ANNUAL REPORT

ON THE ENVIRONMENT IN JAPAN 2016

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This publication is an English-language digest of parts of Japan's Annual Report on the Environment, the Sound Material-Cycle Society, and Biodiversity, which was approved by the cabinet on May 31, 2016. The statements and information included here are current as of the date of the cabinet decision.

FOREWORD

Tamayo Marukawa
Minister of the Environment

The year 2015 was a historic one for the global environment. In October, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, a universal set of goals and targets for achieving sustainable development that involve the entire world. In December, the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) adopted the Paris Agreement, the first legally binding agreement since the Kyoto Protocol eighteen years earlier. And, in May 2016 in Japan, the Cabinet approved the Plan for Global Warming Countermeasures, the G7 Ise-Shima Summit was held in Ise-Shima, Mie Prefecture, and the G7 Toyama Environment Ministers' Meeting was held in Toyama City, Toyama Prefecture. Both internationally and domestically, it could be said that global warming countermeasures and the creation of a sustainable society have entered a new stage. Japan is already making major strides towards the achievement of three of the goals established by this process—reducing greenhouse gases 26.0% by FY 2030, reducing them 80% by 2050, and achieving a sustainable society.

The main theme of the 2016 Annual Report on the Environment is "a new stage for global warming countermeasures." It explains the actions Japan is taking to combat global warming in the context of international discussion regarding measures on global warming. It also describes efforts for reconstruction and environmental recovery after the Great East Japan Earthquake, as well as progress made on the 2030 Agenda and other fronts.

It is my hope that this report will contribute to the realization of a sustainable society.

A NEW STAGE FOR GLOBAL WARMING COUNTERMEASURES

"The Paris Agreement is a monumental triumph for people and our planet," stated Ban Ki-moon, Secretary-General of the United Nations after the adoption of the agreement on the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) held in Paris. All participants shared their delight, with comments such as "a turning point for the world", and "an agreement of conviction, an agreement of solidarity". In this chapter, we describe the circumstances brought about by the agreement and highlight Japan's commitments.

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1

A NEW INTERNATIONAL FRAMEWORK TO ADDRESS GLOBAL WARMING

The Paris Agreement

The Paris Agreement was adopted at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) held in Paris, France from November 30 to December 13, 2015. It is the first legally binding international agreement since the Kyoto Protocol eighteen years earlier.

The Paris Agreement is considered a groundbreaking international framework. It is the first international treaty to agree to "holding the increase in the global average temperature to well below 2°C above pre-industrial levels." It includes "pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" and sets a goal "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century."
In addition, this agreement is applicable to all parties. Each party shall communicate or update its Nationally Determined Contributions (NDCs) every five years, and engage in adaptation planning processes and the implementation of actions, as appropriate. And as Japan had insisted, the new international framework is a fair and effective one applicable to all parties.

Opening Ceremony of COP21 leaders' segment
Photo: Cabinet Public Relations Office

At the opening ceremony of the COP21 leaders' segment, Prime Minister Shinzo Abe reasserted this policy, indicated that the new international framework should include the setting of a long-term goal as well as the establishment of a common process for the review of NDCs (Photo below) and also announced "Actions for Cool Earth 2.0 (ACE 2.0)". Representing the Japanese government at the high-level segment, Minister of the Environment Tamayo Marukawa stated that the legal agreement should include a global long term goal, a cycle whereby all Parties communicate and update their NDCs, and a report and review system.
Japan strongly welcomes and highly appreciates the adoption of the Paris Agreement, which is a fair and effective international framework applicable to all parties.

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JAPAN'S GLOBAL WARMING COUNTERMEASURES

History of global warming countermeasures by Japan

Japan formulated its Action Program to Arrest Global Warming in 1990, and has continued to implement global warming countermeasures ever since. In 1997, the Kyoto Protocol was adopted at COP3, with Japan committing to reduce total greenhouse gas emissions by 6% compared to the FY 1990 level in the first commitment period (2008-2012). Consequently, in 1998 Japan enacted the Act on Promotion of Global Warming Countermeasures, a framework under which the national government, local governments, businesses, and citizens address global warming together. Based on this act, the Kyoto Protocol Target Achievement Plan was approved by Cabinet in April 2005, and Japan has implemented the countermeasures comprehensively and strategically. As a result, average net emissions over the five years of the first commitment period of the Kyoto Protocol came to 1.278 billion tonnes, a 1.4% increase compared to the FY 1990 level, but when forest sinks and Kyoto Mechanism Credits are factored in, the result was an 8.7% reduction compared to FY 1990, which met the Kyoto Protocol target (6% reduction compared to the base year).

In order to continue with the implementation of global warming countermeasures thereafter, the Act on Promotion of Global Warming Countermeasures was revised in 2013, and the Plan for Global Warming Countermeasures was formulated as a plan for the comprehensive and strategic implementation of Japan's global warming countermeasures to replace the Kyoto Protocol Target Achievement Plan. Furthermore, based on the Cancun Agreement adopted at COP16 in 2010, at COP19 in 2013 Japan announced a 3.8% reduction target for Japan's greenhouse gas emissions in FY 2020 compared to the 2005 level.

Japan's mid-term reduction target (FY 2030)

In July 2015, Japan decided on its Intended Nationally Determined Contribution, including its FY 2030 mid-term reduction target, and submitted it to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat on the same day. Japan's FY 2030 mid-term reduction target is at the level of 26.0% by FY 2030 compared to FY 2013 (25.4% reduction compared to FY 2005). The target was set based on the amount of domestic emission reductions and removals assumed to be obtained.

Estimated emissions of greenhouse gases in each sector in Japan's INDC

(mil. t-CO_2)

	Estimated emissions of each sector in FY 2030	FY 2013 (FY 2005)
Energy originated CO_2	**927**	**1,235 [1,219]**
Industry	401	429 [457]
Commercial and other	168	279 [239]
Residential	122	201 [180]
Transport	163	225 [240]
Energy conversion	73	101 [104]

(mil. t-CO_2)

	Emissions target of each gas in FY 2030	FY 2013 (FY 2005)
Non-energy originated CO_2	**70.8**	**75.9 [85.4]**
Methane (CH_4)	31.6	36.0 [39.0]
Nitrous oxide (N_2O)	21.1	22.5 [25.5]
Four fluorinated gases	28.9	38.6 [27.7]
HFCs	21.6	31.8 [12.7]
PFCs	4.2	3.3 [8.6]
SF_6	2.7	2.2 [5.1]
NF_3	0.5	1.4 [1.2]

(mil. t-CO_2)

	FY 2030 removal target	FY 2013 (FY2005)
LULUCF sector	**37.0**	**– [–]**
Forest management	27.8	– [–]
Cropland management /Grazing land management	7.9	– [–]
Revegetation	1.2	– [–]

Source: Submission of Japan's Intended Nationally Determined Contribution (INDC)

Plan for Global Warming Countermeasures

In December 2015, Japan formulated its Policy for Global Warming Prevention Measures Based on the Paris Agreement. This policy includes formulation of the Plan for Global Warming Countermeasures based on the Act on Promotion of Global Warming Countermeasures with the aim of meeting the FY 2030 mid-term reduction target. In addition to this, it was decided that Japan would actively contribute to the development of detailed international rules for the implementation of the Paris Agreement, and would implement the domestic procedures required to ratify the Paris Agreement.

In May 2016, the Cabinet approved both the Plan for Global Warming Countermeasures based on the Act on Promotion of Global Warming Countermeasures and the Government Action Plan. As Japan's sole comprehensive plan regarding global warming, the Plan for Global Warming Countermeasures provides the following basic directions for global warming countermeasures: actions to achieve the mid-term target (26% reduction by FY 2030), strategic actions towards the long-term goal (80% reduction by FY 2050), and actions toward global greenhouse gas reduction. It also describes basic matters regarding measures taken by businesses and citizens, and regarding policies and measures taken by national and local governments for achieving the target. Based on this plan, Japan is promoting global warming countermeasures comprehensively and strategically.

Furthermore, in May 2016, the Act on Promotion of Global Warming Countermeasures was revised in order to strengthen actions for tackling global warming. The revised Act stipulates that the Plan for Global Warming Countermeasures needs to specify issues related to promotion of public awareness and international cooperation, and it also promotes actions for tackling global warming at local level.

The Plan for Global Warming Countermeasures

Introduction
- Scientific findings on global warming
- Actions during the 1st commitment period of the Kyoto Protocol, Actions by 2020 under the Cancun Agreement
- Establishment of an international framework after 2020 and communication of Japan's INDC

Ch.1 Basic direction regarding the promotion of global warming countermeasures
- Directions to pursue
  1. Actions to achieve mid-term target (26% reduction by 2030)
  2. Strategic actions towards long-term goal (80% reduction by 2050)
  3. Actions toward global greenhouse gas reduction
- Basic concepts
  1. Integrated improvements of the environment, economy and society
  2. Steady implementation of measures listed in Japan's INDC
  3. Response to Paris Agreement
  4. Enhancement of R&D and contribution to global greenhouse gases emissions reduction through Japan's leading technologies
  5. Transformation in conciousness of all actors, evocation of action and enhancement of collaboration
  6. Emphasis on PDCA cycle

Ch.2 Greenhouse gas reduction target
- Japan's greenhouse gas emission reductions target
  - Reduction of 26% by FY2030 (25.4% compared to FY2005)
  - More than 3.8% reduction by FY2020 compared to FY2005
- Planning period
  - From date of cabinet decision (May 13, 2016) to FY2030

Ch.3 Polices and measures for achieving targets
- Basic roles of national government, local governments, businesses and citizens
- Measures and Policies for Greenhouse Gas Emissions Reduction and Removal
  - Energy-originated CO_2
    - Measures and Policies by Sectors (industrial, commercial and other, residential, transport, energy conversion)
  - Non-energy-originated CO_2, CH_4, N_2O
  - Four fluorinated gases: HFCs, PFCs, SF_6 and NF_3
  - Removals by Land Use, Land Use change and Forestry (LULUCF)
  - Cross-sectional strategies
  - Foundational measures
- Basic matters regarding measures to be taken by Local Governments
- Expected Efforts of Business Operators with Large Emissions in Particular
- Promotion of nationwide campaign
- Promotion of global emission reduction, international collaboration and cooperation
  - Response to Paris Agreement
  - Global emission reduction due to Japan's contribution
    - Joint Crediting Mechanism (JCM)
    - Actions by industries
    - Support of reduction of emissions from deforestation and degradation (REDD+)
  - Cooperation with other countries and international organizations

Ch.4 Progress Management of the Plan
Yearly progress review, consideration of the plan's revision every 3 years

Appendix (Target of each measure)
- Energy-originated CO_2
- Non-energy-originated CO_2
- CH_4, N_2O
- Four fluorinated gases
- Removals by LULUCF
- Cross-sectional policies

National campaign for global warming countermeasures (COOL CHOICE)

COOL CHOICE is an initiative in which industry, academia, the private sector, and consumers participate as one united front, with prime minister Shinzo Abe standing at its fore. Launched in July 2015, it is a national campaign aimed at meeting the new mid-term reduction target. The COOL CHOICE logo is an easy-to-understand arrow symbol designed to make it easy to choose products, services, and behavior that are low-carbon or save energy. It promotes smart choices that allow individual consumers to immediately engage in global warming countermeasures on their own.

COOL CHOICE

未来のために、いま選ぼう。

Trademark of "COOL CHOICE"
For the Future, Choose Now

3

PLAN FOR ADAPTATION TO CLIMATE CHANGE

Assessment of climate change impacts

In March 2015, the Central Environment Council formulated the "Report on Assessment of Impacts of Climate Change in Japan and Future Challenges", which summarised impacts in seven sectors with 30 categories and 56 sub-categories, and made clear the impacts of global warming based on the judgment of experts in light of scientific findings, viewing each impact from the standpoint of significance, urgency, and confidence. Nine categories, including paddy field rice, fruit trees, plant pests/weeds, flood, storm surges/high waves, and heat illness, were assessed as having very high significance, high urgency, and high confidence.

Outline of Assessment of Climate Change Impacts

Sectors	Categories	Sub-categories	Significance	Urgency	Confidence
Agriculture, Forest/Forestry, Fisheries	Agriculture	Paddy field rice	●	●	●
		Vegetables	–	▲	▲
		Fruit trees	●	●	●
		Barley / Wheat, Soybean, Feed crops, and other crops	●	▲	▲
		Livestock Farming	●	▲	▲
		Plant pests and weeds	●	●	●
		Water, Land and Agricultural Infrastructure	●	●	▲
	Forest / Forestry	Timber production (e.g. Plantations)	●	●	■
		Non-wood forest products (e.g. Mushrooms)	●	●	■
	Fisheries	Migratory fish stocks (Ecology of fishes)	●	●	▲
		Propagation and Aquaculture	●	●	■
Water Environment, Water Resources	Water Environment	Lakes / Marshes, Dams (Reservoir)	●	▲	▲
		Rivers	◆	■	■
		Coastal areas and Closed sea areas	◆	▲	■
	Water resources	Water supply (Surface water)	●	●	▲
		Water supply (Groundwater)	◆	▲	■
		Water demand	◆	▲	▲
Natural Ecosystems (covers ecosystem services and impacts on ecosystems)	Terrestrial ecosystems	Alpine / Subalpine zone	●	●	▲
		Natural forests / Secondary forests	●	▲	●
		Countryside-landscape (Satochi-Satoyama)	◆	▲	■
		Planted forests	●	▲	▲
		Damage from wildlife	●	●	–
		Material balance	●	▲	▲
	Freshwater ecosystems	Lakes / Marshes	●	▲	■
		Rivers	●	▲	■
		Marshlands	●	▲	■
	Coastal ecosystems	Subtropics	●	●	▲
		Temperate / Subarctic	●	●	▲
	Marine ecosystems		●	▲	■
	Phenology		◆	●	●
	Shifts in distribution and populations (covers ecosystem services and impacts on native ecosystems)		●	●	●
Natural disasters, Coastal areas	Rivers	Floods	●	●	●
		Inland waters	●	●	▲
	Coastal areas	Sea-level rise	●	▲	●
		Storm surges, High waves	●	●	●
		Coastal erosion	●	▲	▲
	Mountain areas	Debris flows, Landslides, and other disasters	●	●	▲
	Others	(e.g., Strong winds)	●	▲	▲
Human Health	Winter warming	Mortality in winter season	◆	■	■
	Heat stress	Risk of mortality	●	●	●
		Heat illness	●	●	●
	Infection	Water- and food-borne diseases	–	–	■
		Vector-borne diseases	●	▲	▲
		Other infectious diseases	–	–	–
	Industrial / Economic activities (covers services and impacts on complex impacts)		–	▲	▲
Industrial / Economic activities	Manufacture		◆	■	■
	Energy	Energy demand and supply	◆	■	▲
	Commerce		–	–	■
	Finance, Insurance		●	▲	▲
	Tourism	Leisure	●	▲	●
	Construction		–	–	–
	Medical		–	–	–
	Others	Other impacts (e.g., Overseas impact)	–	–	■
Life of Citizenry, Urban Life	Urban infrastructure, Critical services	Water supply, Transportation, and the others	●	●	■
	Life with sense of culture and history	Phenology	◆	●	●
		Traditional events / local industry	–	●	■
	Others	Impacts on life due to heat stress	●	●	●

Significance: ● Particularly High ◆ Not Particularly High – N/A (currently cannot be assessed)
Urgency: ● High ▲ Medium ■ Low – N/A (currently cannot be assessed)
Confidence: ● High ▲ Medium ■ Low – N/A (currently cannot be assessed)

Source: Central Environment Council "Report on Assessment of Climate Change in Japan and Future Challenges (Comment Submission)"

National Plan for Adaptation to the Impacts of Climate Change

The "National Plan for Adaptation to the Impacts of Climate Change" (National Adaptation Plan) was approved by Cabinet in November 2015. Through the implementation of an adaptive strategy, the National Adaptation Plan (NAP) aims to minimize or avoid damage from the impacts of climate change on people's lives, property, lifestyles, the economy, and the natural environment, regardless of the type of climate change impact that occurs, creating a secure, safe, and sustainable society that can quickly recover from change. It indicates basic adaptive measures for government ministries and agencies to take in seven sectors—Agriculture, Forests/Forestry, Fisheries; Water Environment/Water Resources; Natural Ecosystems; Natural Disasters/Coastal Areas; Human Health; Industrial/Economic Activity; and Life of Citizenry and Urban Life.

