, waste, and mass transportation). • Estimated to create about 720,000 jobs in 2012 in energy saving and renewable energy.
China	Twelfth Five-Year Plan (2011)	• State Five-Year Plan between 2011 and 2015. • Goal of reducing 2010 carbon dioxide emissions per GDP by 17% by 2015. • Plans for about 468 billion dollars invested in the environmental industry between 2011 and 2015. Industry scale is expected to reach about 743 billion dollars by 2015. • To achieve the reduction target, the central government approved an action plan in November 2011 for reducing carbon dioxide.
Korea	Green Growth Korea (2008)	• Announced a vision for low-carbon green growth. • Goals set in three directions and ten detailed sectors to be executed over the five-year period between 2009 and 2013. • Expected to create a ripple effect of 141-160 billion dollars. Also expected to create 1.56-1.81 million jobs in the green industry.

Reference: Ministry of the Environment

2 Measures to Achieve Green Innovation

(1) Green Innovation and Environmental Technology

a) Direction to be Pursued by Environmental Research and Technology Development

Technology development is a critical part of innovation. Japan has a history of developing world-leading environmental technology despite keen global competition, environmental pollution, and oil crises. Making an active contribution to solving global and domestic environmental issues while further developing technology is essential.

Getting effective results from technological development requires intensive research and development as well as established goals. In June 2010, the Ministry of the Environment formulated the "Promotional strategy of environmental research and environmental technology development" with the goal of promoting priority issues and effective policies for environmental research and technology development to be pursued in the coming five-year period. The strategy defines mid- to long-term (2020 and 2050) modalities, and outlines four goals for achieving a sustainable society: (1) Low-carbon Society; (2) Sound Material-Cycle Society; (3) Society in Harmony with Nature; and (4) Safe and Secure Society. In addition to these, the strategy also outlined research and technology development goals in individual fields, comprehensive research (common to all fields) in relation to the ideal mid- to long-term society, cross-sectorial research, system configurations for incorporating technology, and promotion of research in community-building scenarios (Table 4-1-2). The first follow-up session was held in July 2011 to establish shared recognition of the following issues common to all fields: ensuring safe, secure, and strategic use of resources; clarifying the correlation between climate change, countermeasures, and sustainability; and motivating a shift to an ideal society and strengthening a cross-disciplinary approach, including identifying optimal processes.

(2) Green Innovation and Environmental Financing

Japan has over 1,400 trillion yen in personal financial assets. To promote green innovation, it is vital to secure an effective and sufficient money supply that includes these personal assets as well as other funds within Japan, and to fund worldwide business activities that contribute to environment conservation.

Environmental financing has two primary roles. The first is loans and investments to be directly used for projects that reduce environment impact. Specific uses for these funds vary; for example, an estimate suggests that additional

Table 4-1-2 Fields and Priority Subjects Under the Strategy to Promote Environmental Research and Environmental Technology Development

Field	Priority subject
Common to all fields	1. Research related to an ideal society (sustainable society) under the long-term state vision.
	2. Research related to the shift to a sustainable society.
	3. Responding to international issues including those in the Asia region.
Cross-sectional through different fields	4. Win-win research development that contributes to multiple fields at once.
	5. Research development to eliminate trade-offs between fields.
	6. Social impacts and adaption for environmental reasons.
Individual field: (1)Reversing global warming society	7. Formulating low-carbon scenarios that flexibly respond to climate change.
	8. Promoting low-carbon technology in fields with high energy demands.
	9. Promoting low-carbon technology for the energy supply system.
	10. Clarifying the global warming phenomenon and measures to adapt to the situation.
Individual field: (2) Sound material-cycle society	11. Thorough implementation of the 3Rs (Reduce, Reuse, and Recycle), and optimal disposal.
	12. Improving heat recovery efficiency.
	13. Collecting rare metals and establishing recycling systems.
Individual field: (3) Society in Harmony with Nature	14. Protecting biodiversity.
	15. Sustainably securing and using national land, water, and other natural resources.
Individual field: (4) Safe and Secure Society	16. Risk evaluation and management that takes account of previously unidentified risks (such as chemical substances and vulnerability).
	17. Healthy circulation of water and air.

Reference: Ministry of the Environment

Table 4-1-3 Categories of Financial Support

		General description	Major entities
Loan		Loaning funds by establishing an agreement to return the money with interest in the future allows the money to be treated as a debt on the balance sheet for accounting purposes.	Commercial banks, credit unions, etc.
	Project financing	A type of loan that limits the source of repayment to cash flow produced by the project alone, focusing on management know-how and technical capabilities, instead of excessively depending on creditworthiness and the hypothetical value of the corporation. In general, loans are provided to a newly-established special purpose company (SPC) exclusively for the project.	City banks, community banks, development Bank of Japan, etc.
Investment (share acquisition)		This means a person becomes an owner of the company (shareholder) by providing capital funds (acquiring shares). There is no need to repay capital funds or pay the interest; however, the shareholders are given beneficiary rights (the right to enjoy economic benefits, profit sharing, etc.) and common benefit rights (the right to participate in management, propose resolutions at general meetings of shareholders).	Venture capital corporations, banks, credit unions, life insurance companies, etc.
Investment funds		An investor invests money in an investment partnership formed based on the Limited Partnership Act for Investment. An operator invests the money in shares, real estate, or a particular business to distribute the interest obtained by the turnover to investors.	Limited liability partnerships (turnover is entrusted to venture capitals, etc)

Source: Ministry of the Environment based on the Kanto Bureau of Economy, Trade and Industry report

Table 4-1-4 Principles for Financial Action towards a Sustainable Society (Principles for Financial Action for the 21st Century)

Principle 1.	Recognize your roles and responsibilities and promote optimal issues to create a sustainable society with projects based on a preventative approach.
Principle 2.	Help create a sustainable global society through the development and supply of financial commodities and services that can contribute to the development of industry that builds a sustainable society and competitiveness.
Principle 3.	Support the environmental considerations of small and medium-sized enterprises, raise environmental awareness among citizens, increase disaster preparedness, and build community activities from the perspective of promoting local communities and improving sustainability.
Principle 4.	Realize the importance of collaboration between diverse stakeholders to create a sustainable society, and make efforts to an active role as well as in these initiatives.
Principle 5.	Get actively involved in initiatives to mitigate environmental impacts and make efforts to encourage suppliers rather than simply complying with environment-related laws and ordinances.
Principle 6.	Realize that activities to improve social sustainability are a management issue and make an effort to disclose information related to these initiatives.
Principle 7.	Provide awareness training for management and general-level employees on environmental and social issues as a way of actively carrying out the above initiatives in daily operations.

Reference: Principles for Financial Action towards a Sustainable Society (Principles for Financial Action for the 21st Century)

funds on the scale of more than ten trillion to several hundred trillion yen will be needed in the next decade, for purposes such as anti-global warming measures. These include zero-emission homes and buildings (with improved insulation effectiveness and high-efficiency water heaters, energy-saving home appliances, and so on) and renewable sources of energy (e.g., solar and wind power generation). Providing funds effectively to environmental conservation activities, such as global warming measures, is anticipated to be a significant role of financing (Table 4-1-3).

The other role is investment and lending to facilitate efforts to incorporate environmental considerations into business activities by evaluating and supporting economic entities. Providing funds to corporations responding to social needs such as environmental issues is a critical part of Corporate Social Responsibility (CSR). At the same time, the prevalence of such efforts can be an incentive for corporations to make further efforts, since the "environmental strength" of a corporation can become an aspect of its competitiveness.

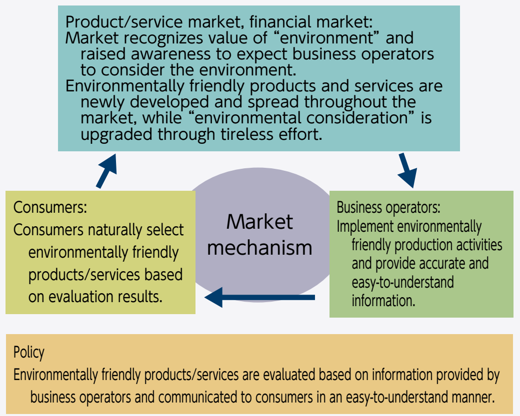
In October 2011, as part of voluntary efforts to promote environmental financing, around 30 financial institutions in Japan jointly formulated Principles for Financial Action towards a Sustainable Society (Principles for Financial Action for the 21st Century) to spread efforts to advance environmental financing. They indicate seven actions for a sustainable society as well as three guidelines for taking specific action: guidelines for deposit, lending, and leasing businesses; guidelines for operations, securities, and investment bank businesses; and guidelines for insurance businesses (Table 4-1-4). The principles have been signed by 175 financial institutions as at the end of April 2012. In March 2012, the first general assembly was held, where participating financial institutions were able to engage in dialogue, share good practices, and engage in other joint activities.

3 Green Innovation and Green Markets

To promote green innovation, it is imperative to facilitate the rapid spread and adoption of environmental technologies and products through comprehensive policy packages. In light of this, the greening of the market can bring benefits effectively and efficiently to a number of entities.

In 2011, the Ministry of the Environment studied the feasibility of further promoting greening of the market (i.e., Green Market+). A report entitled Toward Further Greening of the Market, published in January 2012, defines "greening of the market" as follows: By creating a market by boldly incorporating environmental conservation into socioeconomic activities to boost demand for the development and supply of environmentally friendly products and services, business operators can boost their reputation for environmentally friendly actions, thereby obtaining greater market profits (Figure 4-1-1). Four issues for achieving a green market should be pointed out: (1) insufficient scope of the market (greening has not been fully achieved for the market as a whole); (2) ambiguous environmental criteria (a significant number of policies, initiatives, or environmental labels are not fully recognized, or excessively diverse environmental labels cause confusion in consumers); (3) insufficient explanations given to customers (insufficient information blocks customers from purchasing environmentally friendly products and services, or creates difficulty for business operators trying to provide information to consumers); (4) little motivation among business operators (market evaluation has not been fully established, so corporations are not fully motivated to supply environmentally friendly products and services and do not fully recognize the significance of continuing these efforts in the future). To respond to these issues, the report proposes four approaches: (1) new business development for target products and services (expanding the scope of environmentally friendly products and services); (2) defining innovative criteria (setting up multi-step criteria to evaluate novelty); (3) spreading information in a way that reaches customers (information that triggers action is critical, as is trying to understand customers and develop bonds of familiarity); and (4) linkages and synergies among policies (implementing effective and efficient policies through total optimization is critical).

Figure 4-1-1 Overview of Green Markets



Source: Ministry of the Environment, the Study Group on Green Market Plus Report *Towards Further Green Markets*

Column Japan's Experience with Environmental Pollution and Innovation

This section has described green innovation, and concludes with a look back at Japan's past initiatives to see how serious air pollution and health hazards have been overcome in a variety of ways.

As a result of collaborative efforts between the public and private sectors to put the nation's economy on the fast track, Japan achieved unprecedented growth during the post-1955 economic boom. Real economic growth rates during this period were: 8.8% in the late 1950s; 9.3% in the early 1960s; and 12.4% in the late 1960s. As the dominant source of energy shifted from coal to petroleum, energy consumption over the decade jumped by 300%. A comparison between 1955 and 1970 in terms of the proportions of heavy and chemical industry against industrial production as a whole shows a drastic increase (44.7% to 62.6%), while these proportions against overall exports also surged (from 33.7% to 73.0%), suggesting a shift from light industry to heavy and chemical industries. However, since heavy and chemical industries have large potential emissions per production volume, the shift triggered serious environmental pollution on an enormous scale.

Tremendous efforts by various entities were required for Japan to overcome this environmental pollution, including citizen campaigns involving injured persons, innovative efforts by local public authorities to ensure the health of local residents, the establishment of a system to improve the situation led by the central government, and the development and introduction of technical approaches by the private sector. Innovation to overcome environmental pollution damage was only accomplished through comprehensively promoting these efforts and initiatives.

Japan's Experience with Environmental Pollution and Innovation

Group	Initiative	Achievement
Local residents	• Citizen campaigns to protest construction of industrial complexes, campaigns by victims of environmental pollution, etc.	Campaigns motivated local public authorities, the central government, and the private sector to take steps to combat environmental pollution.
Local governments	• Setting environmental criteria stricter than national criteria at the time and introducing total volume control. • Establishing agreements on pollution prevention with the private sector and providing technical guidance.	Responded to the desperate situation in local communities and drove innovative efforts by the central government to improve legal systems.
Central government	• Establishing a comprehensive legal system based on the Basic Law for Environmental Pollution (1967) and instituting or amending environment-related laws. • Supporting financially to promote measures against environmental pollution control program. • Promoting countermeasures to reduce sulphur content and fuel switching. • Providing low-interest policy financing to encourage investment in environmental pollution prevention. • Establishing the Environment Agency (1971). • Establishing a system to compensate for health damages caused by environmental pollution based on the Polluter-Pays Principle (PPP).	Established a legal system for environmental pollution countermeasures.
Private sector	• Enhancing investment in the prevention of environmental pollution. • Developing engineers who could execute countermeasures for environmental pollution.	Alleviated serious air pollution. Spread the concept of CSR.

Source: Ministry of the Environment based on the Review Committee for Japan's Experience of Air Pollution, *Japan's Experience of Pollution*

Thanks to these efforts, environmental pollution in Japan has dramatically improved. How, then, were these countermeasures evaluated from an economic standpoint? A unique form of research called MERGE (a model for estimating the regional and global effects of greenhouse gas reductions) is a dynamic optimization model that recaptures the history of combatting air pollution in Japan using an economic model analysis. The model was jointly developed by Alan Manne of Stanford University and Richard Richels from the Electric Power Research Institute. The research points out that if the introduction of flue gas desulfurization had been delayed by 10 years, the cumulative damage due to air pollution would have been 12 trillion yen or more against an increase of 6 trillion yen in GDP. If the countermeasures had been introduced eight years earlier, damage reduction would have been in excess of GDP reduction. In other words, there would have been a high likelihood of even more economic benefit than there actually was.

Japan made a vast amount of investment in the 1970s to prevent environmental pollution, and successfully avoided an enormous amount of damage. The environmental protection measures therefore brought economic benefits as well. This case can be considered a best practice for building a green economy through innovation.

Section 2 Japan's Initiatives to Achieve a Low-Carbon Society

Preventing and adapting to global warming is a common challenge for all people, which must be achieved through international partnerships. This section provides an overview of efforts to build low-carbon communities in Japan and abroad. It also introduces innovative green innovation initiatives for achieving a low-carbon society.

1 World Trends in Achieving a Low-Carbon Society (COP 17)

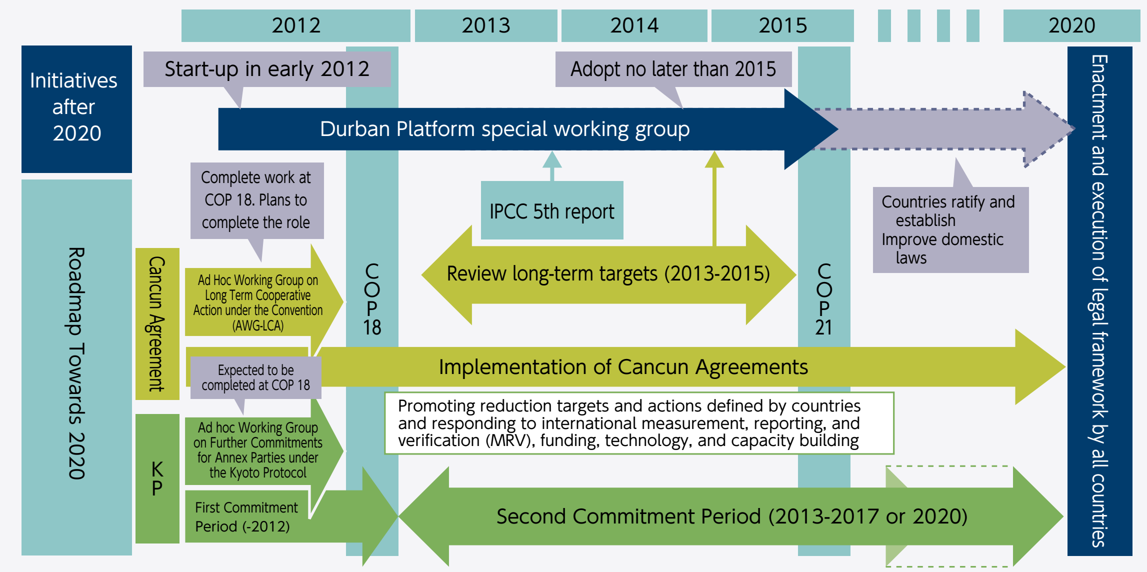
The 17th Conference of the Parties (COP 17) to the United Nations Framework Convention on Climate Change (UNFCCC) took place in Durban, South Africa between November 28 and December 11, 2011.