Climate Change Impacts and Basic Adaptation Policies and Measures

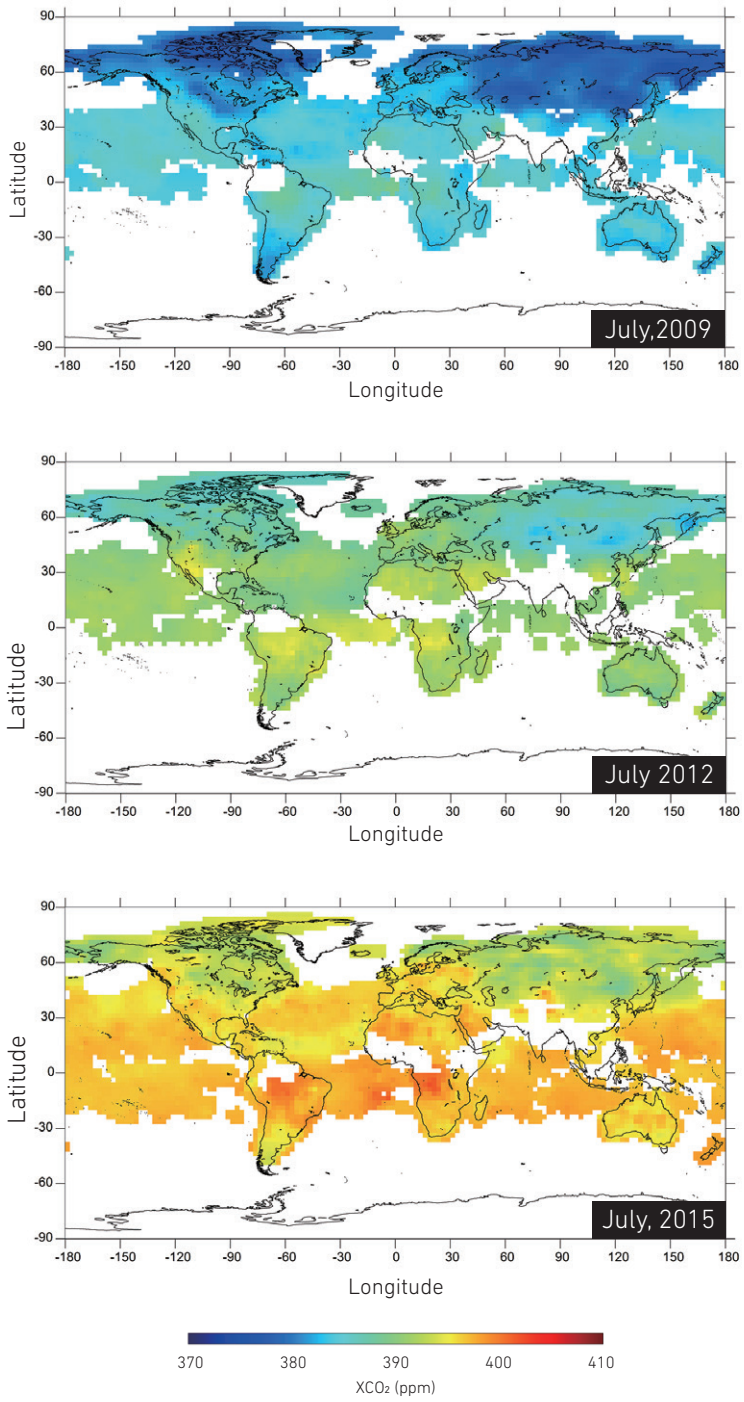
Sector		Projected Climate Change Impacts	Basic Adaptation Policies and Measures Includes measures for other purposes, that also contribute to adaptation
Agriculture, Forest / Forestry, Fisheries	Agriculture	Declining ratio of first-class rice	Development and dissemination of high-temperature-resistant varieties; establish soil and water management
		Poor coloring of apples and other fruits; northward shift of locations suitable for cultivation	Switch to superior colored varieties of fruit; development of breeding materials adapted to high temperature conditions; and dissemination of cultivation management technologies
		Increasing frequency and severity of mountainous disasters	Implementation of studies on situations of occurrences of plant pests; disseminate timely and appropriate information; import /domestic quarantine
	Forest / Forestry	Increasing frequency of occurrence and intense of mountainous disasters	Ascertaining more accurately which areas are at high risk of mountain disasters occurring; development of afforestation structures and forests preparing for occurrence of debris flows or wood debris runoff
	Fisheries	Changes in distributed migration range including sardine (e.g., shift northward)	Improvement in the precision of fishing ground projection; provision of real-time monitoring information
Water Environment, Water Resources	Water Environment	Deterioration of water quality	Measures for wastewater from factories and business premises; measures for domestic wastewater
	Water Resources	Increase in droughts due to an increase in the number of rainless days and a decrease in the total amount of snowfall	Optimal use of existing facilities, use of rainwater, reclaimed waste water, and creation of collaborative frameworks among stakeholders for actions including promoting the formulation of timelines (sequenced action plans) in order to mitigate damage as a drought
Natural Ecosystems	Diverse Ecosystems	Expansion of the habitat of sika deer, decreasing area suitable for the growth of reef-building coral	Management of national parks by eliminating plants which are newly distributed accompanied by climate change; creation of networks of ecosystems to allow creatures to migrate and spread to adapt to climate change
Natural Disasters, Coastal Areas	Water Disasters	Increasing frequency of heavy rainfall and short-term intense rainfall; increasing frequency and intense of water disasters accompanied by increases in precipitation from heavy rainfall events	- Disaster prevention measures to address natural hazards that could occur relatively frequently e.g., steady improvements of facilities; improvements of facilities based on disaster risk assessments; design of facilities to avoid rework - Disaster-reduction measures to cope with natural hazards that exceed the capacity of facilities (1) Improving aspects such as facilities' operations, design, and maintenance/upkeep procedures (e.g., making the most use of existing facilities) (2) Integrating with urban development/local development (e.g., measures to reduce inundation in cooperation with urban development/ local development; providing/sharing detailed disaster risk information) (3) Preparations for evacuation, emergency operations, business continuity (e.g., avoid catastrophic damage by preparing timelines)
	Storm Surge, High Waves	Expansion of inundation damage and coastal erosion due to increases in sea-level rise, typhoons and other events	Weather and marine monitoring, and assessment of the results; to promote improvements to make port and coastal structures more robust; support for formulation of port/harbor hazard maps; technology development to enable flexible responses; strengthen coastal erosion prevention
	Sediment-related Disasters	Increased frequency of sediment-related disasters; increases in sediment movement events exceeding design scale	Locating facilities and equipment to be most effective in protecting human life; promotion of baseline surveys and designation of sediment-related disaster hazard areas; implementation of urgent surveys when large scale sediment-related disasters occur
Human Health	Heat Stress	Increasing frequency of heat waves in summer; doubling of the number of heat illness patients transported by ambulance	Information provision relating to topics such as cautionary alerts; awareness raising regarding prevention and treatment, and status of outbreaks
	Infection	Expansion of suitable habitat for arthropods that are vectors for infectious diseases	Measures targeting sources of larvae of mosquito vectors and extermination of adult insects; calling attention to mosquito-prevention measures
Industrial and Economic Activity	Finance and Insurance	Increasing insured losses	Pay attention to efforts of the General Insurance Association of Japan and other organization efforts
Life of Citizenry, Urban Life	Urban Infrastructure, Critical Services	Impacts on infrastructure and critical services due to an increase in short-term intense rainfall events and droughts	Measures to prevent inundation of places such as underground stations; formulation of Business Continuity Plan (BCP) for ports and harbors; enhancing the resilience of water supply and waste disposal facilities
	Heat Island Effect	Further increases in temperature in urban areas	Improving ground cover using vegetation and water; reducing artificial exhaust heat; improving urban design

RESEARCH AND DEVELOPMENT

GOSAT—Greenhouse gases Observing SATellite

The Ministry of the Environment (MOE), the National Institute for Environmental Studies (NIES), and the Japan Aerospace Exploration Agency (JAXA) have jointly developed the Greenhouse Gases Observing Satellite (GOSAT), also known as "IBUKI", which is the world's first spacecraft specifically for observing greenhouse gases. GOSAT has been monitoring carbon dioxide (CO_2) and methane (CH_4) in the atmosphere from space, and can calculate the whole-atmospheric mean concentrations of these gases (through observations from the surface to the top of the atmosphere). As observed by GOSAT, the whole-atmospheric monthly mean concentrations of carbon dioxide, while varying from season to season, are increasing as years go by, and the global atmospheric monthly mean CO_2 concentration observed vertically through the whole atmosphere exceeded 400 ppm in December 2015 for the first time.

CO_2 concentration map derived from the observation data of "IBUKI"



Source:Japan Aerospace Exploration Agency, National Institute for Environmental Studies and Ministry of the Environment

Floating offshore wind turbine

Japan is a maritime country with the sixth largest exclusive economic zone in the world. Compared to land-based systems, ocean-based wind power has greater potential for providing substantial amounts of renewable energy. Japan's first commercial-scale floating wind turbine demonstration project, with a maximum power output of 2MW, was trialed in FY 2010 off the coast of Kabashima Island in Nagasaki Prefecture by the Ministry of the Environment. The technology for practical implementation was successfully established, and in addition, the floating structure was confirmed to act as a fish aggregating device (a floating fishing reef).

Floating offshore wind turbine demonstration project near Kabashima Island, Nagasaki

Thermal grid system

In FY 2015, Japan's demonstration project using a thermal grid system reduced CO_2 emissions by more than 70% in summer. The system linked air conditioning heat sources (chillers) and air conditioning equipment (loads) in existing buildings with double loop piping.

Hydrogen filling stations supplying hydrogen from renewable sources

In FY 2011, the Japanese government launched a demonstration project in Saitama City with Japan's first small-scale solar hydrogen filling station that produced hydrogen from solar power, establishing technology for practical implementation. In order to make hydrogen available for fuel cell vehicles, the project is now providing support for the establishment of hydrogen filling stations that supply hydrogen derived from renewable energy. The aim is to deploy about one hundred hydrogen filling stations by FY 2020.

5

GREEN FINANCE

ESG investing

As of March 2016, 41 of Japan's pension funds and investment managers, including the Government Pension Investment Fund (GPIF), were signatories to the Principles for Responsible Investment (PRI). ESG investing (investing that takes environmental, social and governance factors into account) is expected to expand in Japan as the nation is influenced by world trends.

Non-financial information, including the environmental, social and governance information that is essential to decision-making in ESG investing techniques, is generally difficult to obtain and compare. The Ministry of the Environment became a world leader in this area by commencing development of a system for disclosure of non-financial information, predominantly environmental information, and is trialing a platform for operation of the system.

6

INTERNATIONAL COOPERATION

Joint Crediting Mechanism projects

The Joint Crediting Mechanism (JCM) is a mechanism for appropriately evaluating contributions from Japan to greenhouse gas emission reductions or removals in a quantitative manner achieved through the diffusion of advanced low carbon technologies as well as implementation of mitigation actions in developing countries, and for using them to achieve Japan's emission reduction target. Japan has established the JCM with 16 partner countries. There are 13 registered JCM projects and another 76 projects in the pipeline. Accumulated emission reductions or removals by FY 2030 achieved through the JCM are estimated as ranging from 50 to 100 million tonnes-CO_2.

3rd JCM Partner Countries' High-level Meeting

7

STRATEGIC ACTIONS TARGETING THE LONG-TERM GOAL

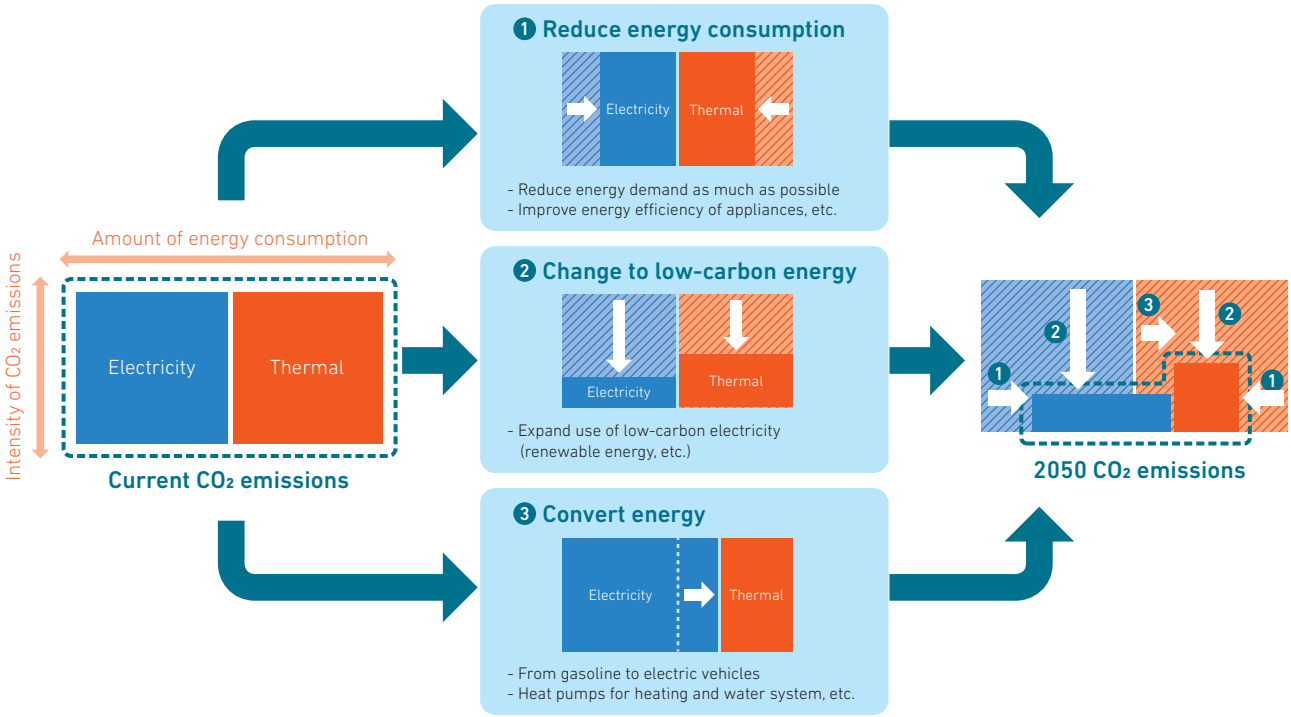
Long-term Climate Change Strategy Advisory Group

The Paris Agreement sets as a goal "to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." Based on the Paris Agreement, Japan aims to achieve the long-term goal of reducing greenhouse gas emissions by 80% by 2050 while pursuing both global warming countermeasures and economic growth under a fair and effective international framework in which all major parties participate.

An advisory group report, Proposal by the Minister of the Environment's Long-term Climate Change Strategy Advisory Group in February 2016, provides one example of a society in which an 80% reduction of greenhouse gas emissions is successfully achieved by 2050. The example illustrates a future in which everything possible is done to reduce energy demand, low-carbon energy is supplied, and electrification is promoted (see figure "One example of directions towards long-term drastic greenhouse gas reduction"). It points out that, instead of just accumulating improvements based on the existing social structure, there is a need for disruptive innovation (innovation of the structure of society) to create a completely new structure of society as a whole.

Discussion about how to achieve this kind of long-term drastic greenhouse gas reduction has only just begun, and it is important to ask a wide range of citizens for their opinions.

One example of directions towards long-term drastic greenhouse gas reduction



Source: Long-term Climate Change Strategy Advisory Group Recommendations: Long-term Orientation for Major Greenhouse Gas Reduction and a Simultaneous Resolution to Economic and Social Issues

8

OTHER INTERNATIONAL FRAMEWORKS

The 2030 Agenda for Sustainable Development

The 2030 Agenda was adopted at the United Nations Sustainable Development Summit for the adoption of the post-2015 development agenda on September 25, 2015.

"Universality", meaning that the goals apply to all countries including both developed countries and developing countries, is a key feature of the 2030 Agenda. Furthermore, in light of the fact that action for "integrated improvements of the environment, economy, and society" was insufficient in the Millennium Development Goals (MDGs), one of the precursors of the Sustainable Development Goals (SDGs), the agenda explicitly states that "we are committed to achieving sustainable development in its three dimensions—economic, social and environmental—in a balanced and integrated manner." This thinking is in line with the appropriate orientation of Japan's environmental policy.

In Japan, the government, NGOs, and businesses are beginning to take action based on the SDGs.

For example, on the day after the adoption of the 2030 Agenda, member organizations of Japanese NGOs and corporations, with cooperation from government and researchers, made a joint announcement from civil society and business regarding the adoption of the 2030 Agenda. This initiative symbolizes the global partnership that is one of the key features of the 2030 Agenda.

The relevant ministries are currently coordinating with relevant ministries, and considering the direction of actions to be taken for the SDGs by the government as a whole. In order to promote the implementation of SDGs, particularly in the environmental dimension, Japan's Ministry of the Environment holds stakeholders' meetings, starting in 2016, to provide a venue where businesses, civil groups, researchers, local governments and each ministry working on SDGs can get together to share and discuss advanced actions.

Source : United Nations Information Centre

G7 Ise-Shima Summit

The G7 Ise-Shima Summit was held in Ise-Shima, Mie from May 26 to 27, 2016 under the presidency of Japan. Continuing the momentum created by two historic international agreements of 2015, the Paris Agreement and the 2030 Agenda, the summit provided an opportunity for a domestic and international demonstration of the political will of G7 countries to aim for a new world in which environmental policies befitting the twenty-first century are spread and shared throughout the world. The G7 Ise-Shima Leaders' Declaration can be viewed at the following link.

G7 Ise-Shima Leaders' Declaration

http://www.mofa.go.jp/files/000160266.pdf

G7 Toyama Environment Ministers' Meeting

The G7 Toyama Environment Ministers' Meeting was held in Toyama City from May 15 to 16, 2016. The communiqué can be viewed at the following link.

Communiqué

https://www.env.go.jp/earth/g7toyama_emm/english/_img/meeting_overview/Communique_en.pdf

The Tripartite Environment Ministers Meeting Among China, Japan, and Korea

In recent years, Northeast Asia has undergone rapid economic development. At the same time, however, problems such as environmental pollution and ecosystem deterioration have also come to light, making it important to find a way to achieve sustainable development. While the respective economic and social conditions differ in the Northeast Asian nations of China, Japan and the Republic of Korea, all of these nations share the common task of having to combat environmental problems at domestic, regional, and global levels. In this context, the environment ministers of the three countries have been holding the Tripartite Environment Ministers Meeting among China, Japan, and Korea (TEMM) on an annual basis since 1999. Within this framework, the three countries aim to take a leading role in regional environmental management, and contribute to global environmental improvement.

TEMM 18 was held from April 26 to 27, 2016 in Shizuoka City, Shizuoka Prefecture. The three ministers reviewed the progress of the Tripartite Joint Action Plan on Environmental Cooperation that was formulated in 2015, and exchanged views. The communiqué can be viewed at the following link.

Joint Communiqué

http://www.temm.org/sub03/11.jsp?commid=TEMM18

RECONSTRUCTION AFTER THE GREAT EAST JAPAN EARTHQUAKE

On March 11, 2011, East Japan was struck by the largest earthquake ever recorded in or around Japan. With magnitude 9.0, it triggered enormous tsunamis that caused immense, widespread damage, primarily along the Pacific coast of the Tohoku region. The tsunami caused accidents at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Plant, which resulted in the release of large amounts of radioactive materials into the environment. This remains the greatest environmental challenge in Japan.

2

1

PROGRESS IN RESTORATION OF THE ENVIRONMENT

Natural environment

Studies of flora and fauna in the tsunami disaster area where important habitats remain indicate ongoing restoration of the natural environment, with all areas showing an increase in the number of species found.

Radiation levels

Findings from environmental radiation (in air) monitoring by aircraft conducted within the 80-kilometer zone of the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Plant show that radiation levels in September 2015 had decreased 65% (to approximately one third) compared to seven months after the accident. (see Figure below) The main reasons for the decrease, besides the physical decay of radionuclides, are thought to be the influence of rainfall and other natural phenomena, and the impact of decontamination efforts.

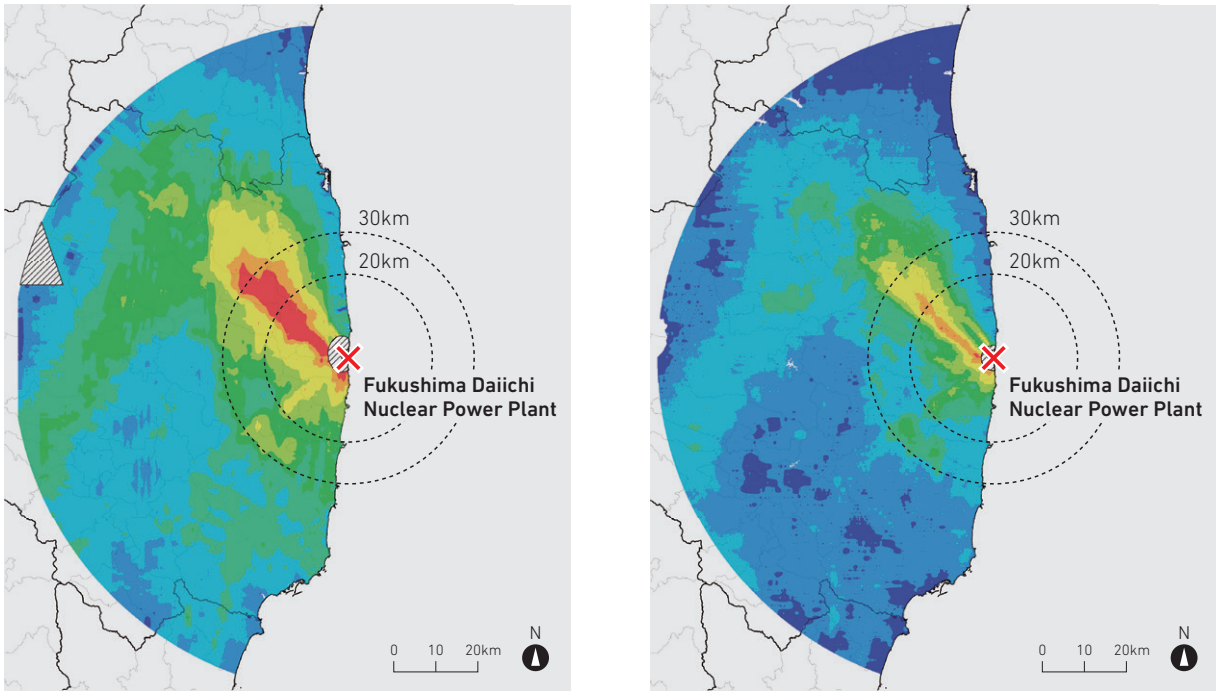
Legend

Radiation dose rates in air (μSv) at 1 m above the ground

- 19.0 <
- 9.5 – 19.0
- 3.8 – 9.5
- 1.9 – 3.8
- 1.0 – 1.9
- 0.5 – 1.0
- 0.2 – 0.5
- 0.1 – 0.2
- ≦ 0.1
- ⊘ Area where radiation dose rate in air was not surveyed

* Radiation dose rates in air observed in the zone include radiation from natural radionuclides.

Distribution maps of radiation dose rates in air within 80-km zone



1 month after accident
(April 29, 2011)

54 months after accident
(September 29, 2015)

Source: The Secretariat of the Nuclear Regulation Authority

2

RESTORATION OF THE ENVIRONMENT IN AREAS CONTAMINATED BY RADIOACTIVE MATERIALS

Handling of waste in the management area

The government estimates that there was, as of January 2016, approximately 1.16 million tons of disaster-related waste in the region designated as the management area, which covers part or all of 11 municipalities in Fukushima Prefecture. By the end of February 2016, approximately 770,000 tons of this waste, equivalent to approximately 66%, had been transported to temporary storage areas. The volume of waste is being reduced by incineration at temporary incineration facilities.

Disposal of designated waste

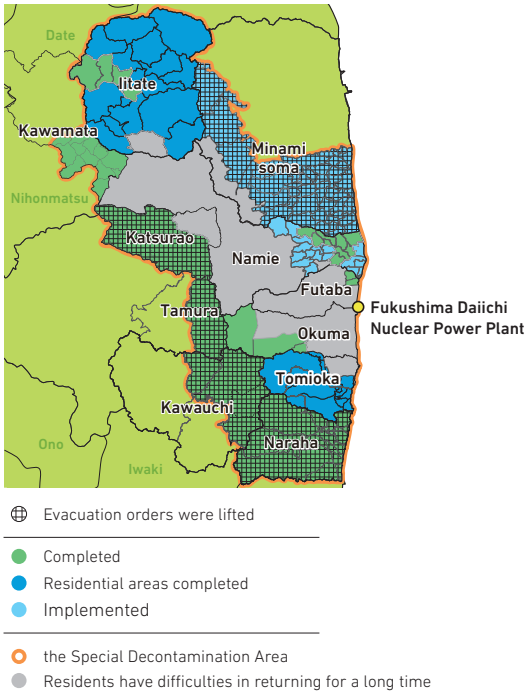
As of December 2015, a total of approximately 170,000 tons of incinerator ash, sewage sludge, and by-products of agriculture and forestry (rice straw, manure, etc.) in 12 prefectures has been labeled "designated waste" by the Minister of the Environment. Japanese government policy is for disposal of designated waste to take place in the prefecture in which the waste was generated. Designated waste is currently being temporarily stored at waste incineration facilities and sewage treatment facilities, and on agricultural land in these prefectures, while storage managers follow national guidelines, and prevent scattering/leaking by covering the waste meticulously with seepage control sheets, etc., and by measuring air dose rates and confirming that the waste is not affecting the surrounding area.

Decontamination of soil contaminated by radioactive materials

The Ministry of the Environment is conducting decontamination on the basis of decontamination implementation plans in the 11 municipalities in Fukushima Prefecture designated as the Special Decontamination Area. By the end of March 2016, whole area decontamination had been completed in Tamura, Okuma, Naraha, Kawauchi, Katsurao, Kawamata, and Futaba. The target for completing whole area decontamination in the remaining municipalities (except for designated difficult-to-return areas) is the end of March 2017.

As of the end of March 2016, 93 municipalities in eight prefectures in the Intensive Contamination Survey Area had formulated decontamination implementation plans of their own supported by the Ministry of the Environment. The implementation of decontamination in all municipalities is planned to be completed by the end of March 2017.