The Japanese government negotiated in hopes of establishing a fair and effective international framework including every major emitting country. Minister for the Environment Goshi Hosono explained the following in his speech: the Japanese government is giving its maximum effort to overcome the national calamity resulting from the Great East Japan Earthquake; Japanese policy strongly addressing climate change will not be changed now or in the future; and the Japanese government is studying the formulation of an ideal mix strategy and plan for new energy, and reviewing future countermeasures for combatting global warming (Photo 4-2-1).

As a result of the negotiations, agreement was obtained to establish the Ad Hoc Working Group on the Durban Platform for Enhanced Action as a process for a future legal framework that will be enforced in every country. Furthermore, robust achievements were also accomplished in implementing the Cancun Agreements, such as the basic design of the Green Climate Fund and the formulation of Measurement, Reporting, and Verification (MRV) guidelines for reducing a country's emissions. Under the framework of the Kyoto Protocol, an agreement was reached for setting the Second Commitment Period. However, some countries, including Japan, announced their nonparticipation in the Second Commitment Period since it makes no contribution to building a future comprehensive framework. Consequently, an outcome document was issued reflecting this standpoint (Figure 4-2-1).

After 2013, Japan will make the utmost ongoing efforts to control its actions by adopting domestic countermeasures to combat global warming. It will also inevitably continue to support global policies related to climate change based on its responsible position as a developed country. At the COP 17 session, Japan announced its commitment to Japan's Vision and Actions towards Low Carbon Growth and a Climate Resilient World to define its international contribution to be made in the future. Japan also made a firm step towards providing 15 billion dollars as aid for climate change measures adopted by developing countries until 2012 by the public and private sectors to the international community (short-term funding), an initiative that Tokyo committed to at the COP 15 session.

Figure 4-2-1 Roadmap to Future Frameworks



Source: Ministry of the Environment

Figure 4-2-2 Kyoto Protocol Second Commitment Period (CP2)

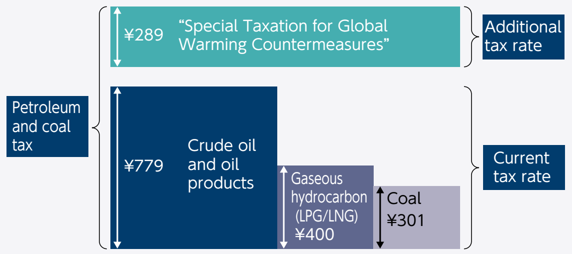
Protocol Draft Revision:
- ✓ Draft revision of the Kyoto Protocol was not adopted at COP17 (body and Annex B describes the target values) (Expected to be adopted at 2012 Conference of the Parties (CMP8))
- ✓ Reflecting the standpoints of Japan and Russia, who declared their nonparticipation in the CP2 (No column exists to enter target value on Annex B attached to outcome document).

Target Values:
- ✓ Advanced countries participating in the CP2 shall submit relevant information about reduction targets by May 2, 2012.
- ✓ Plans to adopt a revised Annex B describing reduction targets at 2012 CMP8 after reviewing the next Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) (AWG-KP will complete its role at that time*).

Commitment Period:
- ✓ Two draft periods are proposed: a five-year period (2013 through the end of 2017) and an eight-year period (2013 through the end of 2020) to be determined at the next AWG-KP.

Source: Ministry of the Environment

Figure 4-2-3 Tax Rates Per Ton of CO_2 Emissions under the "Special Taxation for Global Warming Countermeasures"

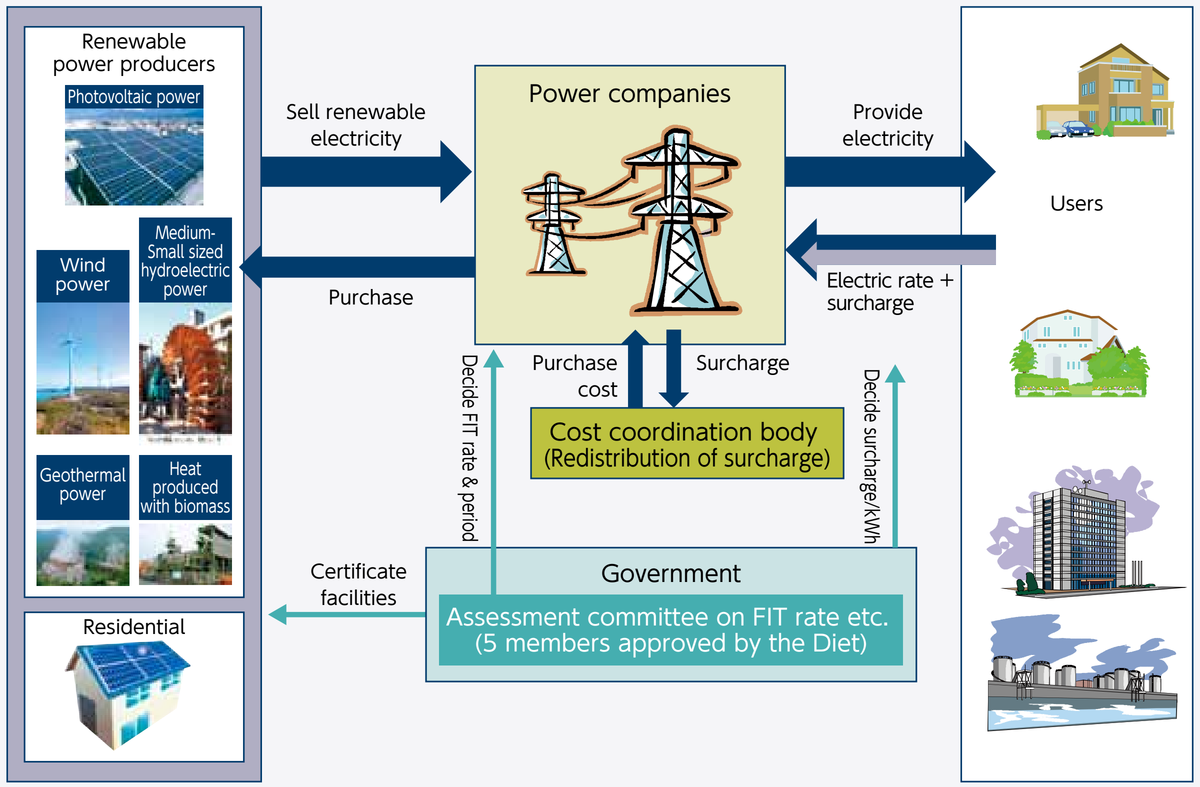


Resource: The 23rd Tax Commission of FY 2010

Photo 4-2-1 Minister of the Environment Goshi Hosono Delivering a speech at COP17

Photo: Ministry of the Environment

Figure 4-2-4 Feed-in Tariff (FIT) from July 2012



Resource: Agency for Natural Resources and Energy

2 Institutional Initiatives toward a Low-Carbon Society in Japan

(1) Greening of the Tax System

The FY 2012 Tax Reform Outline (Cabinet Decision of December 2011) recommended the introduction of the "Carbon Dioxide Tax as a Global Warming Countermeasure" in FY 2012 in order to strengthen global warming measures through tax incentives. This tax is to impose additional tax rates on the current Petroleum and Coal Tax (of which the tax base is whole fossil fuels) based on the CO_2 emission volume of each fossil fuel category.

(2) The Feed-in Tariff Scheme for Renewable Energy

This is a scheme to foster renewable energy in Japan with the help of all electricity customers. Power companies will be obliged to purchase electricity generated from renewable energy sources such as solar PV and wind power on a fixed-period contract at a fixed price. This will promote the introduction of renewable energy.

Costs of purchased electricity generated from renewable energy shall be transferred to electricity customers all over Japan in the form of a nationwide equal surcharge. They shall pay the surcharge for renewable energy proportional to electricity usage.

3 Innovative Energy and Environmental Strategy

The accident that occurred at the TEPCO Fukushima Daiichi NPS after the Great East Japan Earthquake had a great impact on Japan's environmental and energy policies. Amid increasing concerns, fierce debates were held with regard to shaken nuclear safety, the increasing demands for fundamental safety measures for nuclear power generation, and an energy structure that depends on nuclear power. Given this situation, countermeasures have been taken based on an awareness that reflects a social structure characterized by both massive energy consumption and significant energy-saving efforts. Therefore, the current Basic Energy Plan, which aims to increase dependency on nuclear power generation to 50% by 2030, should be completely withdrawn. In light of the problems in Japan's energy strategy revealed by the recent disaster, the Japanese government announced its commitment to formulating an innovative energy and environment strategy consisting of short-term, medium-term, and long-term targets to correct

Figure 4-2-5 Basic Stance to Suggest Options

Basic Stance 1: In terms of the zero-based review, all possible measures should be taken to ensure nuclear risk management.

○The review of energy/environmental strategy is attributed to the severe accident at TEPCO Fukushima Daiichi Nuclear Power Plant. Nuclear risk management is essential in order to suggest a concrete image to reduce nuclear dependency, which is becoming the main trend.

○The options should provide all possible measures to ensure nuclear risk management.

Basic Stance 2: In order to reduce nuclear dependency, while looking at world affairs, energy security and global warming measures should be satisfied simultaneously.

○It is important to simultaneously satisfy to preserving energy security and to contributing to global warming measures, in the situation in which the international situation of resources and international opinion concerning global warming are fluid.

○Countermeasures for the following issues will be also suggested:
- In order to reduce nuclear dependency, how should measures be implemented for energy security aimed at shifting to non-fossil fuel energy, and for global warming?
- How should a system be realized in which energy saving and renewable energy autonomously expand?
- How should greenhouse gas emission be reduced while dependency on nuclear power, which is zero emission power, is decreasing?

Basic Stance 3: A new energy mix or global warming measures can be realized by a new energy system in which users or communities are able to choose energy under the banner of "Creating Energy," "Storing Energy" and "Saving Energy."

○Energy shortage due to the Great East Japan Earthquake or the accident at TEPCO Fukushima Daiichi Nuclear Power Plant have changed all energy users' behavior, and made following points clear:
- Energy users' own investments, such as for "Creating Energy," "Storing Energy" or "Saving Energy," can stabilize the energy demand.
- It has been gradually accepted that the energy supply structure can be changed by the users' choice of energy source.
- It has been gradually accepted that local networks, initiated by communities, are effective for both crisis management and local revitalization.

○An ideal energy mix and global warming measures will be realized by the combination/integration of technology, such as Creating Energy, Storing Energy, or Saving Energy, and by the establishment of a new energy system in which the users or community can choose energy sources an their own initiative. There initiatives are expected to contribute to local revitalization or to the resolution of global issues.

Source: Basic Principles – Towards a proposal defining Options for and Strategy for Energy and the Environment created from Energy and Environmental council on December 21, 2011 by the Ministry of the Environment

Table 4-2-1 Fundamental Principles of Innovative Energy and Environmental Strategies

Fundamental principle 1: three principles for achieving a new energy mix ・Draw up scenarios to reduce dependency on nuclear power plants ・Formulate clear and strategic process to avoid energy deficiency and price increases ・Pursue new modality after carrying out verification of nuclear policy
Fundamental principle 2: three principles for achieving a new energy system ・Strive to achieve a distributed energy system ・Strive to use Japan's position as a developed country to make international contributions to resolving problems ・Multi-layered approach for achieving distributed energy system
Fundamental principle 3: three principles for formulating national consensus ・Promote public debate to overcome bipolar confrontation between anti- and pro-nuclear power groups ・Consider strategies based on objective data verification ・Formulate an innovative energy and environment strategy while maintaining dialogues with those in all segments

Source: Basic Principles-Towards a Proposal Defining Options for and Strategy for Energy and the Environment created from Energy and Environmental Council on December 21, 2011 by Ministry of the Environment

the flaws and vulnerabilities in the energy system and to respond to demands for securing a safe and stable energy supply, energy efficiency, and environmental friendliness.

Based on the Guidelines on Policy Promotion approved in a Cabinet meeting in May 2011, the Energy and Environment Council was established in June of the same year as a subcommittee in the Key Government Panel on New Growth Strategies (the council is also defined as a subcommittee of The Council on National Strategy and Policy, inaugurated in October 2011). The Council aims to formulate an Innovative Strategy for Energy and the Environment by summer 2012, after verifying the costs associated with initiating nuclear power generation, and after conducting a review from the ground up of the modality of nuclear policy and scenarios for reducing dependence on nuclear power generation, while at the same time considering future anti-global warming efforts as being inseparable from this process.

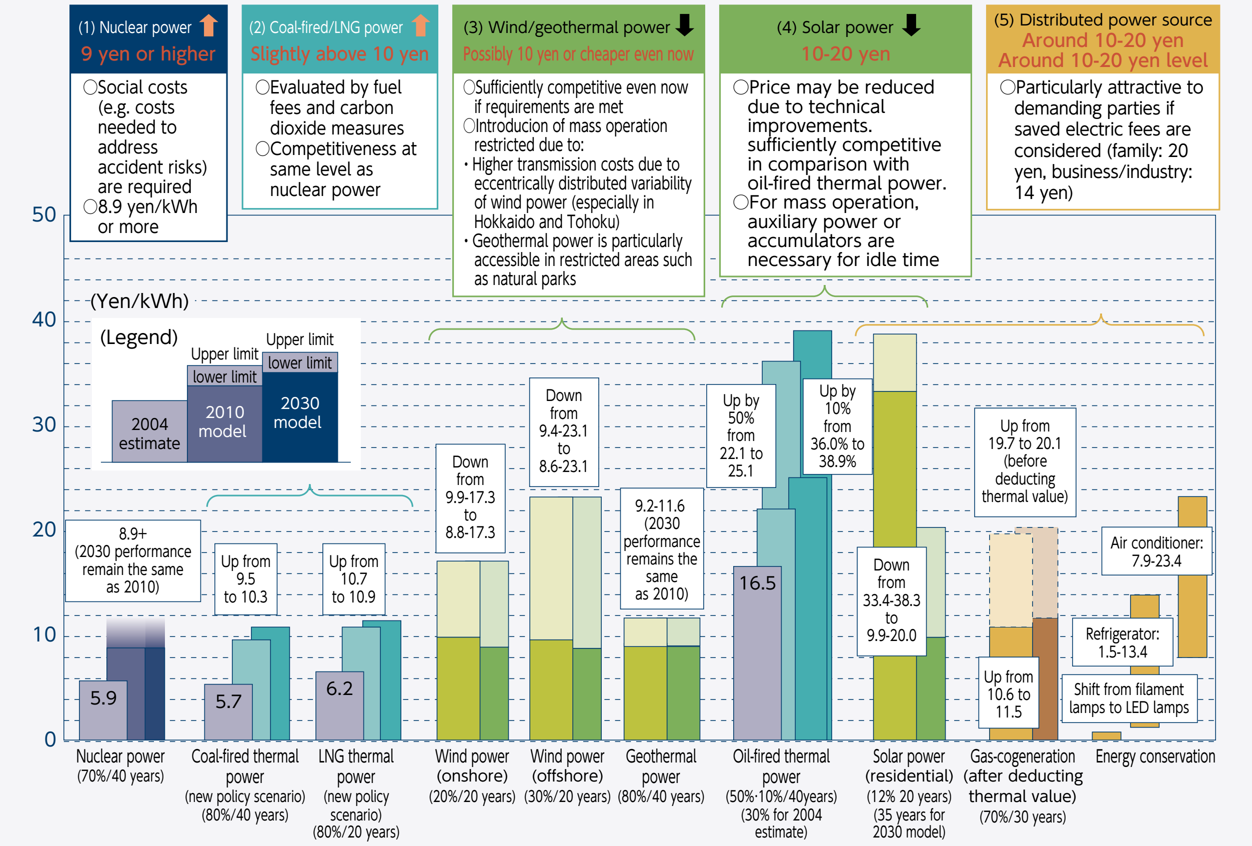
In July 2011, an intermediate summary was published in preparation for formulating an innovative energy and environment strategy. It indicated three fundamental principles for policy formulation: achieving a new energy mix; achieving a new energy system; and forming a national consensus (Table 4-2-1). Based on the summary, work to get back to basic principles is now being implemented from different perspectives and standpoints by the Energy and Environmental Council, the Japan Atomic Energy Commission, the Advisory Committee on Energy and Natural Resources, and the Central Environment Commission.

In addition, the Committee for Studying Costs and Related Topics, which is a cross-ministry organization, verified the costs of power sources including nuclear power. The cost estimation was performed in consideration of the cost of responding to accidents and risks, the cost of measuring carbon dioxide emissions, and so-called sociological expenses (e.g., policy expenses), in addition to cost estimations as of 2030. As to renewable energy, the estimation reflects the volume efficiency of renewable energy, the potential for technical innovation, increasing fuel costs needed for thermal power, and the increasing cost of implementing measures to cope with carbon dioxide problems. According to the report published in December 2011 by the Committee for Studying Costs and Related Topics, all power sources have their strengths and limitations, and one or more scenarios can be realized (Figure 4-2-6).

In December 2011, the "Basic Principles – Towards a Proposal Defining Options and Strategy for Energy and the Environment" were determined so as to indicate options for innovative energy and environmental strategy. These principles indicated a modality for consideration and points for deliberation when proposing options for nuclear policy, the energy mix, and combatting global warming, based on the report prepared by the Committee for Studying Costs and Related Topics, as well as on a review of related institutions. Based on these principles, the Energy and Environmental Council plans to indicate strategy options in spring 2012 for formulating an energy and environmental strategy by the summer of this year, after holding deliberations with full participation by the people of Japan.

The subcommittees for the global environment, such as the Japan Atomic Energy Commission, the Advisory Committee on Natural Resources and Energy, and the Central Environment Commission, plan to formulate proposed options for nuclear energy policy, the energy mix, and anti-global warming measures to be announced at the meeting. Also, the core initiative for reconstructing Japan, the Green Growth Strategy, is expected to be formulated in summer 2012 at the Energy and Environmental Council.

Figure 4-2-6 Verification of Costs for Power Sources other than Nuclear Power Generation



(Utilized capacity[%]/years in operation[years])

Source: Basic Principles-Towards a Proposal Defining Options for and Strategy for Energy and the Environment created from Energy and Environmental Council on December 21, 2011 by Ministry of the Environment

4 Japan's Outstanding Cutting-Edge Low-Carbon Technology

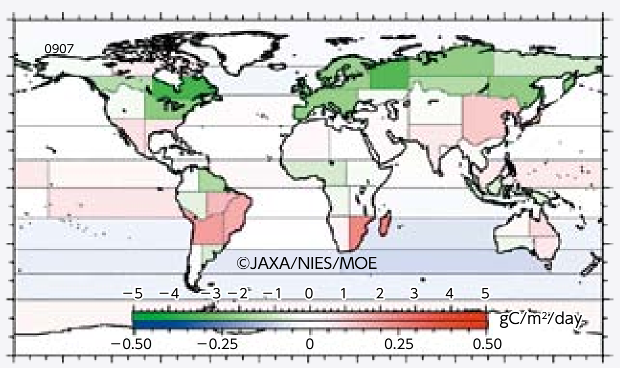
Thus far, this Report has provided an overview of future medium- to long-term approaches, including the international trend towards a low-carbon society and domestic anti-global warming measures. Green innovation is thought to be the key to achieving a low-carbon society, which suggests the potentially enormous contribution that Japan's world-leading low-carbon technology can make to GHG reductions and energy conservation on a global scale. This section describes the following specific global contributions: (1) technology to *measure* the current status of global warming; (2) technology to reduce GHG emissions; (3) technology to *generate* electricity using renewable energy; and (4) technology to accumulate reserve electricity.

(1) Approach from Space: IBUKI Greenhouse Gas Observation Satellite (GOSAT) — Developing Technology to Measure the Global Environment

Global warming is one of the urgent challenges we face as human beings. Technologies to measure carbon dioxide concentration worldwide and accurately understand carbon dioxide generation and carbon sinks are essential for implementing specific measures to mitigate and adapt to climate change.

Carbon dioxide concentration is now observed at about 300 locations around the world. However, since observing carbon dioxide behavior requires highly advanced equipment and technologies, developing countries generally have fewer observation points. Africa and South America are literally blind spots in terms of carbon dioxide observation. Moreover, performing observations from stations at fixed points is probably insufficient from the outset, given that Japan alone has 1,000 or more observation points as part of its Automated Meteorological Data Acquisition System (AMeDAS). Therefore, despite its universality, the behavior of carbon dioxide (e.g., its global distribution, the volume generated, and where and to what extent this volume is

Figure 4-2-7 IBUKI (exterior view) and Regional Carbon Dioxide Sinks and Emissions Data in July 2009 as Estimated from Observation Data



Source: Japan Aerospace Exploration Agency (JAXA) being absorbed) has still not been fully identified.

To resolve these challenges, Japan developed the IBUKI Greenhouse gas Observation SATellite (GOSAT). Joint development was carried out by the Japan Aerospace Exploration Agency (JAXA), the National Institute for Environment Studies, and the Ministry of the Environment. This satellite for observing GHGs from space was launched on January 23, 2009 from Tanegashima Space Center (TNSC) (Figure 4-2-7).

The IBUKI orbits the earth every three days, observing GHGs from above. In the past, data could only be collected from limited observation points on the surface of the earth. With IBUKI, however, we now have global data on carbon dioxide distribution. This data is used by researchers around the world to gather scientific knowledge in fields related to the global environment.

Our mission to overcome global warming cannot possibly be achieved overnight. It requires a continuous effort to reduce carbon dioxide emissions and prevent rising global temperatures based on the accumulation of scientific data derived from observed evidence. To make use of Japan's outstanding technical strengths for making ongoing global contributions, development began in 2012 on a follow-up satellite to the IBUKI. The next satellite will improve the accuracy of regional GHG sinks and emissions estimates with more accurate observations and more observation locations.

Following the IBUKI, the United States, European Union member states, China, and other countries also plan to launch satellites to observe GHGs. Through mutual collaboration and friendly competition with these satellites, IBUKI is expected to make a further contribution to combatting global warming by facilitating scientific development and establishing a more extensive observation network.

(2) Carbon Fiber Technology and Boeing 787 Aircraft — Developing Technology to Reduce Carbon Dioxide using Innovative Materials

Japan's outstanding technology has made a huge contribution to mitigating environmental impacts by conserving energy through more lightweight materials and products. Carbon fiber is one example of this outstanding technology.

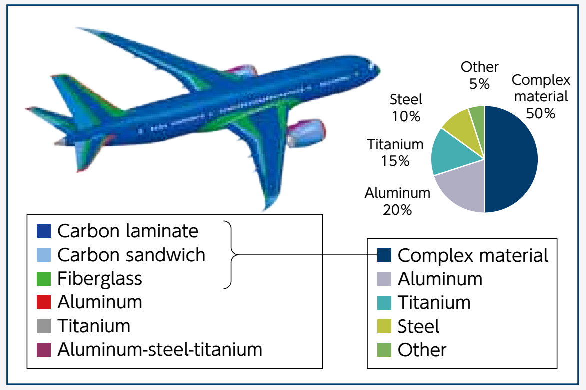
Carbon fiber is a next-generation structural material that can be used as a substitute for metals such as iron and aluminum. Carbon fiber has gained attention worldwide as a high value-added material due to its light weight and durability, which result in conserving energy and therefore environmental conservation. Japan is highly competitive with this material and has a nearly 70% share of the world market. Japan has used carbon fiber to develop a new passenger aircraft called the Boeing 787 Dreamliner (Boeing Company), a machine that showcases Japanese complex carbon fiber material technology.

All Nippon Airways Co., Ltd. acting as a launching customer and dozens of other corporations in Japan participated from the beginning in the development and joint production of the fuselage of this passenger aircraft. Consequently, 35% of the fuselage is being produced by Japanese companies (Figure 4-2-8). One likely reason that the Japanese group successfully obtained such a high share was that outstanding Japanese carbon fiber technology directly improves fuel efficiency. The Boeing 787 achieved dramatic weight saving by using these highly advanced complex carbon fiber materials for about half of the fuselage and main wing parts. The 787 ended up achieving about a 20% improvement in fuel efficiency over previous-generation models of the same size. Furthermore, it also realized a higher aspect ratio (proportional to the square of the wingspan) compared to previous wings that utilized complex carbon fiber materials. The 787 thus achieved lower fuel consumption than previous models of the same size and a higher cruising speed of Mach 0.85. The technology improved the endurance of the mid-sized 787 to a level comparable to larger aircraft.

In addition, complex carbon fiber materials are superior in terms of fatigue endurance and corrosion resistance.

Figure 4-2-8 Proportion of Carbon Fiber Complex Materials Used in the Boeing 787

Boeing 787 Dreamliner



Proportions of materials constituting the fuselage

Source: All Nippon Airways Co., Ltd.

As a result, the 787 can operate effectively in hot, humid conditions while achieving dramatic reductions in both maintenance frequency and cost. Also, introducing high-intensity complex carbon fiber materials in the fuselage significantly reduced barometric altitude in the cabin, as a result of which the 787 successfully reduced discomfort due to pressure differences. Finally, thanks to its outstanding humidity resistance, the 787 met humidity challenges and overcame dryness, resulting in a significant improvement in passenger comfort.

The development of complex carbon fiber materials is now moving towards practical use. In the future, it is expected to spread to industries outside of aeronautics, including the automobile industry. This will further improve fuel consumption, allowing for significant reductions in GHG emissions and resulting in an enormous contribution to developing a low-carbon society.

(3) Developing Cutting-Edge Technology for Renewable Energy to Generate Clean Electricity

Given the fact that it is distributed throughout various different regions, the key to introducing renewable energy is figuring out how to bring out its potential.

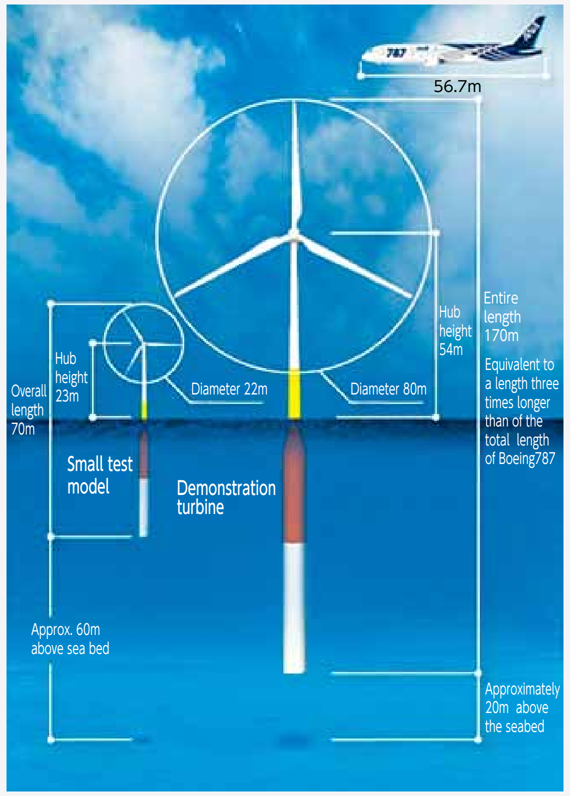
A significant portion of Japan's geopolitical structure is characterized by hilly, mountainous terrain surrounded by oceans, giving the nation the world's sixth-largest exclusive economic zone. Further introduction of renewable energy in Japan must consider these conditions, and it may be beneficial to study the great potential inherent in offshore wind power generation.

Offshore wind power falls into two categories: fixed-bottom wind power that can be installed in shallow water; and floating wind power to be used in deep-sea areas. Japan has minimal shallows at the edge of the continental shelf and there is virtually nothing to hinder the flow of wind in the open sea. Floating wind power thus has greater potential than the fixed-bottom type, since it can be driven by stronger and more stable wind power than generators installed on land or just offshore. Technological development and verification is thus absolutely critical if floating wind power generation is to be made viable.

Offshore wind power generation technology has recently gained attention, but its market penetration is still insufficient, with only three fixed-bottom wind power plants in operation in Japan and only two floating demonstration turbines in operation in Norway and Portugal.

In this context, the Ministry of the Environment launched a verification project in 2010 for installing and starting operation of a full-scale (2 MW) floating wind turbine for the first time in Japan. In December 2010, the ministry selected an area off Kabashima in Goto City, Nagasaki for the verification project. The project covers the installation and operation of a small test model mounting a 100 kW turbine in 2012, and launching a demonstration turbine in

Figure 4-2-9 Floating Type Offshore Wind Power Test Model and Demonstration Turbine for Wind Power Generation to be Installed and Operated off Kabashima in Goto City, Nagasaki Prefecture



Source: Ministry of the Environment

2013. The ultimate goal of the project is to start business as a private entity in 2016 and to obtain necessary knowledge (Figure 4-2-9).

Offshore wind power generation technology is undergoing development on a global scale. As a result, technological verification from this project may bring about a dramatic expansion in the introduction of renewable energies around the world in the years to come.

(4) Potential of Accumulators and Future Development — Technology to Accumulate Clean Electricity

As described in Chapter 3, in response to the Great East Japan Earthquake, renewable energies (e.g., photovoltaic power generation and wind power generation) and next-generation vehicles (including electric vehicles) have gained attention as a way to improve energy security and reduce carbon dioxide emissions. It is known that accumulators can play a central role in leveling unstable output or accumulating excess power from solar and wind power generators. At the same time, high-end, low-cost accumulators are needed as a power source for electric and other next-generation vehicles.

Lithium-ion batteries have several advantageous features, including an extremely high energy density and charge-discharge efficiency, less self-discharge, rapid charge-discharge, and long life, hinting at a wide variety of device applications. Three applications in particular have drawn significant attention: massive accumulators for system stabilization in view of the vast introduction of renewable energy in the future and the establishment of smart grids and other new social systems; fixed accumulators for customers, such as households and business operators; and accumulators for electric and other next-generation vehicles.

Massive accumulators for system stabilization assume a key role in temporarily stabilizing the unstable volumes of electricity generated by renewable energy generators. Demonstration research has been launched as a key component in establishing smart grids.

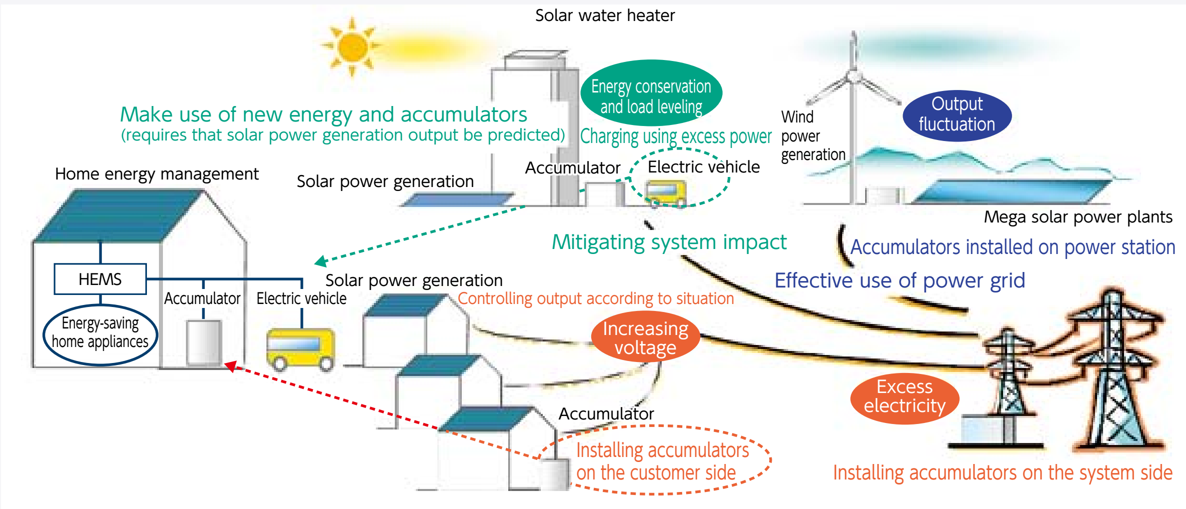
Fixed accumulators installed on the customer side (e.g., households and business operators) can also be used as an emergency power source. For example, products combining a fixed accumulator with solar power generation or a fuel cell have been marketed by some manufacturers for private homes.