Decontamination Progress in the Special Decontamination Area (as of the end of March 2016)



Naraha—An example of the effectiveness of decontamination work

In Naraha, decontamination work commenced in September 2012 on the basis of the decontamination implementation plans, and was completed in March 2014. Air dose rates decreased after decontamination, and monitoring has confirmed that these effects were maintained. Then, in September 2015, Naraha became the first of the municipalities that had been totally evacuated to have its evacuation orders lifted.

Interim Storage Facility

The Interim Storage Facility will be established as a centralized facility for safely managing and storing soil containing radioactive materials generated from decontamination work in Fukushima Prefecture, and designated waste exceeding 100,000 bq/kg being stored in Fukushima Prefecture, until final disposal is conducted.

The Ministry of the Environment confirmed safe and secure transportation from 43 municipalities in Fukushima Prefecture in 2015 and 2016. The Five-year Ad-hoc Policy on Interim Storage Facility, published in March 2016, shows that approximately 5 million to 12.5 million m^3 of contaminated soil is expected to be delivered to the facility by FY 2020.

Recycling and reducing volume of contaminated soil

Necessary measures should be taken for the final disposal outside Fukushima Prefecture within 30 years after operations start at the Interim Storage Facility. In preparation for final disposal outside Fukushima Prefecture, it is important to raise the proportion that can be recycled and reduce the amount requiring final disposal to the greatest extent possible through the development and use of technology that reduces the volume of contaminated soil. Consequently, the Ministry of the Environment is investigating strategy for the development of technology applicable to recycling and volume reduction, and is conducting demonstration projects for newly-developed technologies.

3

HEALTH MANAGEMENT FOR PEOPLE EXPOSED TO RADIATION

Health management in Fukushima Prefecture

The government provides support to Fukushima Prefecture for health management, including grants to the Fukushima Residents Health Management Fund. One of the ways that Fukushima Prefecture has been utilizing those grants is to conduct the Fukushima Health Management Survey.

With regard to external exposure, the Fukushima Health Management Survey's basic survey had covered 460,000 of the 2.02 million residents of the prefecture by the end of 2015, estimating external exposure doses during the four months after the accident. Fukushima Prefectural Oversight Committee Meeting for the Fukushima Health Management Survey evaluated the results and concluded that the radiation doses estimated so far are unlikely to cause adverse effects on health, although this conclusion is based on external radiation doses estimated only for the first four months following accident.

Surveys of internal exposure covered approximately 280,000 residents by March 2016, and Fukushima Prefecture made the assessment that the internal exposure dose levels of those who were examined "are not high enough to affect their health conditions".

In addition, thyroid examinations have been performed on approximately 370,000 residents who were about 18 years old or younger at the time of the disaster. The committee's interim report on the Fukushima Health Management Survey (published March 2016) made the assessment that judging from an overall perspective, the cases of thyroid cancer discovered to date are unlikely to be due to the effects of radiation. This conclusion was reached because a) exposure doses were small overall compared to the Chernobyl accident, b) the period from exposure to discovery of cancer was short, at about one to four years, c) cancer was not discovered in individuals who were 5 years old or younger at the time of the accident, and d) there were no significant differences in prevalence from one area to another. The interim report also stated that the thyroid examinations should continue.

Studies by experts regarding health management

The government organized an Expert Meeting (group of experts) to examine health management after the accident from a medical and scientific perspective. The Interim Report by the Expert Meeting published in December 2014 stated,

"We have not found any evidence of biological effects due to the radiation exposure up to this time, and have concluded that there was little possibility that the risk of some diseases would increase by radiation exposure going forward."

4

PREPAREDNESS FOR ENVIRONMENTAL RISKS CAUSED BY DISASTERS

In light of the lessons learned from the Great East Japan Earthquake and recent natural disasters, actions are being taken in order to be prepared for environmental risks due to disasters.

Revision of Waste Management and Public Cleansing Act and Disaster Countermeasures Basic Act

Massive amounts of disaster waste are generated in the event of a large-scale disaster, as might be caused by large earthquakes predicted as "the Nankai-Trough Large-scale Earthquake" or "Tokyo Inland Earthquake". To prepare for such disasters, it is necessary to take measures such as formulation of disaster waste disposal plans before an emergency occurs. In order to ensure the formulation of such plans, and to ensure the proper and rapid treatment of disaster waste, the Waste Management and Public Cleansing Act and the Disaster Countermeasures Basic Act were revised in August 2015. The revisions included simplifying the procedures for installation and utilization of waste treatment facilities in times of disaster and proxy measures for waste treatment by the Minister of the Environment.

Disaster Waste Treatment Network

The Disaster Waste Treatment Network (D.Waste-Net) was established in September 2015 to enhance support for disaster waste management by local governments. With a membership including experts on disaster waste, engineers, and members of relevant industry groups, D.Waste-Net supports local governments to cooperate in appropriate disaster waste management by sharing the latest scientific and technical knowledge.

In September 2015, experts and engineers of this network gave advice to local governments in disaster areas affected by heavy rain and flooding in the Kanto and Tohoku regions.

Regional councils for disaster wastes management

In order to promote wide-area coordination across prefectural boundaries, as well as to strengthen regional disaster waste management, regional councils have been established in eight blocks across Japan to build frameworks for disaster waste treatment. Participants in these councils include the representatives of prefectural governments, major municipalities, local private-sector enterprises, and disaster waste management experts.

Ecosystem-based Disaster Risk Reduction

In the face of intensifying meteorological disasters due to climate change and growing areas of under-used or unused land due to declining population, the Japanese government has issued a handbook on the concept of Ecosystem-based Disaster Risk Reduction (Eco-DRR) and compiled a set of examples in order to disseminate Eco-DRR.

http://www.env.go.jp/nature/biodic/eco-drr/pamph04.pdf

Disaster-resistant renewable energy

The Japanese government is supporting the installation of decentralized and self-reliant energy systems at evacuation centers and disaster prevention centers. By the end of March 2015, over 600 local governments had installed self-reliant energy systems at a total of approximately 2,400 locations. Most installations combine solar power generation with batteries for storage, enabling them to provide renewable energy under normal circumstances, and continue to provide sufficient power for lighting and communications from batteries after a disaster and at other times when mains electricity is unavailable.

Solar panel installation subsidized by the goverment

Photo: Minamisoma City

3 BIODIVERSITY AND ECOSYSTEM SERVICES

In March 2016, the government published Japan Biodiversity Outlook 2, the results of an assessment of biodiversity and ecosystem services in Japan over the past 50 years.

Overview of biodiversity

The assessment found that biodiversity in Japan continues to be in a state of long-term decline. The four major drivers indicated were: 1) development and other human activities; 2) the reduction in use/management of nature; 3) invasive alien species, chemical substances, and other things introduced by humans; and 4) global climate change. Examples of each of these drivers of the decline in biodiversity include the following.

The first driver is the result of continued habitat alteration of the Japanese ecosystem, including forests, farmlands, wetlands, and tidal flats, due to development during the period of high economic growth, with around 40% of tidal flats having disappeared. River crossing structures are affecting the continuity between upstream and downstream, and between rivers and oceans, and deterioration of the continuity of rivers may be obstructing the movement of animals going upstream. Furthermore, development and exploitation were indicated as drivers of extinction for the 26 species so far confirmed extinct in Japan. In the case of the second driver, there has been a loss of Satochi-Satoyama, the secondary natural environment formed through human intervention in nature, such as farmland and grassland. For example, the loss of secondary grassland is indicated as a driver of the dramatic loss of grassland birds and butterflies. With regards to the third driver, the effects of alien species are a concern, for example, as indicated by the increase in agricultural damage caused by raccoons. With regard to the fourth driver, cases have been reported of disruption of phenological synchronism relationship between biological cycle events and seasonal variation, such as mismatches in timing between the flowering of alpine plants and the appearance of the bumblebees that pollinate them. Also, average coral coverage around the Okinawa Main Island is reported to have decreased to 7.5% due to factors such as rising ocean temperatures.

Results of Biodiversity Assessment

			Long-term trend of impact		Degree of impact and current trend
			Between 50 and 20 years ago	From 20 years ago to present	
Drivers of Biodiversity Loss	First Crisis	Development, alternation of ecosystems			
		Eutrophication			
		Loss of endangered species			
	Second Crisis	Reduced and management of Satochi-Satoyama			
		Reduced direct use of wildlife			
		Loss of endangered species			
	Third Crisis	Invasion and establishment of alien species			
		Chemical substances			
		Loss of endangered species			
	Fourth Crisis	Climate change			
		Loss of endangered species	?	?	?

Note: Descriptions of the terms used in the table are as follows:

- First Crisis is the impact on biodiversity caused by development, exploitation and other human activities, including habitat alternation, direct use, and water pollution.
- Second Crisis is the impact caused by decline in human intervention in nature, including reduced use/management of Satochi-Satoyama.
- Third Crisis is the crisis brought by alien species, chemical substances, and other consequences of modern lifestyles and human activities.
- Fourth Crisis is the impact due to climate and other environmental changes including global warming, increased occurrence of strong typhoons, change in precipitation patterns, decreased fisheries catch, and ocean acidification.

Legend

Drivers			
Degree of impact during assessment period		Long-term and current trend of impact	
Weak	○	Decreasing	↘
Medium	●	Same	→
Strong	●	Increasing	↗
Very strong	●	Increasing rapidly	↑

Notes: Graphic symbols may not represent all of the multiple factors related to the indicators in question.

Arrows circled by dotted lines indicate that information is insufficient to make accurate assessments.

Overview of ecosystem services

Many of the provisioning services in Japan were assessed as being in decline, particularly with agricultural and fisheries products and timber, which are seeing major declines compared to historical levels.

Both the supply and demand sides contribute to the decline of provisioning services, with the former responsible for the deterioration of resources through overuse, habitat destruction and other factors, and the latter responsible for underuse of resources as a result of change in lifestyle and increased dependence on imported food and resources.

One of the causes of underuse is Japan's exceptionally heavy dependence on imported food and resources. Decreased domestic production of food and resources leads to an increase of abandoned farmland. The number of workers in the agricultural/forestry/fisheries industries is falling due to a shift in economic structure and resulting population flow from rural to urban areas, which could result in the loss of traditional knowledge and skills necessary to harness the bounties of nature.

Soil erosion control and other regulating services of artificial forests are sometimes compromised due to lack of management. In addition, reduced human activities in Satochi-Satoyama are creating conflicts with wild animals, thereby increasing disservices to humans, including attacks by bears.

Inter-regional food diversity is gradually being lost throughout Japan along with landscape diversity that creates a colorful mosaic of different vegetation and ecosystems. This fact suggests the loss of cultural services as well, which are rooted in each locality and its natural environment.

Interaction with nature has positive effects on our physical and mental well-being. While urbanization has deprived children of opportunities to interact with nature on a daily basis, many people are still interested in nature and are increasingly looking for ways to reconnect with rural communities and get back into nature through eco-tourism, etc.

Results of Ecosystem Services Assessment

		Assessment Result		
		Between 50 and 20 years ago	From 20 years ago to present	Overuse or underuse*
Provisioning services	Agricultural crops	→	↘	▼★
	Non-timber forest products	↗	↘	▼☆
	Seafood	↗	↘	▲★
	Freshwater	–	→	▲☆
	Timber	↘	→	▼★
	Raw materials	↘	↘	▼★
Regulating services	Climate	–	↘	–
	Air quality	–	→	–
	Water	–	(↘)	–
	Soil	→	–	–
	Disaster mitigation	(↗)	(→)	–
	Biological control	–	(↘)	–
Cultural services	Religion / festivals	↓	↘	–
	Education	↘	→	–
	Landscape	–	↘	–
	Traditional arts & crafts	↘	↘	–
	Tourism / recreation	↗	↘	–
Dis-service	Damage caused by wild animals	–	↗	–

Validity of the questionnaire assessment was examined by taking into account the results of expert questionnaire surveys conducted as part of JBO2.

Note: Descriptions of the terms used in the table are as follows:

- Provisioning services are services that provide food, fuel, timber, fiber, medicine, water and other important resources for human living brought by agriculture, forestry, and fisheries.
- Regulating services are services that modulate the environment, such as climate alleviation, flood mitigation, and water purification by forests.
- Cultural services are services that provide spiritual fulfillment, aesthetic enjoyment, religious/social foundation, recreational opportunities, etc.

Legend

	Quantitative trend in services received	
	Results of quantitative assessment	Where data is insufficient
Increasing	↑	(↑)
Slightly increasing	↗	(↗)
Same	→	(→)
Slightly decreasing	↘	(↘)
Decreasing	↓	(↓)

Overuse	▲
Underuse	▼
based on data	★
based on questionnaire	☆

Notes: Graphic symbols may not represent all of the multiple factors related to the indicators in question.
Arrows circled by dotted lines indicate that information is insufficient to make accurate assessments.

4 HARMONIZING THE CYCLES OF NATURE AND ECONOMIC SOCIETY

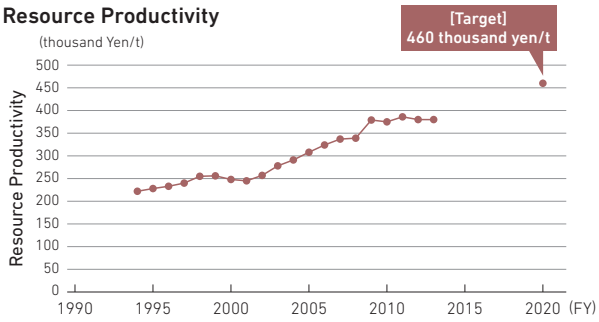
The Leaders' Declaration of the G7 Summit in 2015 asserted, "The protection and efficient use of natural resources is vital for sustainable development." An improvement of resource efficiency and a reduction of waste are also embraced in the SDGs.