The performance of accumulators mounted in electric and other next-generation vehicles directly impacts automobile performance. Manufacturers have been making serious efforts to develop high-output, high-capacity lithium-ion rechargeable batteries with reduced size and weight. Another practical use for accumulators on a vehicle is to be used as a home accumulator. As an example, an electric vehicle equipped with a high-capacity 24-kWh accumulator can supply electricity to a house for about two days. An accumulator like this was developed by a Japanese company with support from the Ministry of the Environment.

As stated above, accumulator technology is the key to energy management for vehicles, industrial equipment, products, and electric power systems. Accumulator systems have great potential to bring dramatic changes to our daily lives and industry, including social conveniences, economic efficiency, environmental impact, and more (Figure 4-2-10).

During 2010, sales of lithium-ion rechargeable batteries in Japan amounted to 295.8 billion yen. This demonstrates that Japan is sufficiently competitive globally in this field; however, other countries have been making joint public- and private-sector efforts in recent years. It is therefore critical for Japan to establish technologies that focus on these fields: improving performance and safety while reducing costs to expand penetration of markets both domestically and abroad.

Figure 4-2-10 Energy Management Model Using Accumulator



Source: Agency for Natural Resources and Energy

Column

Technology for Using Microbes to Mitigate Environmental Impacts

Research on environmental technologies using algae and microbes has been developing rapidly. The purpose of these technologies is to apply the biological activities performed by algae and microbes (their metabolism and energy metabolism) to various aspects of resource supply and environmental impact mitigation (e.g., supplying biofuels, environmental purification, and GHG sinks using carbon fixation). Specific examples include research on power generation systems using microbial catalysts and the use of biomass energy through the hydrocarbons produced by a type of blue-green algae called *Aurantiochytrium*. In addition, advances in research on the microbe euglena, a well-known freshwater flagellate used in science experiments and observations, have been making rapid progress in recent years.

Euglena is a collective term for a genus of flagellates of the phylum Euglenophyta, which perform photosynthesis using chloroplasts and use their flagella to move around.

Euglena's photosynthesis is extremely efficient, and is capable of carbon fixation performance about eighty times more effective than that of rice plants. Because of its outstanding production capacity per area, euglena is expected to help supply biomass resources that do not compete with the food supply, and to help formulate a low load distribution food supply chain and material circulation cycle.

Moreover, euglena can grow prolifically in conditions where carbon dioxide is heavily concentrated. It is known that euglena can grow in exhaust gas from thermal power plants (usually containing around 15% carbon dioxide). These characteristics were used to conduct an experiment to verify the feasibility of euglena in practical use, in which pipes were connected to the smoke path of a power plant and the exhaust gas was vented into a euglena culture tank. It turned out that the euglena grew prolifically around seven days, suggesting that the microbe successfully performed carbon fixation.

Not many aspects of microbes have been scientifically identified at present. Future research may find environmental impact mitigation potential.

Euglena

Source: Euglena Co., Ltd.

5 Japan's Contribution to Achieving a Low Carbon Society by Cooperation with Developing Countries

Climate change causes floods droughts, reduction of agricultural production, and the spread of infectious disease. It is immediately necessary for developing countries to make efforts to adopt to the climate change such as preventing disasters and infectious disease, and improving the system of agricultural production, because climate change especially impacts on developing countries. Carbon dioxide emissions in developing countries have also becomes a global issue. But developing countries often need technology, funding and human resources cooperation with developed countries.

Japan provides technical assistance to developing countries climate change countermeasures through cooperation with international institutions and bilateral assistance. The following section describes the international cooperation with developing countries in the field of climate change, especially focusing on Japanese experience, expertise and technologies.

(1) Contribution to Achieving a Low Carbon Society by Technical Cooperation with Developing Countries

Japan implements ODA to promote cooperation with developing countries. Bilateral technical assistance is one of the important efforts under the policy of "utilization of Japan's experience and expertise" in the "Japan's Official Development Assistance Charter" (revised in August., 2003). These technical cooperation effort projects have been implemented through the Japan International Cooperation Agency (JICA).

A technical cooperation project is integrated practical assistance to a developing country under a plan make with a consensu of the countries involved. Such a project includes training for local engineers or officials, the dispatch of JICA experts, and the supply of equipment. The recipient countries need to prepare the operation base and expenses.

The ministry of the Environment promotes the dispatch of experts. They on consultation provide environmental policy, transfer technology, and develop appropriate technology, utilizing their knowledge, and experience.

It is important to focus not only on introducing high-technology but also on transferring human resources especially in developing countries.

Table 4-2-2 Aid to Developing Countries by JICA for Realizing a Low Carbon Society

Countries	Projects	Duration of projects	Summery of projects
Thailand	Capacity Building for Climate Change Adaptation and Mitigation for Implementation in Bangkok	June,2009 -May,2012	Strengthening the institutional capacity of Bangkok Metropolitan Administration in the field of followings:1) mass transportation 2) renewable energy 3) saving energy in buildings 4) management of waste disposal and waste water 5) urban greening
Vietnam	Project for Capacity Building for National Greenhouse Gas Inventory	Sept.,2010 May, 2014	Strengthening the technical capacity for Ministry of Natural Resources and Environment to conduct the GHG inventory regularly with accuracy and reliability.
Indonesia	Project of Capacity Development for Climate Change Strategies	Oct.,2010 –Oct.,2015	Strengthening the institutional capacity of the organization related to climate change countermeasures in the field of following three sub projects; 1) mainstreaming mitigation of climate change and adaption under development project 2) capacity for assessing vulnerability 3) conducting the GHG inventory(Ministry of the Environment)
Serbia	Capacity Development Project for Nationally Appropriate Mitigation Actions (NAMAs)	Nov.,2010 –Feb.,2013	Strengthening the capacity for planning and implementing NAMAs with researching, reporting and verifying.

Source: The Ministry of the Environment based on JICA materials

(2) Japan contribution by Clean Development Mechanism

The Clean Development Mechanism (CDM), defined in the Kyoto Protocol, allows a country with an emission - reduction or emission - limitation commitment under the Kyoto Protocol to implement an emission-reduction project in a developing country. CDM projects can earn saleable "Certified Emission Reduction (CER)" credits, which can be counted towards meeting Kyoto targets. The CDM is one of the systems for international contribution because technical transfer to developing countries is expected through a CDM project.As of December 2011, 3,725 projects have been registered, and the amount of CERs is 820 million tons of carbon dioxide as of the end of December 2011. (Figure 4-2-11).

(3) Bilateral Offset Credit Mechanism

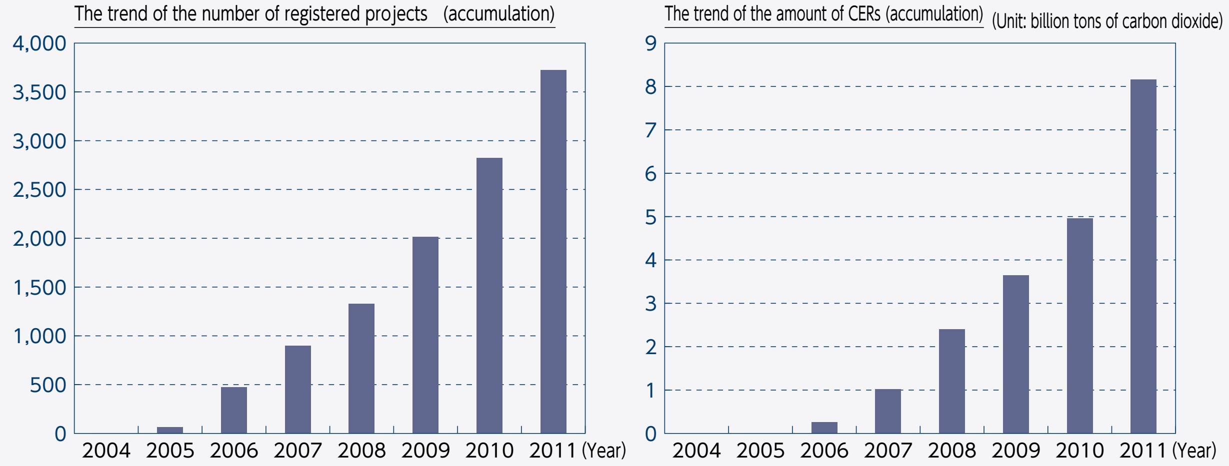
Japan suggests a bilateral offset credit mechanism, which complements the Kyoto mechanism through the appropriate evaluation of the contribution to GHG emission reductions by joint projects between a developed country and a developing country, including assistance for introducing low carbon technologies and products. This mechanism is expected to be that one of the various approaches that are noted in COP17 (2011, Durban) as "Parties may, individually or jointly, develop and implement such approaches in accordance with their national circumstances".

Figure 4-2-11 The Number of Registered CDM Project and Amount of CERs

○3,725 projects have been registered as of December 31, 2011 and the amount of CERs is about 820 million tons of carbon dioxide.

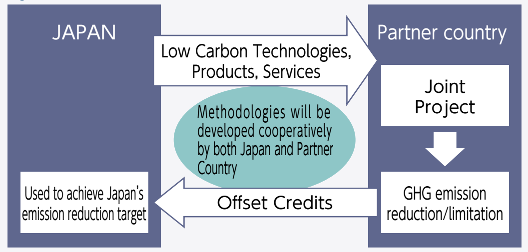
○CDM is often recognized as one of the most successful systems (World Bank, UNFCCC secretariat, etc.)

○According to the World Bank report, the amount of estimated CERs is from approximately about 1.2 billion to about 1.3 billion tons of carbon dioxide up to 2012 and from approximately about 2.7 billion to 4.0 billion tons of carbon dioxide up to 2020. *State and Trends of the Carbon Market Report 2011*(World Bank)



Source: IGES CDM Project Database, IGES CDM Monitoring and Issuance Database (as of December 31, 2011)

Figure 4-2-12 Summery of Bilateral Offset Credit Projects



Source: Ministry of the Environment

Column

Examples of Technical Assistance for Developing Countries in the scheme of the CDM

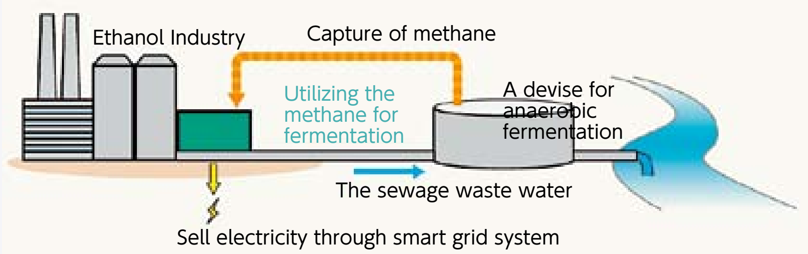
The environment in emerging countries is deteriorating because of their increasing population and economic growth. Especially in Asia, urbanization and industrialization as a result of economic growth impose serious environmental pollution and increases in GHG emissions. As we have seen in Section 1 of Chapter 4, Japan has had the experience of having overcome environmental pollution, and is expected to contribute to solving environmental issues in developing countries.

Japan has provided technical assistance for implementing co-benefit projects in which reduction of greenhouse gas emissions and moderation of environmental pollution are fulfilled simultaneously.

Here is an example of a project in Thailand, which aims to introduce biomass gas generation utilizing sewage waste water from the bio ethanol industry. The sewage waste water from the industry has been drained into an open lagoon, which caused a large amount of methane emission. Japan's assistance aimed to reduce the water pollution and emission of methane by introducing a sewage management system with divices for anaerobic fermentation and a biomass gas generation system using methane. Half of the emission reduction amount is transferred to Japan as carbon credit.

This is just an example, but it is necessary to promote technical assistance for developing countries through the advance of Japan's high technology overseas and the taking the initiative in the field of countermeasure of climate change countermeasures.

The Project of Biomass Gas Generation Utilizing the Sewage Waste Water from the Ethanol Industry in Thailand



Source: Ministry of the Environment

Section 3 Exploring and Using Japan's Prospective Terrestrial Resources

1 Japan's Prospective Terrestrial Resources

Mineable natural resources are exhaustible, and in some circumstances, such resources could face depletion at a scale or speed that has not been experienced before in 10 to 20 years. Moreover, numerous environmental problems associated with mining mineral resources have recently occurred, and the world has been shaken by an unstable supply of precious and rare metals, which are critical for producing precision instruments.

On the other hand, various used products in Japan contain a deal of reusable metal resources that can be converted to raw materials. If metal resources from used products can be collected and reused, we can reduce the input of newly mined natural resources.

In general, the countries that produce underground resources are different from those that consume them. However, with metal resources (terrestrial resources) in used products, it is highly likely that the two groups will overlap. For example, in Japan, there is a strong demand for platinum to be used in automotive catalysts (mufflers), and a large number of used mufflers are produced. If, instead of disposing of them as waste, the mufflers can be collected separately to extract the platinum to be reused as a raw material for newly manufactured mufflers, that amount of platinum can be subtracted from the current volume imported from overseas.

The National Institute for Materials Science carries out research to estimate the amount of metal resources in Japan in the form of terrestrial resources. According to these estimates, there are 1.2 billion tons of iron, 38 million tons of copper, 60,000 tons of silver, 6,800 tons of gold, 4,400 tons of tantalum (a rare metal), and 150,000 tons of lithium. Expressed as a percentage of current global deposits, the figures are 1.62% for iron, 8.06% for copper, 22.42% for silver, 16.36% for gold, 10.41% for tantalum, and 3.83% for lithium (Figure 4-3-1).

It must be noted that the figures above include a large portion of virtually non-recyclable materials (e.g., products currently in use, landfilled waste.) However, Japan's dormant terrestrial resources can be considered to have enormous potential, which could even be equal to that of large mines overseas.

To what degree are we then able to effectively use this massive amount of terrestrial resources today? Metallic waste landfilled instead of being recycled in 2009 amounted to approximately 530,000 tons of general waste (about 34% of the total amount produced) and approximately 230,000 tons of industrial waste (about 3% of the total amount produced). In addition, a significant number of products remain unused and undisposed of in homes (dead storage), including about 50% of all cell phones, about 30% of video and DVD players, and about 40% of portable music players. The statistics indicate that small electronic devices in particular tend to be part of dead storage in households (survey by the Ministry of the Environment).

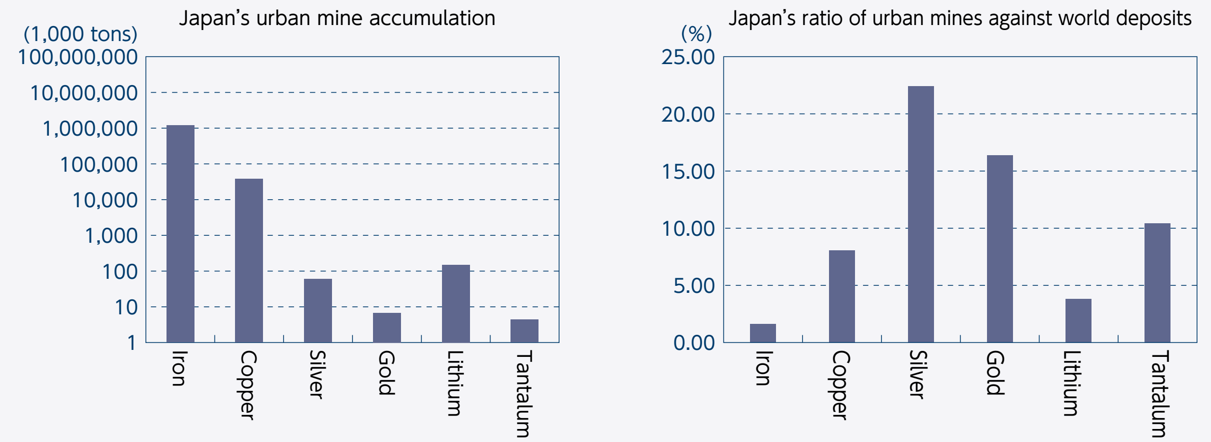
As stated above, terrestrial resources that are dormant in Japan may have great potential to be used in some form again in the future.

2 Flow of Metal Resource Recycling

How are metal resources recycled in Japan? Figure 4-3-2 provides a brief overview.

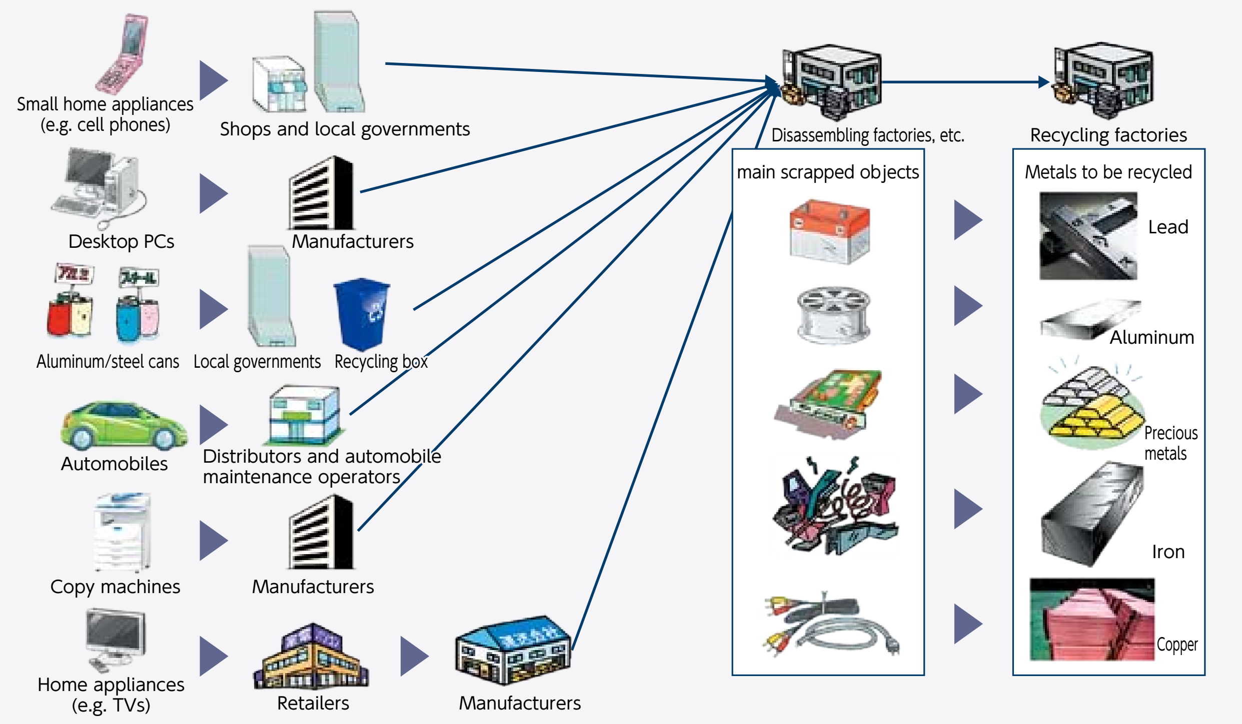
The Law for the Recycling of Specified Kinds of Home Appliances makes recycling compulsory for four items: air conditioners, TVs, refrigerators, and washing machines. Under this scheme, customers hand over waste home

Figure 4-3-1 Japan's Accumulated Urban Mine Content and Percentage of Global Deposits



Source: Press release reference by National Institute for Materials Science

Figure 4-3-2 Flow of Recycling of Major Products



Reference: Ministry of the Environment

appliances to retailers when they replace the items, and pay collection, delivery, and recycling fees. The waste home appliances handed over to the retailers are then given to manufacturers to collect resources such as iron, copper, and aluminum for recycling. The recycling ratios (recycled weight/recycled throughput) for these four home appliance items in FY 2010 were: 88% for air conditioners; 85% for cathode ray tube (CRT) TVs; 79% for LCD and plasma TVs; 76% for refrigerators and freezers; and 86% for washing machines and dryers.

Collection and recycling by manufacturers of personal computers, sealed accumulators, and automotive batteries are obligatory under the Law for Promotion of Effective Utilization of Resources. The itemized recycling ratios (recycled weight/recycled throughput) in FY 2010 were: 76.1% for desktop computers (main units); 55.6% for laptop computers; and 50.0% to 76.6% for sealed accumulators.

For automobiles, the Law for the Recycling of End-of-Life Vehicles requires the collection and proper disposal of chlorofluorocarbons, airbags, and shredder dust (automobile shredder residue produced at the time of disposal). In addition, business operators voluntarily collect useable parts (including engines, doors, and tires) for reuse. Moreover, useful metals such as iron are collected from leftover scrapped vehicles. Thanks to these efforts, the recycling rate for vehicles has reached nearly 95%.

Most copy machines are collected by manufacturers, since these products are highly likely to be on lease. Copy machines are designed to be easily reused or recycled before they are even sold. Specifically, the machines indicate grades to show which materials have been used or design strength to ensure easy recycling. Parts removed from the main unit of collected copying machines and optical parts with minimal deterioration are reused again in new products. Parts that are not reusable are collected as resources; these include iron, stainless steel, and plastics. These efforts have helped achieve a recycling rate of 99% or more (Japan Business Machine and Information System Industries Association).

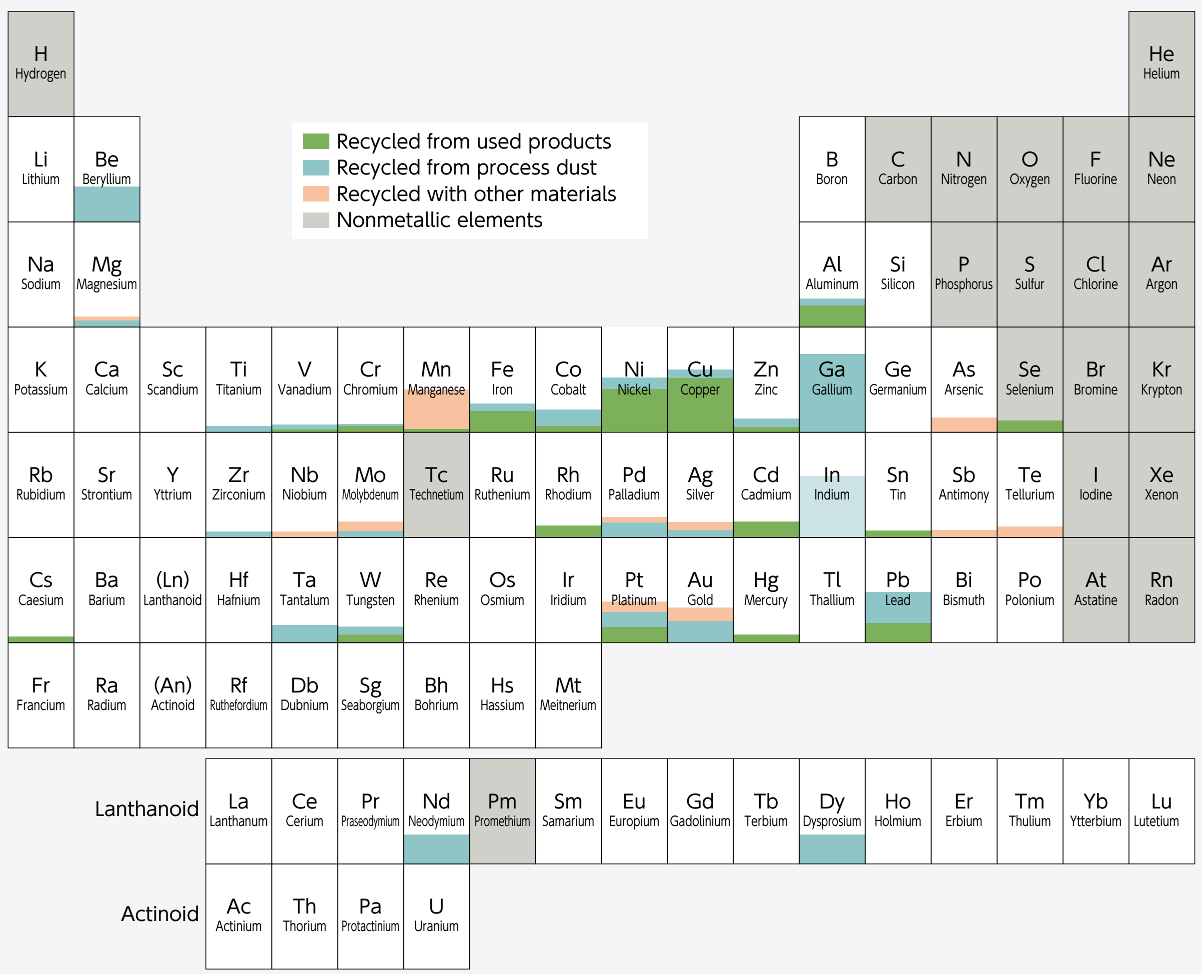
Steel cans, aluminum cans, and similar products that are primarily made of iron or aluminum and that can be easily recycled are separately collected by local governments to recover the metal resources. Thanks to active collection and recovery of these metals, Japan has achieved a high recycling rate for both steel and aluminum cans: 89.4% for steel cans (Japan Steel Can Recycling Association); and 92.6% for aluminum cans (Japan Aluminum Can Recycling Association).

Looking at data for specific metal resources, those such as iron (Fe), aluminum (Al), copper (Cu), and lead (Pb) show relatively high recycling rates due to their being distributed in large quantities and their ease of separation into a single material (Figure 4-3-3).

However, metal resources other than the above are generally disposed of as waste in a condition containing one or more metal substances. These metals must therefore be separated through a screening, sorting, or refining process, which translates to high resource collection costs due to the extensive business investment required.

For example, when removing gold or silver from electronic parts, items containing a high concentration of gold or silver are collected, and a secondary separation process is then

Figure 4-3-3 Recycling Ratios by Metal Element



Source: National Institute for Materials Science

Figure 4-3-4 Useful Metals Collected by Local Governments During FY 2010

Metallic element	Ratio collected*
Iron	66.8%
Copper	21.7%
Silver	4.0%
Gold	4.6%
Aluminum	52.9%
Stainless steel	16.5%
Rare metals	2.6%

Note: Ratio collected refers to the percentage of local governments collecting the metals (number of local governments that responded: 1,748)
Source: Ministry of the Environment

performed to collect these substances via recovery of other base metals such as copper. The specific process involves: (1) heating the material at high temperatures to melt and oxidize it so that iron, sulfur, and other substances can be removed; (2) creating an intermediate product called matte; (3) melting and oxidizing the matte at an even higher temperature to increase its purity; (4) producing crude copper at 99.5% purity; and (5) going through an electrorefining process (a process that dissolves the crude copper into a water solution to separate out copper once again using electricity) to produce 99.99% electrolytic copper. The gold, silver, platinum, and other substances contained in the crude copper can be separated and collected through the electrorefining process.

When collected electronic or other parts have high concentrations of gold or silver, it is possible to remove the metals through a wet reduction method using nitric acid (a process that removes specific metals by changing the concentration of an acid or similar substance in solution).

To recycle accumulators such as lithium-ion batteries, substances are extracted for recycling after removing impurities (e.g., battery cases and non-recyclables). Since one or more metals are still contained at this stage, manganese, cobalt, nickel, lithium, and other metals are separated in the form of a solution using several types of solutions according to the substance. Finally, electrifying the separated solutions can abstract high-purity metals. This process is called electrorefining.

In general, it is difficult for local governments to perform the complicated process explained above when collecting metals at waste disposal facilities. This is because most metal resources other than iron and aluminum disposed of as waste are landfilled instead of recycled (Figure 4-3-4).

3 New Recycling Systems for Used Small Electronic Devices

As stated above, in Japan, large home appliances are actively recycled under the Law for the Recycling of Specified Kinds of Home Appliances or by voluntary collection by manufacturers to recycle useful metals.

However, useful metals (including rare metals) are also contained in used small electronic appliances, which are not reliably recycled.

Statistics for used small electronic appliances have yet to be established. However, the Ministry of the Environment estimates that the quantity of small electronic appliances that reach the end of their product life and are disposed of is 651,000 tons per year, and the useful metals contained within them are estimated at 279,000 tons (equivalent to 84.4 billion yen). Figure 4-3-5 shows a comparison between the estimated quantities of metals contained in small electronic appliances that will reach the end of their product life per year and the level of domestic demand for metals to be used in production per year. The data show that a constant benefit can be expected by collecting used small electronic appliances and recycling metals in terms of lowering the volume needed for new manufacturing. The target metals are: tantalum (ratio against domestic demand: 9.4%); gold (ratio against domestic demand: 6.4%); and silver (ratio against domestic demand: 3.7%).

For example, an average cell phone (140 grams) contains 48 milligrams of gold (equivalent to 200 yen). This is equal to the volume of material that can be obtained from 52.8 kilograms of earth and sand excavated in mines (Figure 4-3-6). There are currently several technical obstacles to collecting resources from substrates. If gold were collected from all 40 million used cell phones disposed of during 2011, about 2 tons (equivalent to 8 billion yen) could be reused as a resource.

Countries like EU member states have already started systematic recycling in consideration of the fact that used small electronic appliances contain a large amount of useful metals.

In Japan as well, starting in FY 2008, the Ministry of the Environment and the Ministry of Economy, Trade and Industry jointly implemented a model project for collecting useful metals, focusing attention on used small electronic appliances. The local governments participating in the model project made a proposal to boost profitability: since the small electronic appliances had to be collected and disposed of over a widespread area, the central government should work to loosen regulations to remove the requirement for permission to collect and transport this waste under the Waste Disposal and Public Cleansing Law.

Transaction prices for the useful metals collected from small electronic appliances may vary widely depending on supply and demand conditions for the metal resources and market rates for the natural resources. In spite of the fact that local governments bear the expense of collecting small electronic appliances, if recyclers can easily refuse to accept the products because of changes in market conditions, thus a significant portion of local governments may hesitate to participate in the program.

In consideration of the above, the central government submitted a new law to the Diet on March 9, 2012: the Act on the Promotion of Recycling of Used Small Electronic Devices (Small Electronic Appliances Recycling draft act).

Figure 4-3-7 shows the flow of recycling based on the Small Electronic Appliances Recycling Act. According to the prevailing conditions, local governments voluntarily choose a method for collecting used small electronic devices from the following options: box collection; station collection; and pick-up collection. Used small electronic devices collected by the local government are delivered to business operators authorized by the Minister for the Environment and the Minister of Economy, Trade and Industry for collection and recycling of the useful metals (authorized business operators). To ensure stable recycling, authorized business operators may not refuse to accept such requests from the local government to accept the devices unless there is justifiable reason.

When authorized business operators collect or deliver the used small electronic devices based on the Small Electronic Appliances Recycling Act, they are exempted from obtaining permission based on the Waste Disposal and Public Cleansing Law. Also, when the business operators procure the necessary funds for improving facilities, they are entitled to have a guaranty of liabilities from the Japan Industrial Waste Management Enterprise Development Foundation.