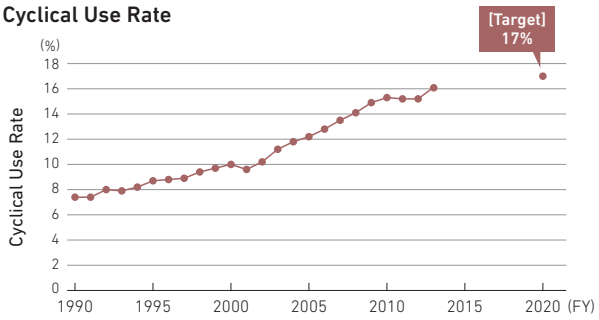
Current state of measures for promoting a sound material-cycle society

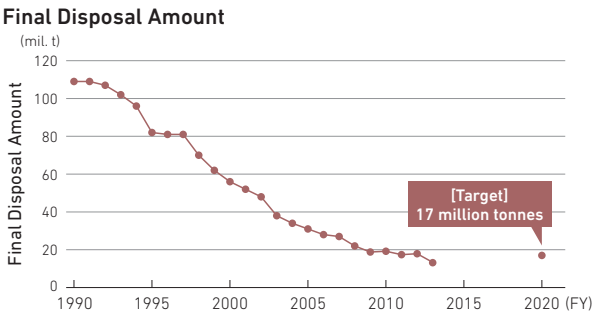
In 2000, the first year of the "sound material-cycle society," the Basic Act on Establishing a Sound Material-Cycle Society was enacted with the aim of forming a sound material-cycle society in order to minimize consumption of natural resources and reduce environmental loads. In addition, progress was made towards developing the individual recycling laws. Under the basic act, priorities were established for the use of resources through the 3Rs (Reduce, Reuse, Recycle) initiative, heat recovery and proper disposal were promoted, and the Fundamental Plan for Establishing a Sound Material-Cycle Society was determined by Cabinet decision in March 2003, for systematically building a sound material-cycle society. As a result, the final disposal amount of waste was dramatically reduced after 2000 when the basic act was enacted, declining from approximately 56 million tons in 2000 to approximately 16.30 million tonnes in 2013, and the rate of cyclical use has steadily increased from 10.0% in 2000 to 16.1% in 2013.

Meanwhile, the Third Fundamental Plan for Establishing a Sound Material-Cycle Society, which was determined by Cabinet decision in 2013, pointed out the inadequacy of the effort for 2R (reduction and reuse), which are higher priorities than recycling. Even for recycling, although the rate of recycling of industrial waste has made relatively good progress, at 53.4% as of 2013, the rate of recycling of municipal solid waste, which is more directly related to our everyday lifestyles, is still only 20.6%. Furthermore, although resource productivity (378,000 yen/tonne) is showing long-term improvement since FY 2000 (248,000 yen/tonne), achieving the Fundamental Plan's target for FY 2020 (460,000 yen/tonne) appears extremely difficult.

In order to improve resource productivity and promote 3R, rather than just focusing on actions at the stage at which things are discarded or disposed of, it is important to move ahead with reducing the amount of resources consumed, eco-friendly design, and use / reuse of recycled materials at the earlier stages of production, distribution, and consumption.







Harmonization of two cycles

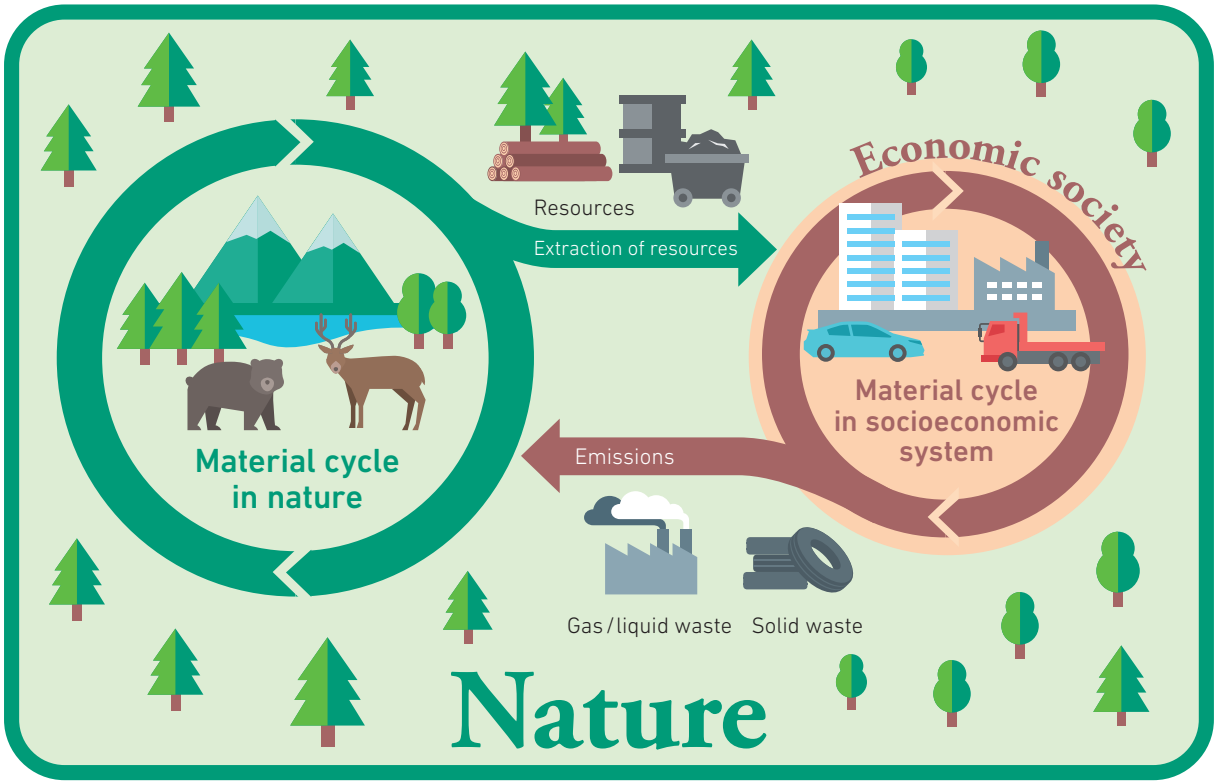
The Fundamental Plan for Establishing a Sound Material-Cycle Society states that, in order to sustain circulation in nature in a sound way and coexist with it, we must minimize adverse effects on the natural world caused by economic society, by conserving resource use in our socioeconomic system as much as possible and by promoting recycling, as well as by minimizing the environmental loads due to mining or landfill. Put simply, it aims to achieve harmonization of two cycles—the circulation in the natural world and the material cycle in our socioeconomic system. In other words, it stresses the importance of sustaining the healthy circulation in the natural world by minimizing adverse effects on that circulation through sound material cycles in our socioeconomic system (see figure below).

In order to make this kind of society a reality, in addition to achieving reduction, reuse, recycling, and proper disposal at the discarding / recycling stage, it is necessary to broaden our perspective and consider actions for reducing environmental loads during various stages, including resource mining, procurement of materials, production, distribution, and consumption.

Events around the world indicate that initiatives for achieving a sound material-cycle society have become a world trend, with improvement of resource efficiency and the 3Rs-related initiatives addressed in the G7 Summit Leaders' Declaration at Schloss Elmau in Bavaria, Germany and in the Sustainable Development Goals (SDGs). Consumption of resources is increasing worldwide, and concerns grow about the scarcity of resources and about the environmental impact of mining and consuming resources. Japan, which is dependent on imports for many of its resources, must take an integrated approach, reorganizing in terms of various existing environmental policies, economic policies, and social policies, while responding in an appropriate manner to socioeconomic system reforms and changes in regional societies and global trends.

Moving forward with these actions, the potential to achieve a sound material-cycle society realizes for the first time the harmonization of the two cycles—the circulation in the natural world and the material cycle in our socioeconomic system. At the same time, it is linked with surmounting a diverse range of environmental, economic, and social issues, including efforts such as global warming countermeasures, conservation of biodiversity, and measures for toxic substances. Consequently, it also contributes to the realization/ achievement of sustainable development.

Harmonizing the material cycle in the natural world and the material cycle in our socioeconomic system

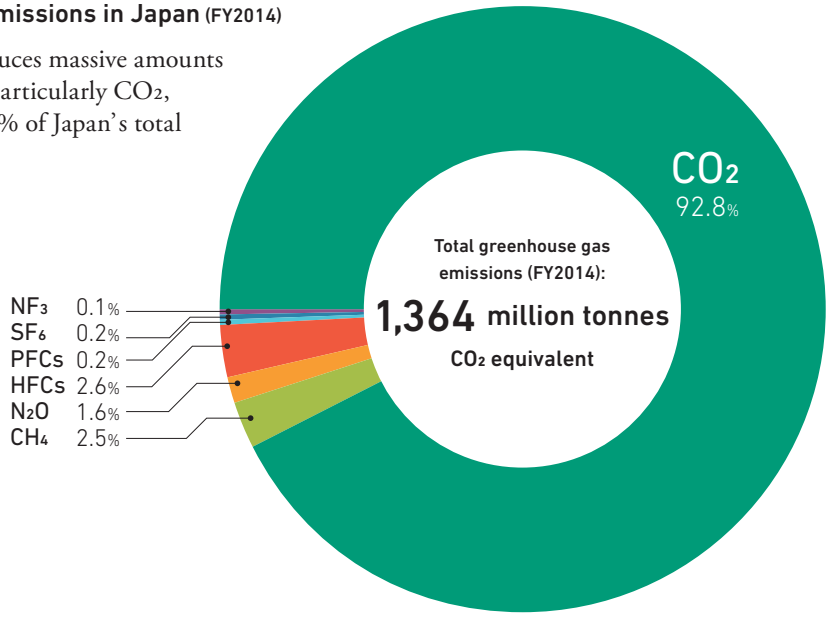


Source: Compiled by Ministry of the Environment based on *Comparative Analysis on Images of Cycle-Oriented Society* by Hashimoto Seiji, et al.

ADDITIONAL MATERIALS FROM THE 2016 ANNUAL REPORT ON THE ENVIRONMENT

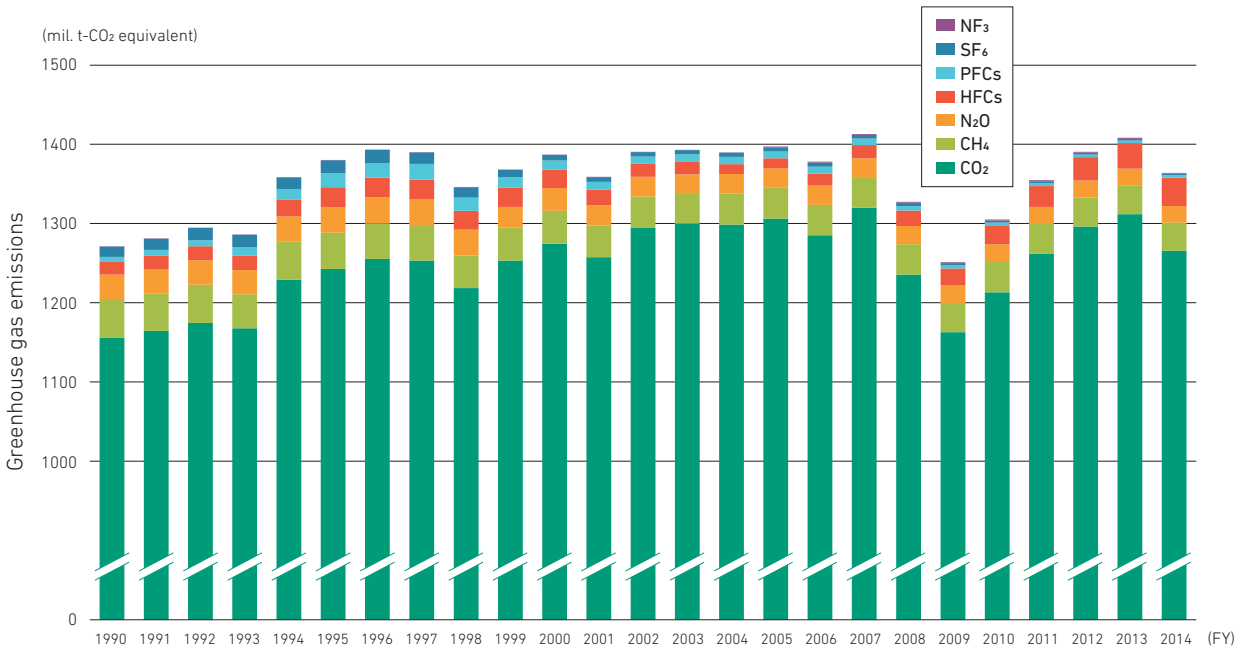
Breakdown of Greenhouse Gas Emissions in Japan (FY2014)

Globally, fossil fuel combustion produces massive amounts of anthropogenic greenhouse gases, particularly CO_2, which accounts for approximately 93% of Japan's total greenhouse gas emissions.



Greenhouse Gas Emissions in Japan

Japan's total greenhouse gas emissions in FY 2014 were equivalent to approximately 1,364 million tonnes of CO_2, a 3.1% drop from the previous year. This was due to energy originated CO_2 emissions decreasing as lower electricity consumption and the improvement of carbon intensity in power generation resulted in less CO_2 production from power generation.



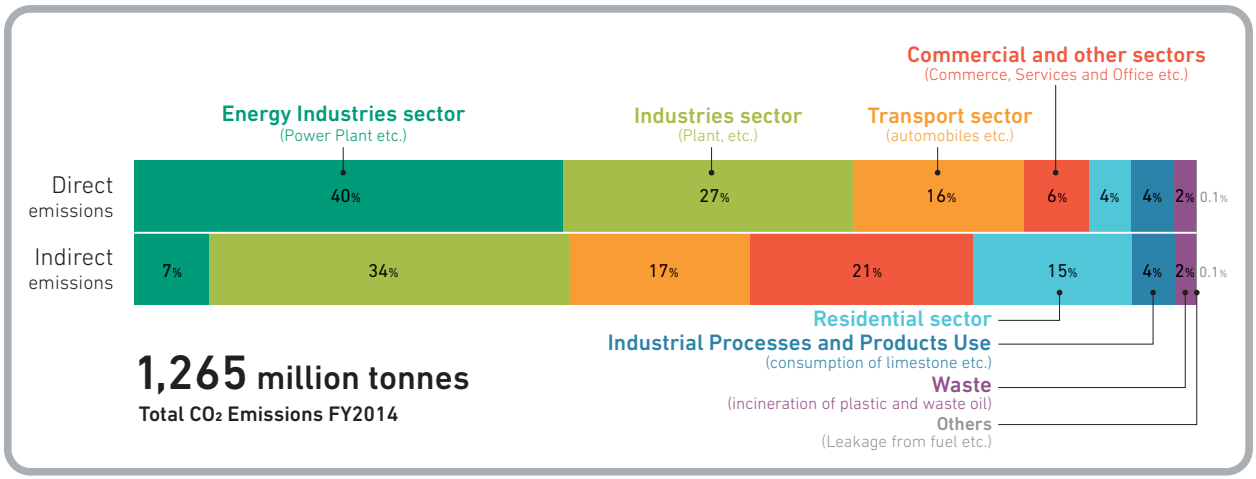
Note: Emissions data is subject to change due to corrections or recalculations of statistical data in annual reports.

Low-carbon society

Additional materials provide more details about the global warming issue.

Breakdown of CO_2 Emissions by Sector

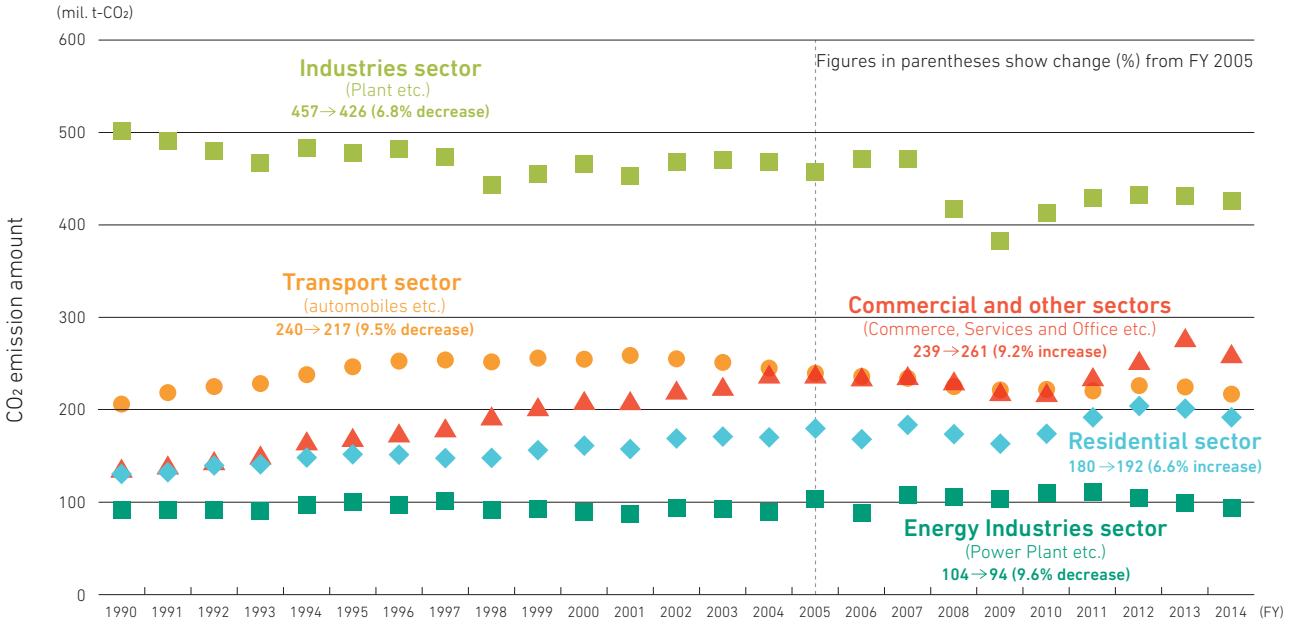
Industries was the sector with the largest CO_2 emissions in FY 2014, accounting for approximately 34% of Japan's total.



Notes: The upper bar represents the share of direct emissions from each sector.
The lower bar represents the share of each final demand sector, correcting emissions from power generation by the electric utility companies and emissions from heat generation by heat supply operators to final demand sectors in proportion to their electricity and heat consumption level.
Due to statistical errors and rounding, the sum of percentages of emissions does not always add up to 100%.

Energy originated CO_2 Emissions by Sector

Plotting energy originated CO_2 emissions by sector reveals that emissions in most sectors are currently on a downward trend.



ADDITIONAL MATERIALS FROM THE 2016 ANNUAL REPORT ON THE ENVIRONMENT

Threatened Wildlife Species in Japan

With an increasing number of species being put on the Red List, which publicizes threatened wildlife species, it is clear that the circumstances of wildlife in Japan continue to be grave.

(Reported in September 2015)

Taxonomical group			Species for the survey (a)	Extinct	Extinct in the wild	Threatened (b)			Near threatened	Data Deficient	Total number of Red-listed	Threatened local population (b/a)
						Category I (critically endangered + endangered)		Category II (vulnerable)				
						IA (Critically endangered)	IB (endangered)					
				EX	EW	CR	EN	VU	NT	DD		
Animals	Mammals		160 (160)	7 (7)	0 (0)	33(34)			18 (17)	5 (5)	63 (63)	23 (22)
						24(24)		9(10)				
						12(12)	12(12)					
	Birds		approx. 700 (approx. 700)	14 (14)	1 (1)	97(97)			21 (21)	17 (17)	150 (150)	2 (2)
						54(54)		43(43)				
						23(23)	31(31)					
	Reptiles		98 (98)	0 (0)	0 (0)	36(36)			17 (17)	3 (3)	56 (56)	5 (5)
						13(13)		23(23)				
						4(4)	9(9)					
	Amphibians		66 (66)	0 (0)	0 (0)	22(22)			20 (20)	1 (1)	43 (43)	0 (0)
						11(11)		11(11)				
						1(1)	10(10)					
	Brackish water and freshwater fish		approx. 400 (approx. 400)	3 (3)	1 (1)	167(167)			34 (34)	33 (33)	238 238)	15 (15)
						123(123)		44(44)				
						69(69)	54(54)					
	Insects		approx. 32,000 (approx. 32,000)	4 (4)	0 (0)	358(358)			353 (353)	153 (153)	868 (868)	2 (2)
						171(171)		187(187)				
						65(65)	106(106)					
	Molluscs		approx. 3,200 (approx. 3,200)	19 (19)	0 (0)	563(563)			451 (451)	93 (93)	1126 (1126)	13 (13)
						244(244)		319(319)				
	Other invertebrate		approx. 5,300 (approx. 5,300)	0 (0)	1 (1)	61(61)			42 (42)	42 (42)	146 (146)	0 (0)
						20(20)		41(41)				
	Animals subtotal			47 (47)	3 (3)	1337(1338)			956 (956)	347 (347)	2690 (2690)	60 (59)
						660(660)		677(678)				
Plants, etc.	Plants etc. I	Tracheophyte	approx. 7,000 (approx. 7,000)	32 (32)	10 (10)	1779(1779)			297 (297)	37 (37)	2155 (2155)	0 (0)
						1038(1038)		741(741)				
						519(519)	519(519)					
	Plants etc. II	Bryophyte	approx. 1,800 (approx. 1,800)	0 (0)	0 (0)	241(241)			21 (21)	21 (21)	283 (283)	0 (0)
						138(138)		103(103)				
		Algae	approx. 3,000[Note 1] (approx. 3,000)	4 (4)	0 (0)	116(116)			41 (41)	40 (40)	202 (202)	0 (0)
						95(95)		21(21)				
		Lichen	approx. 1,600 (approx. 1,600)	4 (4)	1 (1)	61(61)			42 (42)	46 (46)	153 (153)	0 (0)
						41(41)		20(20)				
		Fungi	approx. 3,000[Note 1] (approx. 3,000)	26 (26)	0 (0)	62(62)			21 (21)	50 (50)	160 (160)	0 (0)
						39(39)		23(23)				
	Plants etc. Subtotal			66 (66)	12 (12)	2259(2259)			422 (422)	194 (194)	2953 (2953)	0 (0)
						1351(1351)		908(908)				
	Total of the 10 taxonomical groups			113 (113)	15 (15)	3596(3597)			1378 (1377)	541 (541)	5643 (5643)	60 (59)
						2011(2011)		1585(1586)				

* Figures in parentheses indicate the species (including subspecies, and, in the case of Plants, etc., variants (in part varieties)) for the 4th Red List, reported in 2012 and 2013.
LP shows the number of local populations surveyed.

Note 1: Numbers of species exclude species that cannot be identified visually.
Note 2: Data on the assessed animal species (including subspecies) were derived from the Environment Agency's Checklist of Japanese Species of Wildlife (1993, 1995, and 1998).
Note 3: Among "Plants, etc.," data on species (including subspecies) of tracheophytes were derived from data aggregated by the Japanese Society for Plant Systematics.
Note 4: Among "Plants, etc.," data on species (including subspecies) of non-tracheophytes (bryophytes, algae, lichen, and fungi) were derived from Ministry of the Environment surveys.

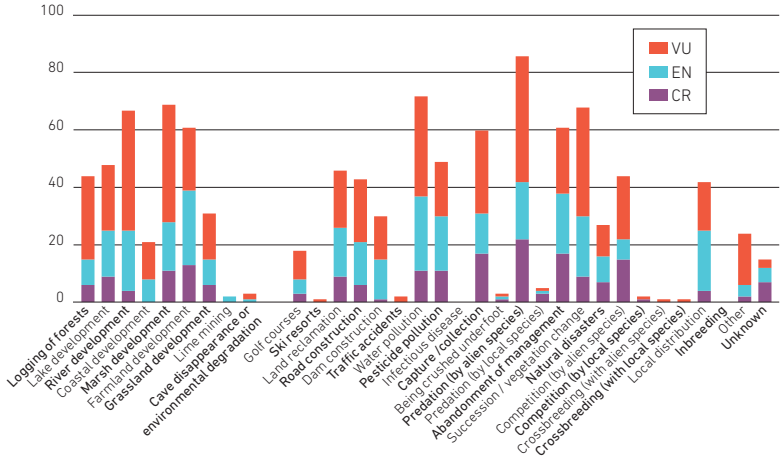
The categories are considered as follows:

Extinct: Species thought to already be extinct in Japan / Extinct in the Wild: Species surviving in cultivation, in captivity, or as a naturalized population well outside its historic range /
Critically Endangered + Endangered: Species in danger of extinction / Vulnerable: Species facing increasing danger of extinction /
Near Threatened: Species with weak foundation for survival / Data Deficient: Species with insufficient data to make an assessment

Source: Table of species listed in Red List by the Ministry of the Environment

Drivers of Loss of Endangered Species (insects)

There are various drivers of loss of endangered species, but typical drivers include development, capture/collection, abandonment of management or succession, overuse, water pollution, and alien species.



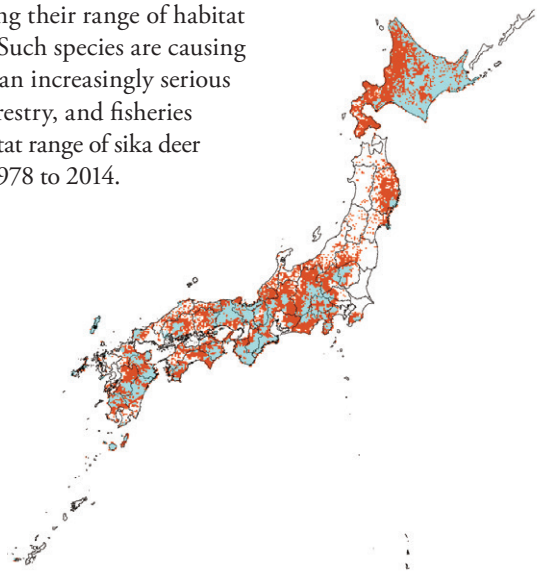
Note 1: Horizontal axis represents number of species.
There are some species for which multiple drivers of loss apply.
Note 2: CR: Category IA. EN: Category IB. VU: Category II.

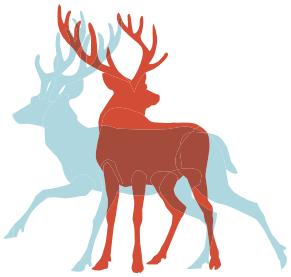
Biodiversity

Additional materials provide more details about biodiversity in Japan.

Growing Range of Sika Deer

While certain flora and fauna are endangered, there are also issues with other species, such as sika deer and wild boar, that are suddenly expanding their range of habitat and growing their populations. Such species are causing increasing damage, resulting in an increasingly serious situation for the agricultural, forestry, and fisheries industries. For example, the habitat range of sika deer expanded approx. 2.5 fold from 1978 to 2014.



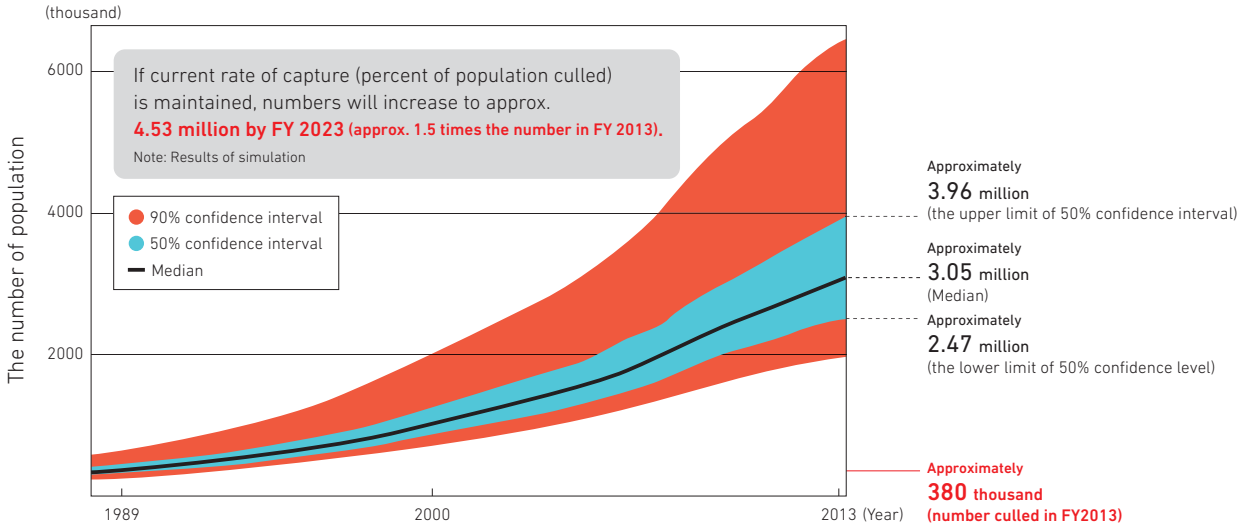


Range of distribution of sika deer

- Range of distribution in 1978
- Expanded range of distribution by 2014

Estimated Number of Deer in Japan (excluding Hokkaido*)

Furthermore, the number of sika deer on the main Japanese island of Honshu and further south is forecast to increase to 1.7 times its 2011 level by 2023.