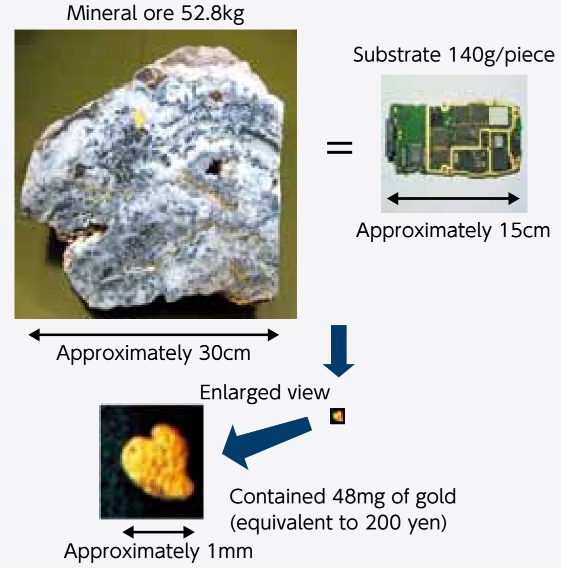
As stated above, the Small Electronic Appliances Recycling Act is a system that encourages people to participate in the world of recycling rather than imposing an obligation. Therefore, active cooperation between parties (e.g., local residents, local governments, and recyclers in local communities) is absolutely necessary. To further ensure effective recycling in communities, it is strongly hoped that a high level of environmental awareness will develop for each party and coalesce into a kind of community strength.

Figure 4-3-5 Comparison Between Useful Metal Contained in Used Small Electric/Electronic Devices and Domestic Demand

		Domestic demand (tons)	Compact electrical and electronic devices		Cell phones		Personal computers	
			Volume (tons)	Ratio against domestic demand	Volume (tons)	Ratio against domestic demand	Volume (tons)	Ratio against domestic demand
Base metals	Iron (Fe)	94,291,000	230,105	0.2%	418	0.0%	16,845	0.0%
	Aluminum (Al)	4,002,000	24,708	0.6%	50	0.0%	3,914	0.1%
	Copper (Cu)	1,763,000	22,789	1.3%	1,001	0.1%	2,730	0.2%
	Lead (Pb)	251,000	740	0.3%	19	0.0%	220	0.1%
	Zinc (Zn)	489,000	649	0.1%	44	0.0%	70	0.0%
Precious metals	Silver (Ag)	1,870	68.9	3.7%	10.5	0.6%	21.1	1.1%
	Gold (Au)	166	10.6	6.4%	1.9	1.2%	4.5	2.7%
Rare metals	Antimony (Sb)	7,666	117.5	1.5%	2.3	0.0%	43.5	0.6%
	Tantalum (Ta)	360	33.8	9.4%	3.2	0.9%	14.9	4.1%
	Tungsten (W)	4,000	33.0	0.8%	27.1	0.7%	1.1	0.0%
	Neodymium (Nd)	7,000	26.4	0.4%	18.9	0.3%	–	–
	Cobalt (Co)	16,260	7.5	0.0%	2.2	0.0%	–	–
	Bismuth (Bi)	682	6.0	0.9%	0.7	0.1%	0.8	0.1%
	Palladium (Pd)	131	4.0	3.1%	0.5	0.4%	2.1	1.6%

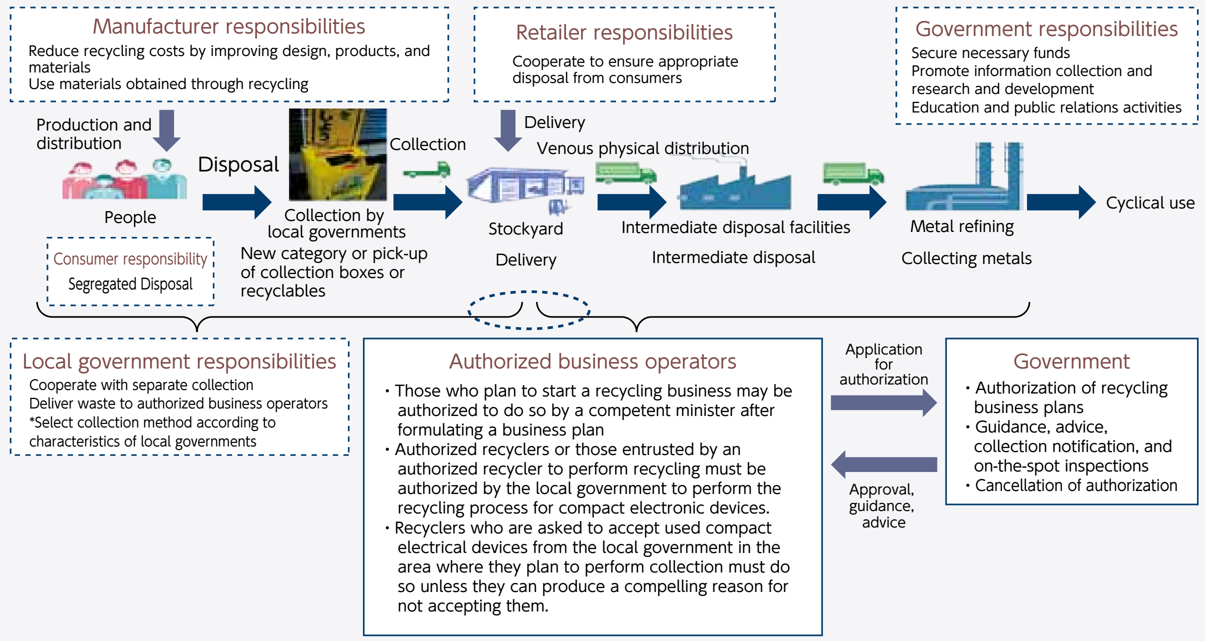
Note: Cells marked "-" indicate that the calculation were not performed because no data was available (this does not mean that the product contains no target substance). The personal computers category includes desktop and laptop computers.
Source: Ministry of the Environment

Figure 4-3-6 Conceptual Diagram for Mining Gold from Urban Mines



Source: Ministry of the Environment

Figure 4-3-7 Outline of Small Electronic Appliance Recycling Act



Reference: Ministry of the Environment

4 Innovative Examples of Exploring and Effectively Using Terrestrial Resources

Backed by heightened environmental awareness and soaring resource prices in recent years, a new initiative led by business operators and local public authorities has emerged to proactively and vigorously reuse and recycle metal resources. The following describes examples of innovative initiatives taking place in Japan to explore and use terrestrial resources.

(1) Qualitative Change in Recycling Steel

At present, iron is recycled through the iron scrap produced at various stages: steel production, processing at plants, dismantling civil engineering and construction sites, and disposing of used products such as automobiles. In fact, about 53 million tons of the 140 million tons of steel materials produced in Japan (about 38%) are actually derived from scrap steel (Figure 4-3-8).

Raw materials from steel products made from scrap iron were previously used for construction materials, which demanded less quality. However, a new movement pursues higher quality by reducing the mixture of foreign particles in scrap to increase purity and to carry out plant and equipment investments.

These efforts have triggered a qualitative transformation in recycling: scrap iron now can be used as a raw material for electrical and electronic devices or automotive sheet steel rather than virgin iron ore.

Producing iron from iron ore inevitably involves the emission of a large volume of carbon dioxide, because it is necessary to eliminate (resolve) the oxygen contained in the iron ore using coal. However, producing iron from scrap iron using an electric furnace emits less carbon dioxide than producing iron from iron ore, since the process requires only the energy to make products by melting scrap iron. Using more scrap iron therefore helps reduce carbon dioxide emissions at the same time.

(2) Recycling Copper Wires

Copper wire is widely used as wiring in electrical cables, communications networks, buildings, appliances, auto parts, and the like due to its outstanding electrical conductivity.

Copper wire used for electrical cables and communications networks is made in a typical shape (wire with a thick conducting unit). Therefore, copper wire and its covering materials can be easily separated using a special machine. To that end, power companies and telecoms operators are actively working to recycle wire collected during maintenance or inspection work. Since the copper recovered from the wire is highly purified and can be used for various applications such as additional copper wire, almost 100% of it is reused.

On the other hand, copper wire used for wiring in buildings requires labor and cost for it to be removed during dismantling. Because of this, a significant portion of this copper wire is often disposed of together with the building materials. As a result, it is vital to reduce the total disposal cost by accurately recycling plastic parts in the coating materials, which are often disposed of without being recycled. There is an ongoing effort to recycle the coating materials after separating the collected wire by type.

(3) Ink Cartridge Satogaeri Project

Six manufacturers of home printers initiated the Ink Cartridge Satogaeri Project in April 2008. Satogaeri means "homecoming," and the project includes collecting spent ink cartridges used in homes to reuse them as a resource. The collected ink cartridges are each sorted according to the printer manufacturer and then delivered to the respective manufacturers. The manufacturers then reuse the ink cartridges if they contain reusable ink or raw materials (known as "material recycling").

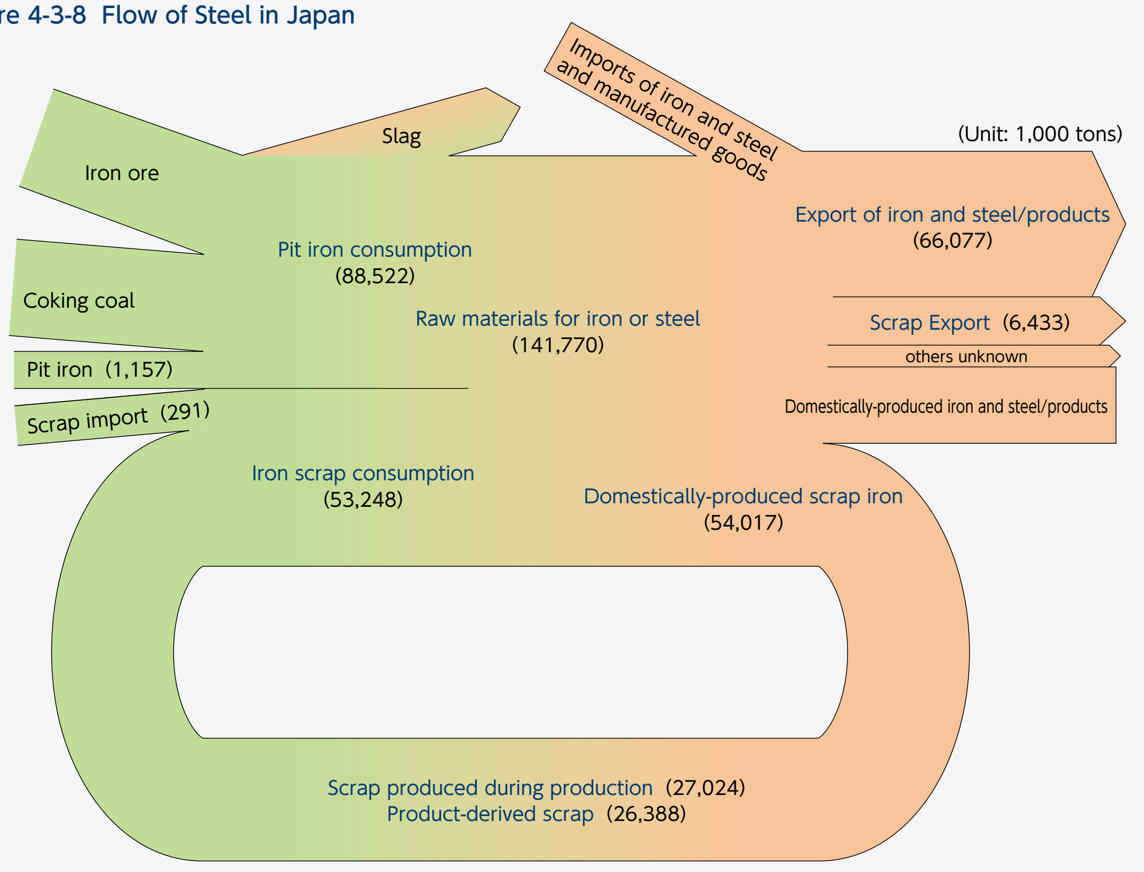
To secure a sufficient quantity of spent cartridges for collection, collection boxes have been installed at approximately 3,600 post offices throughout the nation. Local governments also collect cartridges at 151 local government offices and other facilities totaling about 1,900 locations. Through the unique effort to use post offices and local government facilities for collection, the quantity collected has been constantly growing: 700,000 in 2008; 1,300,000 in FY 2009; 1,600,000 in FY 2010; and just under 2,000,000 estimated for FY 2011.

Since April 2010, the six manufacturers have been donating 3 yen per collected cartridge to the United Nations Environment Programme (UNEP), and since March 2011, 1 yen per collected cartridge has been donated to the Satoyama Initiative, promoted by the Ministry of the Environment and the United Nations University Institute of Advanced Studies (UNU-IAS). The Ink Cartridge Satogaeri Project makes a contribution to the environment, not only in terms of collecting or recycling ink cartridges, but also forest protection and biodiversity conservation.

(4) Recycling Rare Metals Contained in Cemented Carbide Tools

Cemented carbide, typically used for the blades of metalworking drills and tools for mine excavation, is generally made from tungsten (a rare metal) due to its high abrasion resistance and hardness at high temperatures.

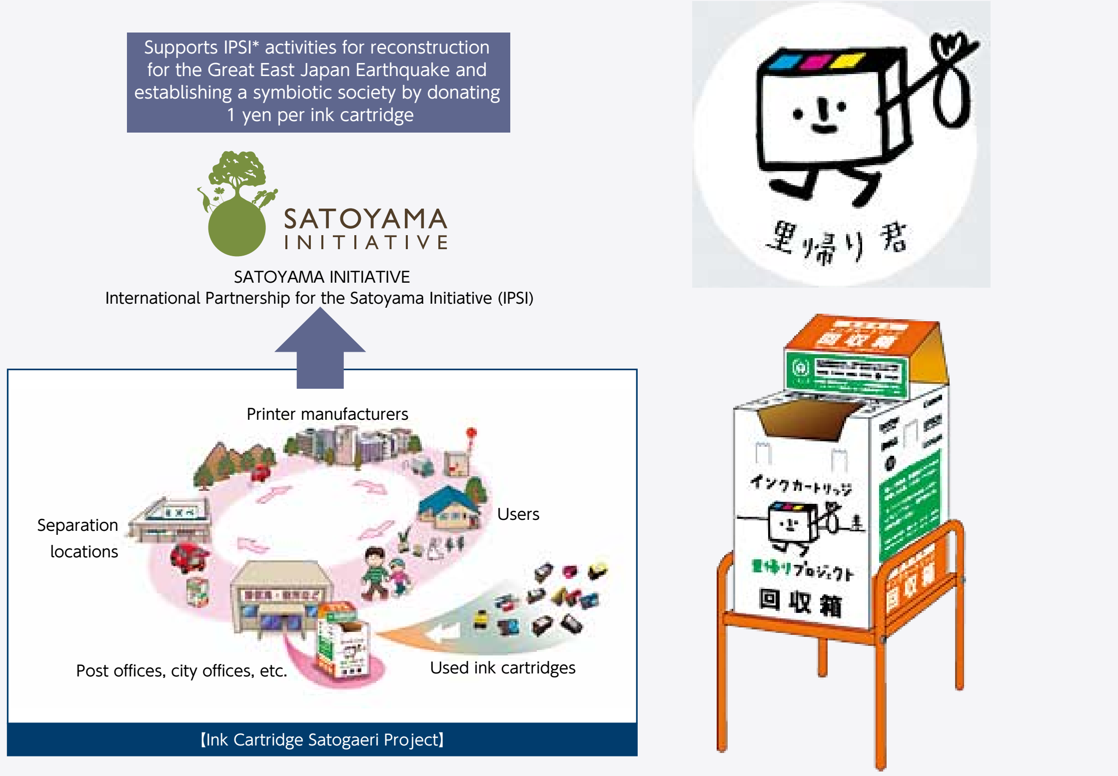
Figure 4-3-8 Flow of Steel in Japan



Note: Slag refers to impurities separated from molten iron for iron refining. It is commonly used as a material for roadbeds or as an aggregate for concrete.

Source: The Japan Ferrous Raw Materials Association

Figure 4-3-9 Outline of the Ink Cartridge *Satogaeri* Project, Including the "*Satogaeri-kun*" Mascot and Collection Boxes (illustration) Installed at Post Offices



Reference: Created by the Ministry of the Environment based on the Ink Cartridge *Satogaeri* Project (a joint project promoted by six manufacturers: Brother Industries Ltd., Canon Inc., Dell Inc., Seiko Epson Corporation, Hewlett-Packard Development Company, and Lexmark International, Inc.)