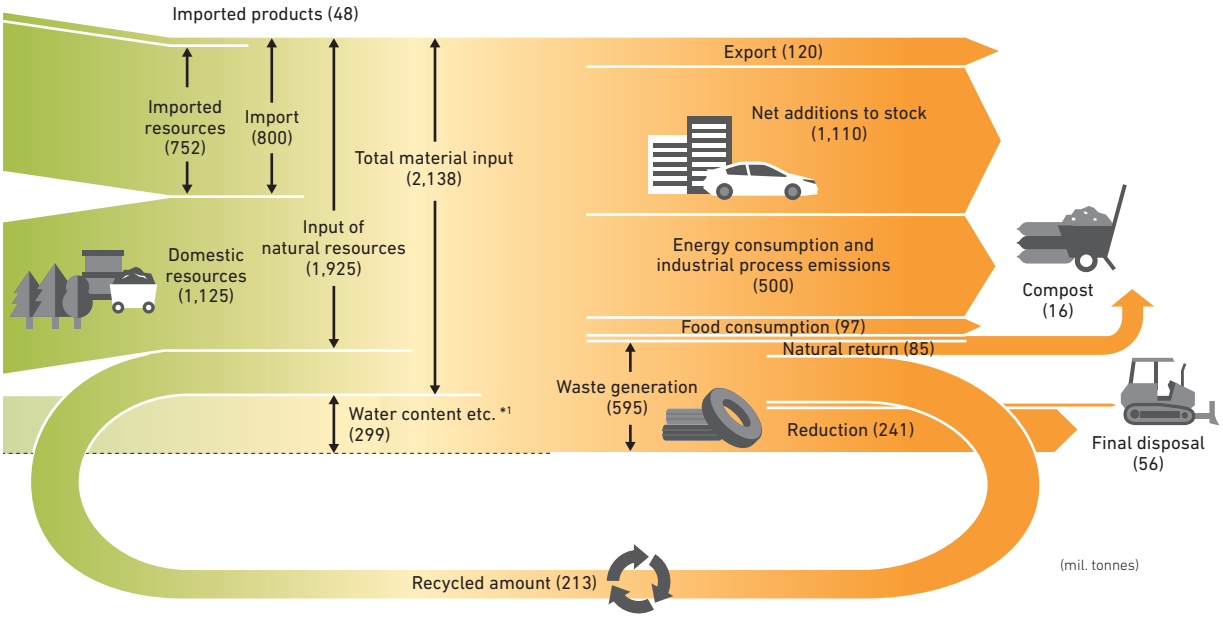
*: In FY 2013, estimated number in Hokkaido was approx. 540,000, and number culled was approx. 130,000 (Hokkaido data).

ADDITIONAL MATERIALS FROM THE 2016 ANNUAL REPORT ON THE ENVIRONMENT

Material Flow in Japan

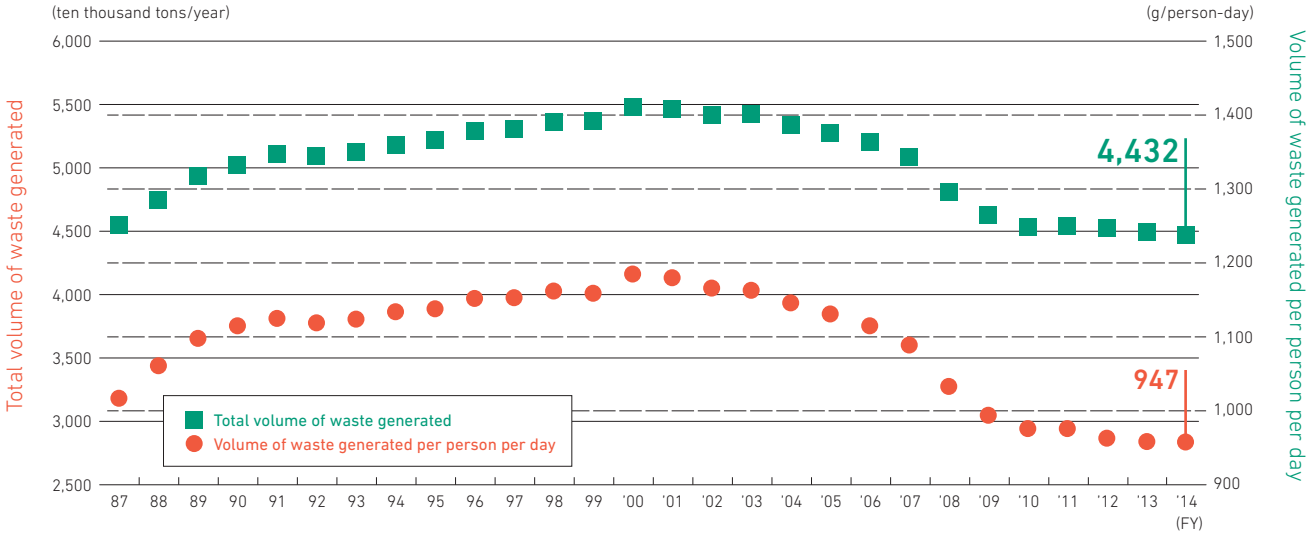
In order to establish a sound material-cycle society, it is necessary to comprehend material flows (or substance flows) to understand the extent of material extraction, consumption, and disposal in Japan. Japan uses material flows to determine targets for the three indicators of resource productivity, cyclical use rate, and final disposal amount.

FY2000 (for reference)



Total Volume of Waste Generation and Waste Volume Per Person Per Day

Total generated waste and waste generated per person per day are declining year by year.



Note 1: In the figures for FY 2005 onwards, total generated waste is considered the same as the total volume of municipal solid waste, defined as "volume of waste collected by local governments + waste directly brought into waste treatment facilities + group collection of recyclable waste" in the Basic Guidelines for the Comprehensive and Systematic Promotion of Waste Reduction Measures and Other Appropriate Treatments, developed based on the Waste Disposal and Public Cleansing Act.

Note 2: Waste generated per person per day calculated by dividing total generated waste by total population x 365 days, or 366 days.

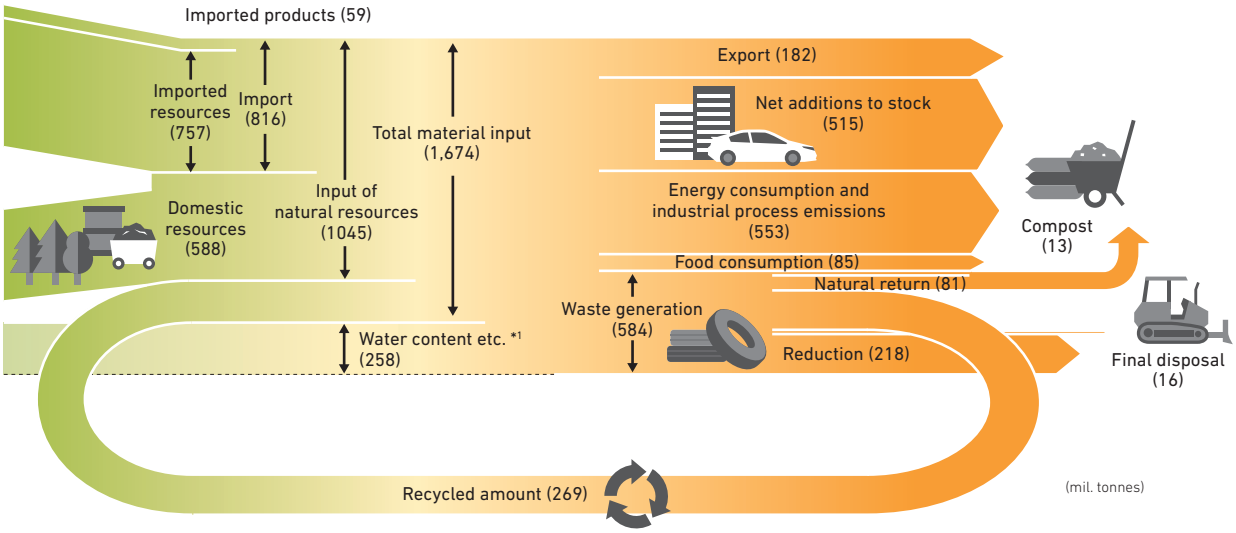
Note 3: From FY 2012 onwards, total population includes population of non-Japanese residents.

Sound material-cycle society

Additional materials provide more information about current efforts to form a sound material-cycle society.

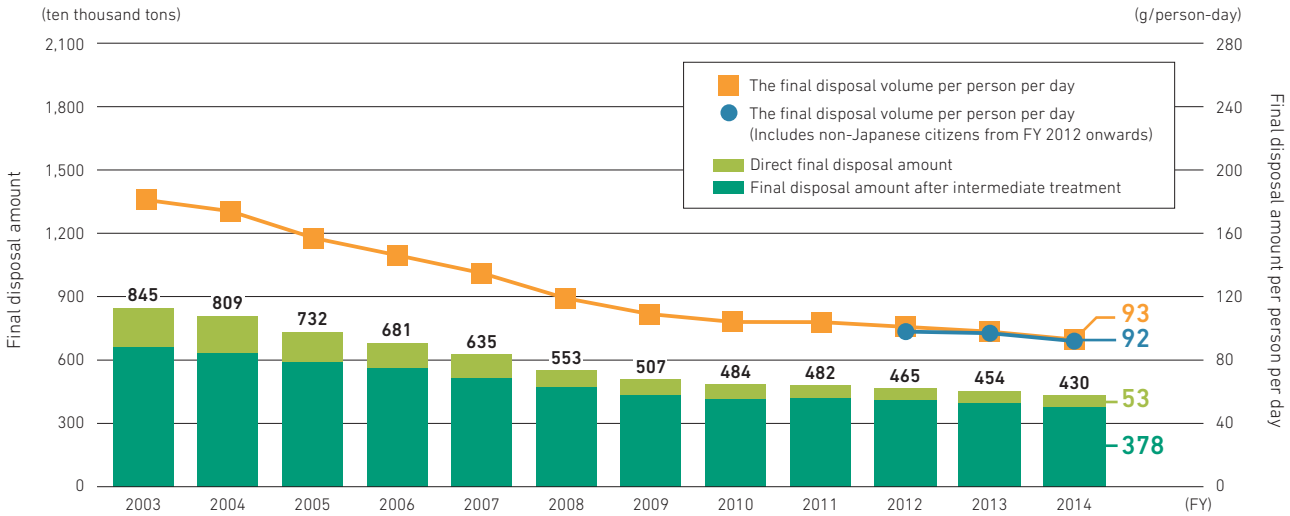
*1 Water content: water contents of wastes (sludge, livestock waste, night soil, waste acid, waste alkali) and sediments dumped in association with the process of economic activities (sludge in mining, construction and in waterworks as well as slag)

FY2013



Final Disposal Amount and Final Disposal Amount Per Person

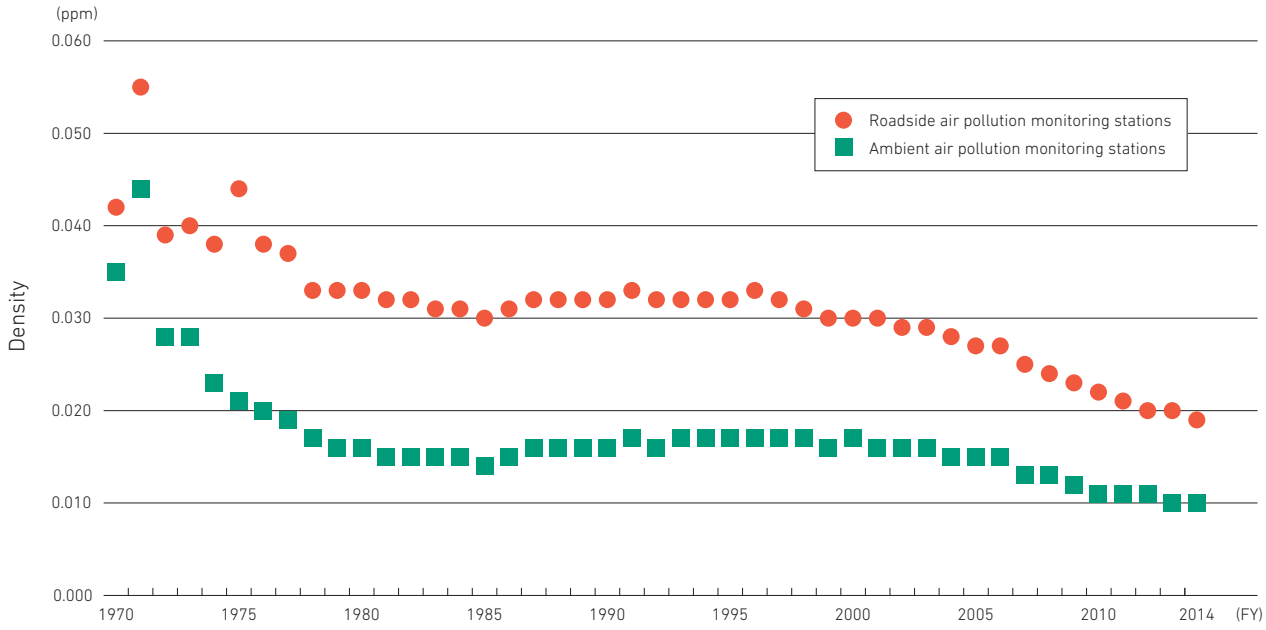
Final disposal amount of waste and final disposal amount per person per day are trending downwards.



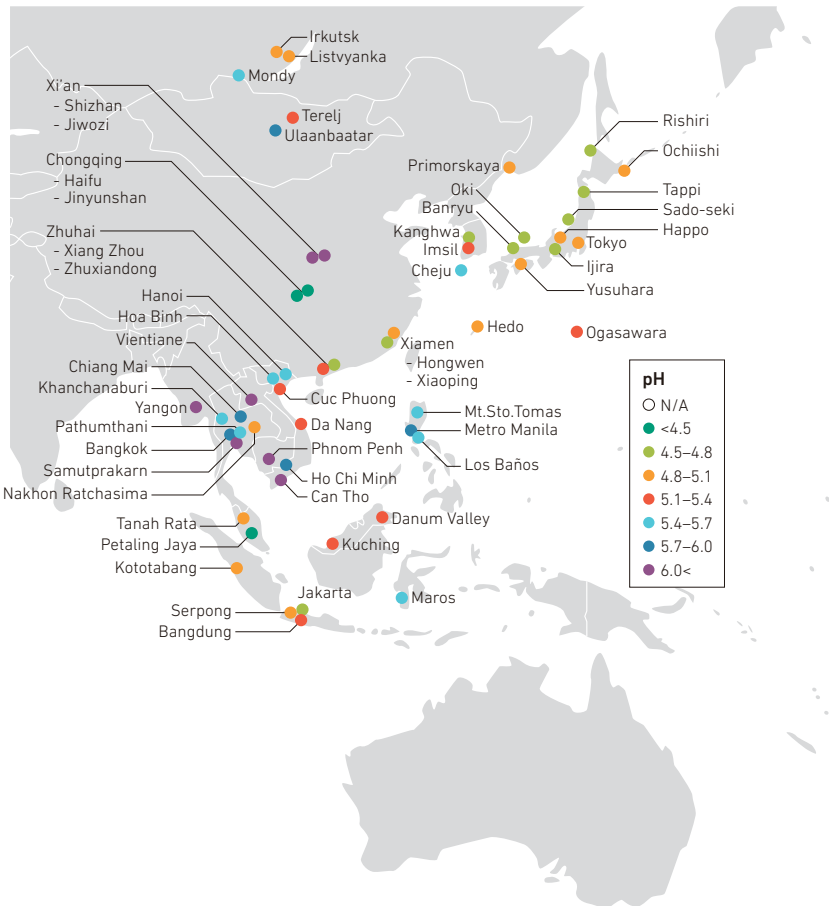
ADDITIONAL MATERIALS FROM THE 2016 ANNUAL REPORT ON THE ENVIRONMENT

Annual Average Density of NO_2 (from FY1970 to FY2014)

A gradual fall in mean nitrogen dioxide levels can be seen recently at both ambient air pollution monitoring stations and roadside air pollution monitoring stations.



Source: "Air Pollutions in FY2014 (for press release)" by Ministry of the Environment



pH in Precipitation in EANET Region

(Average pH 2011 - 2014)

The Acid Deposition Monitoring Network in East Asia (EANET) was established through a Japanese initiative with the aim of establishing a regional cooperative framework regarding acid rain, and of making clear the state of the acid deposition issue and its impact in the East Asian region. Currently thirteen East Asia nations participate, collecting reliable data through acid deposition monitoring using the same methodology. The network will expand its range of operations to include PM2.5 and ozone monitoring.

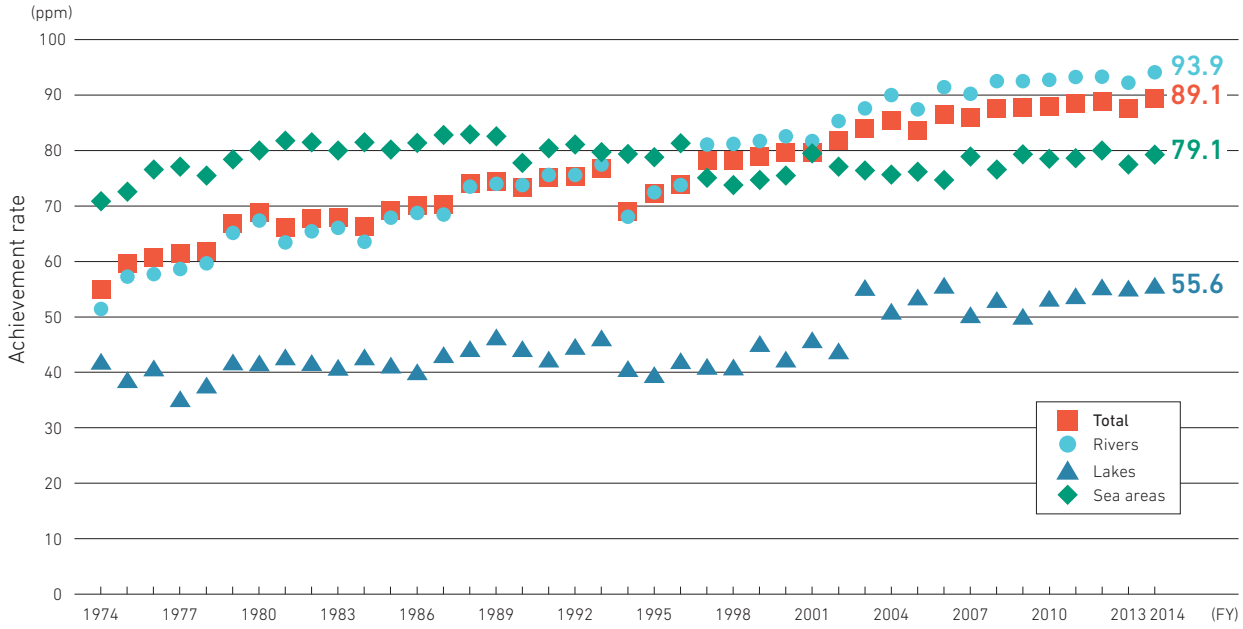
Source: EANET "Data Report on the Acid Deposition in the East Asian Region 2013"

Atmospheric and water environments

Additional materials provide more information about atmospheric and water environments.

Achievement of Environmental Standards (BOD or COD)

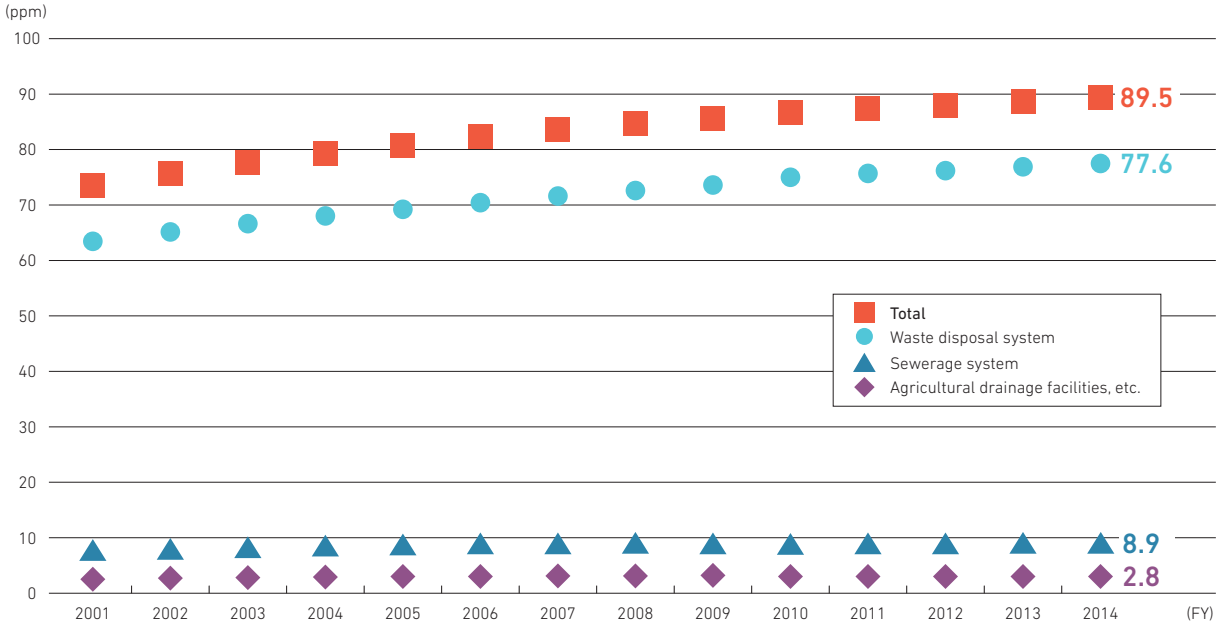
An overall level of 89.1% has been achieved for the biochemical oxygen demand (BOD) and chemical oxygen demand (COD) environmental standards relating to the maintenance of living environments. BOD and COD are leading indicators of water quality in respect of organic pollution.



Source: "Measurement Results of Water Quality in Public Waters FY 2014" Ministry of the Environment

Coverage of Population Served by Waste Disposal System

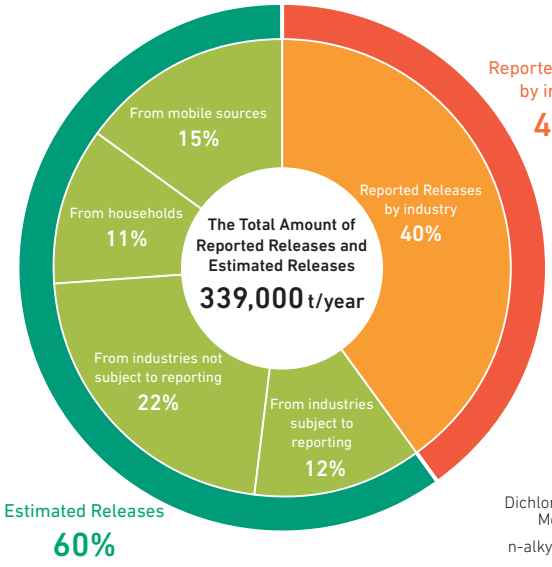
The population coverage of wastewater treatment systems in Japan is 89.5%. Wastewater treatment facilities are being installed to cover the population not yet served by the wastewater treatment systems.



Source: press release of "Coverage rate of population served by waste disposal system (September, 2015)," Ministry of the Environment

ADDITIONAL MATERIALS FROM THE 2016 ANNUAL REPORT ON THE ENVIRONMENT

Breakdown of Reported Releases by industry and Estimated Releases of chemical substances in FY 2014

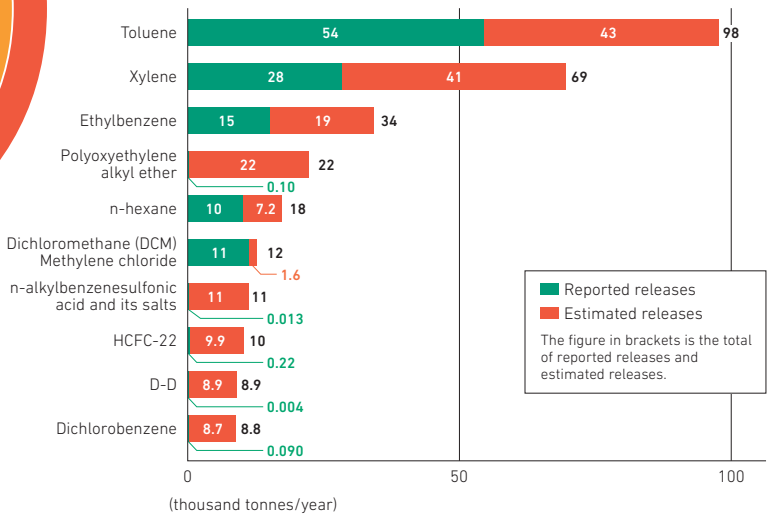


Notes: The reported releases are from the business entities categorized as subjected to reporting. Releases are estimated for businesses that do not meet the reporting requirements, such as number of employees, annual handling quantity, etc., and are exempted from reporting.

Figures in parentheses are the totals of reported and estimated releases.

Source: Ministry of Economy, Trade and Industry and Ministry of the Environment

Top 10 Chemicals with High-volume of Reported Releases and Estimated Releases (FY 2014)



Source: Ministry of Economy, Trade and Industry and Ministry of the Environment

In March 2016, the government compiled data reported from businesses concerned on release and transfer of chemical substances complying with the Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (PRTR Law). Releases that were not subject to reporting were estimated.

Cover: Drift Ice on Shiretoko

Shiretoko, a national park in Hokkaido, was registered as a World Heritage Site in 2005. The peninsula, untouched and abundant with wildlife, is an excellent example of the interrelationship of marine and terrestrial biodiversity thanks to rich nutrition brought by drift ice. It provides a breeding and wintering area for endangered species such as marine mammals and raptors. Global warming may decrease drift ice in Hokkaido, the southernmost coast that drift ice reaches in the northern hemisphere.

Shiretoko
World Heritage Site

Environmental risks of chemical substances

The following data provides information on action regarding chemical substance emissions into the environment and initiatives for children's environmental health.

The Japan Environment and Children's Study (JECS)

The Japan Environment and Children's Study (JECS), a large-scale, long-term national birth cohort study involving 100,000 mother-child pairs, was launched in January 2010. The Sub-cohort study, which includes home visits for environmental measurements, medical examinations and children's bio-specimen collection, began in November 2015, involving 5,000 participants selected from the Main Study.

JECS is a large-scale, long-term prospective cohort study to examine the impact of the exposure to chemical substances during pregnancy and childhood on children's health.

Background

The effects of chemical substances in the environment on children's health have not been well documented. That leads to growing concern among parents. ▶ Large-scale epidemiological studies are warranted in order to identify these effects.

Study protocols

Recruitment (3 years)

FY 2010: Establishment of national and regional organizations and formulation of research protocols
January 2011: Start of recruitment period (100,000 pregnant women)
March 2014: Completion of the recruitment

Follow-up period (13 years)

Pregnancy	- Questionnaire - Collection of maternal blood, urine, and hair samples as well as paternal blood samples
At birth	- Health check of the babies - Collection of cord blood samples
One month old	- Physician's examination and questionnaire - Collection of breast milk and babies' hair samples
Until 13th birthday	- Physician's examination and questionnaire - Collection of children's bio-specimens

Chemical analysis on bio-specimens
Long-term storage of bio-specimens
▼
Multivariate analysis of the environmental factors on children's health including hereditary, lifestyle, and social factors
▼
Identification of the impact of environmental factors on children's health

Follow-up completes in 2027 / Study concludes in 2032

Organization

Ministry of the Environment (MOE)
Considers environmental policies incorporating results of the study, and conducts coordination with other ministries as well as on an international level.

Programme Office
(National Institute for Environmental Studies)
Leads the study, manages the collected data and bio-specimens, and conducts exposure analysis

Medical Support Center
(National Centre for Child Health and Development)
Provides medical expertise

Regional Centers
(15 universities and institutes)
Recruit participants and conduct follow-up study (in cooperation with local health care providers)

Accreditation from the MOE (April 2011)
[1] Hokkaido [2] Miygai [3] Fukushima [4] Chiba [5] Kanagawa [6] Koushin [7] Toyama [8] Aichi [9] Kyoto [10] Osaka [11] Hyogo [12] Tottori [13] Kochi [14] Fukuoka [15] South-Kyushu / Okinawa

Expected outcomes

- Policy development to provide parents with the safe and secure child-raising environment
- Development of better strategies for chemical risk assessment and management that considers children's vulnerability

Annual Report on the Environment,
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