The Japan Cemented Carbide Tool Manufacturers' Association consists of tool manufacturers undertaking the task of recycling in a coordinated manner with the help of the Ministry of Economy, Trade and Industry. Specifically, the association provides guidebooks to users on collecting and recycling cemented carbide tools, raises awareness of the fact that the carbide blade tips are valuable, and points out the necessity of thorough separation when collecting the tools. The association collects swarf produced through the refining process for tungsten dust (including dust stuck to the equipment) as much as possible for reuse as raw material.

In addition to the efforts made by the association, tool manufacturers are working to reduce the volume of tungsten used during the product design stage: for example, by developing products that use only the minimum necessary amount of tungsten in the blade tip.

Column

The Utilize Resources Project: A People's Movement to Promote Domestic Use of Recyclable Resources

Turn Japanese Waste into Japanese Wealth

Since March 2012, the Ministry of the Environment has been promoting the Utilize Resources Project people's movement on the theme Turn Japanese Waste into Japanese Wealth. The purposes of this movement are to let people know about the high quality of products made of recycled materials and the related value of carbon dioxide emissions reduction, and to promote domestic use of recyclable resources by promoting products made of recycled materials.

Promote the Work of the People's Movement as a Bridge between Business and Consumers, and Drive the Reuse of Domestic Recyclable Resources.

In order to construct a sound material-cycle society, it is essential to boost demand for products that utilize recyclable resources. Thus far, although various business operators have developed products utilizing recyclable resources, many of these faced a halt in production due to sluggish sales. It is a fact that the demand for products utilizing recyclable resources has not grown. Various reasons for this can be listed. Among these, the vicious cycle between demand and supply is pointed out as an issue. Weak demand for products utilizing recyclable resources induces reduced production by suppliers, which then recreates a weaker demand. It is considered to be important for the national government to provide assistance to resolve issues including those mentioned above, to increase the demand for products utilizing recyclable resources. The Utilize Resources Project is a campaign that has been launched based on recognition of such a problem. It is conducted by the national government and requests the cooperation of many companies, works as a bridge between business and consumers, and creates a positive cycle to drive the utilization of recyclable resources.

With resources created by intermediate waste processes in Japan positioned as domestic recyclable resources, the project goals are to: disperse information to people about the usefulness of products that utilize domestic recyclable resources, through the project website and various events; develop and operate a navigation system on companies that practice excellent industrial waste disposal (Yuryo Sanpai Navi), which provides information about companies with excellent waste disposal ability in order to be able to dispose of waste appropriately, such as by recycling, and that can be operated easily; and establish and operate an organization for waste-producing companies and waste-disposing companies to collaborate (in a consortium) to utilize recyclable resources.

Companies are being asked to produce goods that utilize recyclable resources, and proactive publications are being produced about them to construct a sustainable sound material-cycle society, in which resources are used with care. The Japanese people are being asked to carry out the following four actions to drive the utilization of recyclable resources, so please join the Utilize Resources Project.

For details: http://ikashigen.go.jp

The Utilize Resources Project: A people's Movement to Promote Domestic Use of Recyclable Resources

◆4 actions we can do

Utilize Resource Project! 4 actions we can do	1. Understand more	Let's understand that Japan has lots of recyclable waste!
	2. Select wisely	Let's wisely select products made of recycled materials!
	3. Separate correctly	Let's keep recycling in mind, and separate waste correctly when we dispose of it!
	4. Support by everybody	Let's support companies or organizations that actively initiates recycling!

◆Picture of the kick-off ceremony

In March 2012, a kick-off ceremony was held in the Vice Minister's office with businesspeople from leading companies that are driving the utilization of domestic recyclable resources.

In March 2012, an event to commemorate the kick-off (meeting, display panels and goods, workshops) was held in ECOZZERIA (10th floor, Shin Marubiru).

Tokyo Zokei University and the National Federation of Industrial Waste Management Association collaborated to create Art Recycle Box made of industrial waste.

Source: Ministry of the Environment

Section 4 Contributing to the International Community to Achieve the Aichi Biodiversity Targets

People's livelihoods are greatly supported by the benefits of biodiversity in many areas: not only in Japan, but also throughout the world. The food, timber, pharmaceuticals, and even fossil fuels that we import and use are derived from biodiversity. At the same time, biodiversity serves as the basic infrastructure for local people, bringing a variety of benefits that include food provision, disaster prevention, and the formulation of culture. Biodiversity also contributes to the maintenance of a healthy global environment by providing oxygen and stabilizing the climate.

However, despite various efforts, the world's biodiversity still continues to be lost. If no significant measures are taken, the livelihood of future generations may be threatened. The tenth meeting of the Conference of the Parties to the CBD (COP 10) was held in October 2010 in Nagoya City, Aichi Prefecture, amidst a heightened sense of urgency. At COP 10 a new global biodiversity target for the period beyond 2010, the Strategic Plan of the Convention on Biological Diversity (CBD) was adopted with the goal of further promoting the conservation and sustainable use of biodiversity. There are now ongoing efforts to achieve the Aichi Biodiversity Targets by the Parties to CBD (including Japan) and related international organizations.

This section introduces Japan's contribution to the international community to achieve the Aichi Biodiversity Targets.

1 Aichi Biodiversity Targets

In 2002, at COP 6, the Parties to the Convention adopted a Strategic Plan including the 2010 Target, committing themselves to achieving by 2010 a significant reduction of the current rate of biodiversity loss. Efforts have been made globally to achieve the target; however, the third edition of Global Biodiversity Outlook (GBO3) [by the Secretariat of the Convention on Biological Diversity (SCBD), published] in May 2010 concluded that the 2010 target has not been met and biodiversity loss still continues.

Amid a heightened sense of urgency shared the world over, COP 10 was held in October 2010: the target year for the 2010 Targets. At COP 10, the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets, the new world targets for the period starting in 2011, were adopted without any interruption (Figure 4-4-1). The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets set a goal under the long-term target up to 2050 (Vision): achieving a world living in harmony with nature. In addition to this target, taking effective and urgent action to halt the loss of biodiversity was defined under the short-term target through 2020 (Mission). Also, to achieve the short-term target, five strategic goals and 20 subordinate individual targets up to 2015 or 2020 were adopted. The term "Aichi Biodiversity Targets" formally refers to the 20 individual targets. However, the term is conventionally used to collectively refer to the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets as a whole. Therefore, for the purpose of convenience, the term "Aichi Biodiversity Targets" will be used to indicate the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets as a whole.

To halt the loss of biodiversity, avoid tipping points, restore biodiversity, and pass the world down in a healthy state to future generations, the Aichi Biodiversity Targets must be achieved. At the 65th United Nations General Assembly, held in December 2010, it was decided that the ten years from 2011 through 2020 would be the United Nations Decade on Biodiversity, during which all sectors of the international community would collaborate to tackle issues of biodiversity and help achieve the Aichi Biodiversity Targets.

Japan will serve as the Presidency of COP 10 until the start of COP 11, to be held in Hyderabad (India) for October 8–19, 2012. Japan will enhance domestic measures to revice its National Biodiversity Strategy to achieve the Aichi Biodiversity Targets, both from the standpoint of the COP 10 Presidency and as one of the Parties. Japan will also actively make international contributions, such as supporting capacity building in developing countries and promoting the Satoyama Initiative, based on the concept of living in harmony with nature, which has been cultivated in Japan since ancient times. Details on Japan's international contributions will be described in the next section.

Figure 4-4-1 Strategic Plan for Biodiversity 2011-2020 (Aichi Biodiversity Targets)

■ Long-term targets (Vision) 2050

○A world of "living in harmony with nature"
○A world in which, by 2050 biodiversity is valued, conserved, restored, and wisely used, maintaining ecosystem services, sustaining a healthy earth and delivering benefits essential for all people.

■ Short-term targets (Mission) 2020

To take effective and urgent action to halt the loss of biodiversity

◇This will ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the earth's variety of life while contributing to human well-being and poverty eradication.

■ Individual targets

- Target 1: People are aware of the values of biodiversity and the steps they can take
- Target 2: Biodiversity values have been integrated into national and local development strategies, and are being incorporated into national accounting, as appropriate, and reporting system
- Target 3: Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed, and positive incentives are developed and applied
- Target 4: All stakeholders implement plans for sustainable production and consumption
- Target 5: The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced
- Target 6: All fisheries resources are managed and harvested sustainably
- Target 7: Agriculture, aquaculture and forestry are managed sustainably
- Target 8: Pollution has been brought to levels that are not detrimental
- Target 9: Invasive alien species are controlled or eradicated
- Target 10: Adverse affects on coral reefs and other ecosystems impacted by climate change or ocean acidification are minimized
- Target 11: 17% of terrestrial and inland water, and 10% of coastal and marine areas are conserved as protected areas, etc.
- Target 12: The extinction or decrease of known threatened species has been prevented
- Target 13: The genetic diversity of cultivated plants and farmed and domesticated animals is maintained and the loss of such diversity is minimized
- Target 14: Ecosystems that provide essential services are restored and safeguarded
- Target 15: At least 15% of degraded ecosystems are restored, thereby contributing to climate change mitigation and adaptation
- Target 16: Nagoya Protocol on ABS is in force and operational
- Target 17: Each Party develop and implement an effective and participatory national biodiversity strategy and plan
- Target 18: The traditional knowledge, innovations and practices are respected and mainstreamed
- Target 19: Knowledge and the science base and technologies relating to biodiversity are improved
- Target 20: Financial resources for effectively implementing the Strategic Plan 2011-202 should increase substantially from the current level

Source: Ministry of the Environment

2 Initiatives to Provide Support

(1) The Life in Harmony initiative

Based on the Aichi Biodiversity Targets adopted at COP 10, the Parties are expected to steadily address various issues to achieve the targets through efforts such as revising the National Biodiversity. However, initiatives are actually being delayed in developing countries due to insufficient scientific knowledge and experience, or insufficient awareness among government bodies of the significance of conserving biodiversity.

To resolve this situation, then Prime Minister Naoto Kan announced the Life in Harmony initiative at the COP 10 High-Level Segment (ministerial-level meeting), to support the efforts of developing countries to achieve the Aichi Biodiversity Targets (with a total of two billion dollars to be provided over three years starting in 2010). Through this initiative, Japan will make an international contribution to achieving the Aichi Biodiversity Targets, particularly by providing support in the: (1) improving countries' ability to administer natural reserves using Japanese management techniques in national parks; (2) promoting sustainable use of natural resources in conjunction with the *Satoyama* Initiative; and (3) facilitating access to genetic resources and benefit-sharing in a way such as establishment of establishes conservation and culturing techniques for microbes.

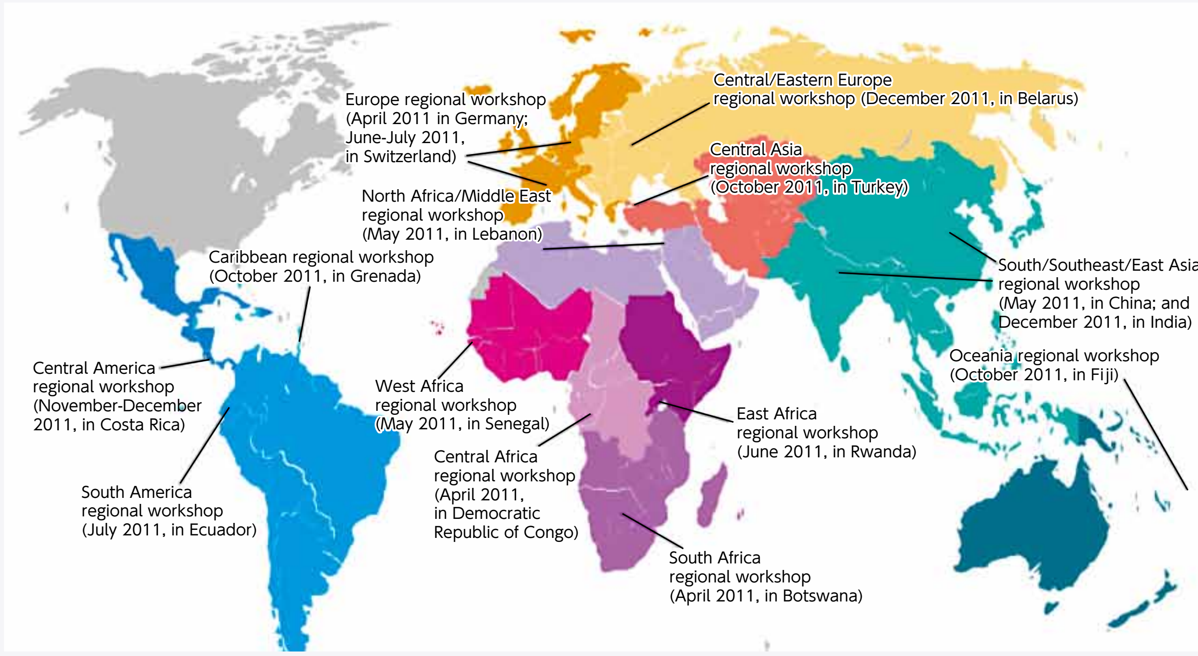
(2) The Japan Biodiversity Fund

As a part of the Life in Harmony initiative, the Japan Biodiversity Fund (JBF) was announced by the then Minister of the Environment Ryu Matsumoto, who served as the President of COP 10. The purpose of the fund is to support capacity building in developing countries to achieve the Aichi Biodiversity Targets through the SCBD. The fund was established within the SCBD, and Japan provided one billion yen and four billion yen in 2010 and 2011, respectively.

To achieve the Aichi Biodiversity Targets, the most important issues for the Parties are to set fheir national targets, based on the Aichi Biodiversity Targets and incorporated into the National Biodiversity Strategy to strengthen biodiversity-related countermeasures. In response to this, a project was launched primarily targeting developing countries to improve capacity and support the revision of the National Biodiversity Strategy using JBF. Since March 2011, fifteen regional capacity building workshops have been held around the world, attended by a total of more than 650 government officials from 162 Parties to the convention (Figure 4-4-2).

Through the series of workshops, important perspectives for reviewing or revising the National Biodiversity Strategy for the and good practices were introduced, and there

Figure 4-4-2 Workshop to Support Amendment of the National Strategy using JBF (2011)



Reference: Ministry of the Environment

were opportunities to share experiences and promote international exchange among Parties. The workshops are also expected to promote effective use of The Economics of Ecosystems and Biodiversity (TEEB, the equivalent to the Stern report for biodiversity) and mainstream biodiversity in society as a whole by incorporating biodiversity perspectives in policies that extend outside the environmental arena (e.g., agriculture, forestry and fisheries industries, and national land development).

Project achievements using JBF are widely published through various forms of media, including websites, newsletters, and journals of the secretariat of the Convention. Japan's international contributions as the Presidency of COP 10 are thus spread around the world.

(3) Nagoya Protocol Implementation Fund

The world's genetic resources are widely used for pharmaceuticals, physiologically functional food, cosmetics, breeding, research and development, and the like, all of which serve to improve human welfare. There is a mechanism for ensuring the smooth provision of genetic resources from the countries that possess them (mostly developing countries) to the private sector or researchers in the countries that want to use them (mostly developed countries) called Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Access and Benefit-Sharing, ABS). ABS also ensures that benefits obtained from the selling of products developed by using these genetic resources are accurately allocated to the countries that provided them as a way to contribute to biodiversity conservation and sustainable use in those countries (Figure 4-4-3).

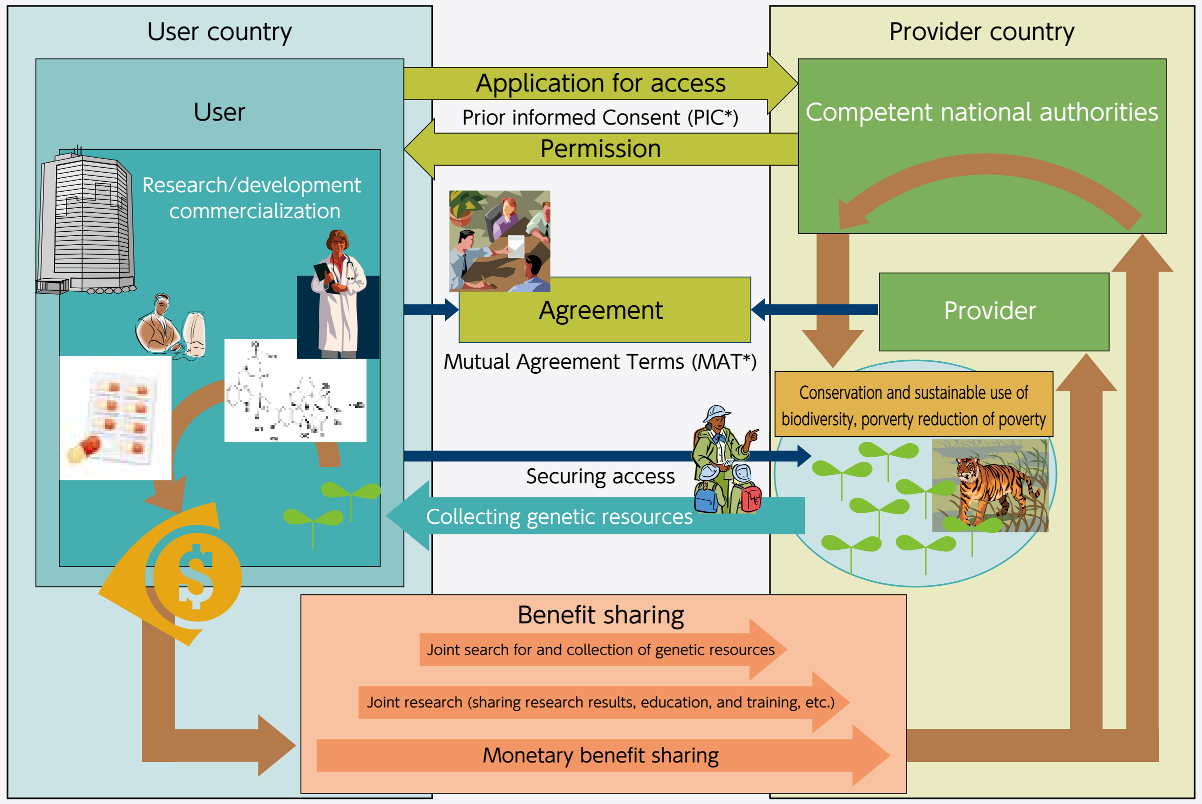
At COP 10, the Nagoya Protocol on ABS was adopted together with the Aichi Biodiversity Targets after many years of negotiation. Also, the Aichi Biodiversity Targets incorporated the enforcement of the Nagoya Protocol by the Parties by 2015 as individual target No. 16. ABC is advocated as one of the three goals of the Convention on Biological Diversity (CBD) and its basic scheme is defined in the text of the convention. The Nagoya Protocol stipulates that specific measures should be taken by countries providing resources and countries using resources in order to implement ABS. Nevertheless, the following are considered essential in developing countries in particular: (1) establishing a domestic system corresponding to the Nagoya Protocol; (2) facilitating the participation of society (e.g., indigenous peoples) and stakeholders in ABS initiatives; and (3) building capacity and raising public awareness of conservation and sustainable use of genetic resources.

During the COP 10 session, Japan committed to providing one billion yen to support developing countries in capacity building in relation to in ABS. In response to this commitment, the Nagoya Protocol Implementation Fund (NPIF) was established on March 17, 2011 by the World Bank, with the goal of early entry into force and effective implementation of the Nagoya Protocol. On April 27 of the same year, Japan provided the funding. The NPIF is operated by the Global Environment Facility (GEF). Based on the proposal offered by Japan and opinions issuing from the Council Meeting, detailed information on the support activities of the NPIF, methods for managing projects and funds, and work programs were approved at the 40th GEF Council Meeting, held between May 24 and 26, 2011. The objectives and activities include: (1) developing ABS domestic systems; (2) promoting private sector engagement and investment in the conservation of genetic resources; (3) building capacity in societies of indigenous peoples to secure access to traditional knowledge of genetic resources; (4) raising public awareness; and (5) strengthening knowledge and scientific base. Funds will be accepted not only from the governments of the respective countries but also from the private sector.

On December 13, 2011, the NPIF's first project was approved, with aims to implement the following in Panama: discovery of active compounds for the treatment of cancer and other ailments; allocating benefits through transfer of technologies to facilitate the discovery of effective chemical compounds and the sustainable use of biodiversity, conserving protected areas with genetic resources, and allocating benefits through capacity building at related research institutions; and establishing domestic ABS systems. This academy, industry, government project is being executed by several organizations, including the National Environment Authority of Panama (ANAM), the Institute of Advanced Scientific Investigations and High Technology Services (INDICASAT), the University of Panama, the Smithsonian Tropical Research Institute (STRI), the United Nations Development Programme (UNDP), and Eisai Inc. (a US subsidiary of Eisai Co., Ltd.).

The NPIF may be useful for a wide range of projects to be executed in developing countries, such as: joint development of products using genetic resources; the sustainable use, evaluation, and storage of genetic resources; conservation of habitats with numerous genetic resources; and building and making effective use of databases of traditional knowledge relating to genetic resources. It is hoped that, in the future, the NPIF will be effectively used by various organizations (e.g., states, international organizations, and the private sector) or that these organizations will actively participate in funding NPIF for conservation and sustainable use of genetic resources, thereby making a contribution to the early entry into force and effective implementation of the Nagoya Protocol.

Figure 4-4-3 Outline of ABS (Access to Genetic Resources and Benefit Sharing) Mechanism



*PIC: Prior Informed Consent MAT: Mutually Agreed-upon Terms

Reference: Ministry of the Environment

3 Strengthening Linkages between Policy and Science

(1) Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

To achieve the Aichi Biodiversity Targets, it is vital to assess the current situation and changes in biodiversity and ecosystem services based on scientific knowledge, and then accurately reflect this information in national policies. There is currently an ongoing effort to establish the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) as an intergovernmental organization for making policy proposals based on research results achieved around the world. The IPBES is also referred to as the biodiversity version of the IPCC, referring to the Intergovernmental Panel on Climate Change (IPCC) in the climate change sector. The IPBES consists of four core activity areas: knowledge formulation, scientific assessment, policy planning support, and capacity development. It is hoped that establishment of the organization will further promote initiatives for effectively and efficiently conserving biodiversity from a scientific perspective.

Japan has been actively contributing to the establishment of the IPBES from its position as the Presidency of COP 10. Prior to the first session, in July 2011, Japan hosted a Scientific Workshop on IPBES Assessment together with the United Nations University and the government of South Africa (Photo 4-4-1). At the workshop, a lively discussion focused on scientific assessment, one of the four core activity areas. The results were reported to the first session as a reference document. In addition, Japan hosted a side event related to scientific assessment and knowledge formulation based on the workshop achievements during the session. The side event was attended by a large number of people and discussions were held to facilitate a dialogue between scientists and policymakers, as well as to forge linkages between scientific assessment and other activities.

Photo 4-4-1 Scientific Workshop on IPBES Assessment

Source: Ministry of the Environment

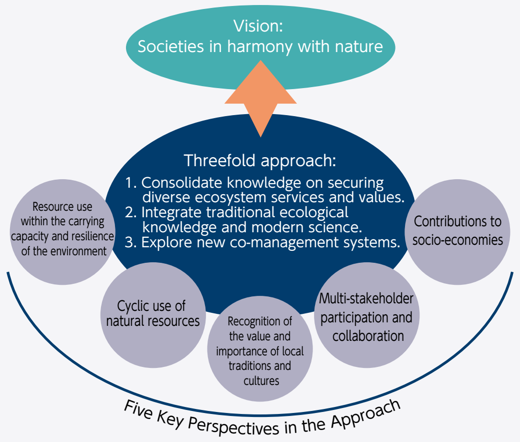
(2) The Global Biodiversity Information Facility (GBIF)

The Global Biodiversity Information Facility (GBIF) is a worldwide information platform for biodiversity with the goals of accumulating, sharing, and using biodiversity information. The GBIF accumulates observation data from the Group on Earth Observations Biodiversity Observation Network (GEO-BON) of the Group for Earth Observation (GEO), a global observation network. GBIF biodiversity information serves as a clearinghouse (information-sharing) mechanism for the CBD. In the future, the GBIF is likely to increase in significance, since it is expected to provide critical basic data that can be used to help the Nagoya Protocol be steadily implemented and the IPBES develop knowledge and carry out scientific assessment, in addition to its existing roles.

4 Disseminating Information from Japan to the International Community: The *Satoyama* Initiative

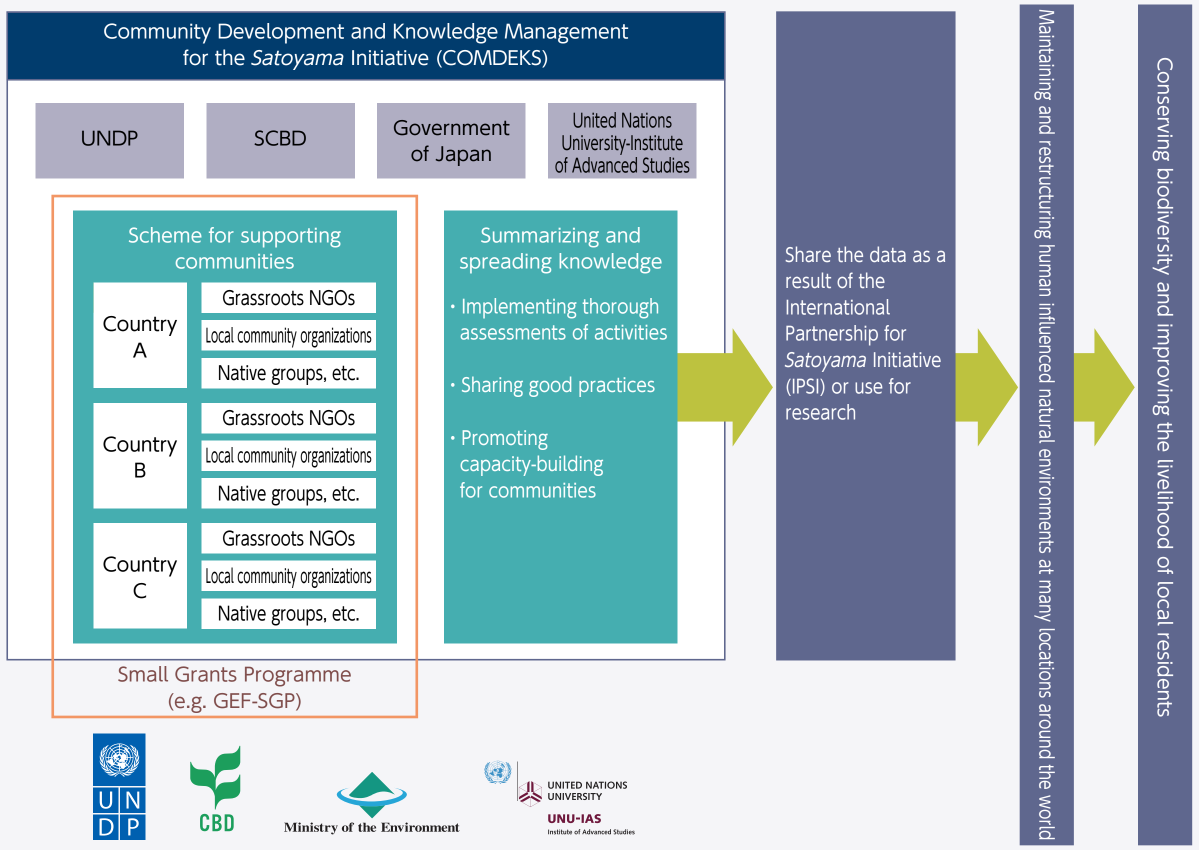
In addition to conserving pristine natural environments, the conservation of socio-ecological production landscapes formed and maintained through human activities (such as agriculture or forestry) is important if we are to protect human livelihoods and biodiversity. In these natural environments, diverse living things exist and grow by adapting themselves to the environment, playing a critical role in biodiversity conservation. However, these living things are faced with the threat of extinction in numerous locations around the world due to urbanization, industrialization, and rapid changes in the demographic composition of local populations.

Figure 4-4-4 Conceptual Structure of the *Satoyama* Initiative



Source: Ministry of the Environment

Figure 4-4-5 Mechanism of Community Development and Knowledge Management for the *Satoyama* Initiative (COMDEKS)



Reference: Ministry of the Environment

In Japan as well, management and revitalization of satochi-satoyama (community-based forest areas and the surrounding countryside) has been a challenge for people for years, as primary industries deteriorate and local populations and communities decline sharply. To achieve the vision of societies in harmony with nature, Japan has advocate for the *Satoyama* Initiative (aiming to simultaneously pursue biodiversity conservation and sustainable use) for human-influenced natural environments together with the United Nations University. It has also promoted ongoing efforts around the world while considering shared problem awareness with foreign countries and related organizations.

To promote the *Satoyama* Initiative, the International Partnership for the *Satoyama* Initiative (IPSI) was launched on October 19, 2010 during the COP 10 session. The number of participating organizations increased from 51 including nine government agencies to 117 organizations including 16 government agencies, at the 2nd IPSI Global Conference held March 13–14, 2012.

To promote specific efforts based on the concept of the *Satoyama* Initiative, IPSI facilitates information sharing among groups attending the Global Conference and other meetings (Figure 4-4-4) while carrying out cooperation activities. As of March 2012, 22 IPSI collaborative activities are ongoing.

One of those cooperation activities is the Community Development and Knowledge Management for the *Satoyama* Initiative (COMDEKS), launched on June 24, 2011 by Japan, SCBD, the United Nations Development Programme (UNDP), and the United Nations University (UNU) (Figure 4-4-5). In this activity, Japan will support on-site activities wherein local communities in developing countries maintain and restructure socio-ecological production landscapes, and then summarize and spread knowledge obtained from these activities. The program is the first to provide support for on-site activities based on the *Satoyama* Initiative concept at the global level. It is believed that Japan can make a contribution to the natural environment, conservation, and sustainable use of biodiversity, and to people living in the area, by maintaining or rebuilding endangered human-influenced natural environments in the world.

Furthermore, Japan and the Global Environment Facility (GEF) secretariat signed a Memorandum for Cooperation on the *Satoyama* Initiative in December 2011. In this way, Japan will facilitate medium and full size projects related to the *Satoyama* Initiative and explore opportunities for collaboration under the GEF-5 Biodiversity Focal Area Strategy (Photo 4-4-2).

Moreover on August 5, 2011 the government held [a symposium titled "Great East Japan Earthquake Rebuilding Symposium: Exploring Integrative Approaches from Land to Sea"] in order to discuss the feasibility of local revitalization through linkages between *Satoyama*, Satochi, and Satoumi (mountains, land, and ocean in the vicinity of a village) in areas in the Tohoku region damaged by the Great East Japan Earthquake on March 11 with the goal of supporting reconstruction activities by local residents (Photo 4-4-3).

Photo 4-4-2 At the Signing Ceremony for Memorandum for Cooperation on the *Satoyama* Initiative with the GEF

Source: Ministry of the Environment

Photo 4-4-3 Great East Japan Earthquake Rebuilding Symposium: Exploring an Integrative Approach from Land to Sea

Source: Ministry of the Environment

As described in Chapter 4, Section 3, six manufacture of home printer in Japan, which jointly implement the Ink Cartridge Satogaeri Project to collect spent ink cartridges have launched actions in support of IPSI's activities to establish a harmony with nature and to recover and rebuild following the damage caused by the Great East Japan Earthquake. The six printer manufacturers jointly implement the Ink Cartridge Satogaeri Project to collect spent ink cartridges.

In conjunction with the increase in IPSI members and more vigorous involvement in collaborative activities, further promotion of the *Satoyama* Initiative is expected. Japan will gather global knowledge and hold discussions through IPSI to conserve human-influenced natural environments and foster sustainable use, including the reconstruction of satoyama, satochi, and satoumi areas in the coastal regions of Tohoku, which was badly damaged by the Great East Japan Earthquake. Japan hopes to share information through meetings to be held in 2012: the United Nations Conference on Sustainable Development (Rio+20), the 5th World Conservation Congress for the International Union for Conservation of Nature (IUCN-WCC), and COP 11.