

# Chapter 8 Creating and Preserving a Beautiful and Healthy Environment

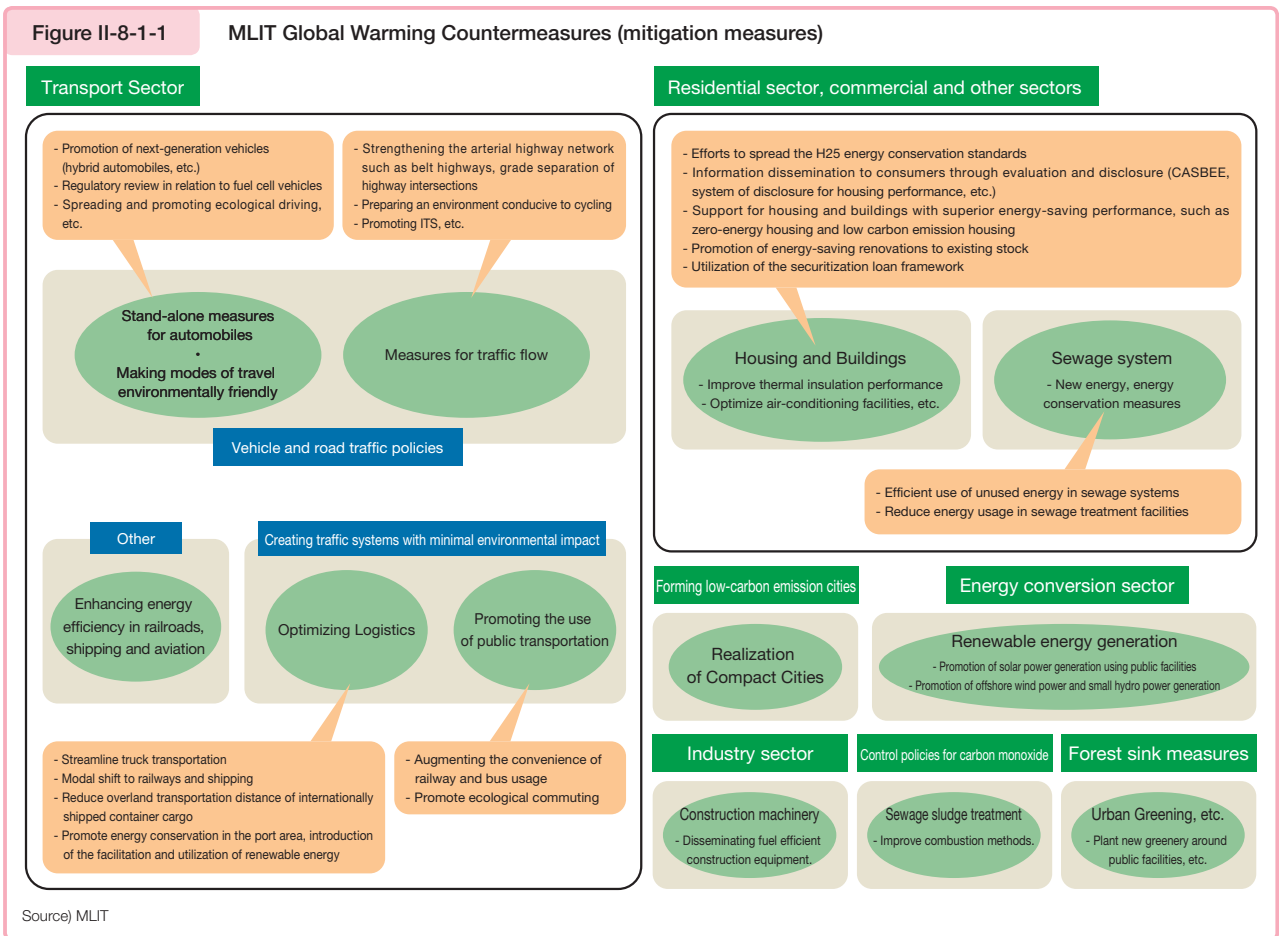
## Section 1 Promoting Global Warming Countermeasures

### 1 Implementing Global Warming Countermeasures

At the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate, change (COP21) which was held in Paris, France, in December 2015, the Paris Agreement was adopted as a new international framework for reducing greenhouse gas emissions to replace the Kyoto Protocol.

Based on the Paris Agreement, Japan was called upon to formulate “the Plan for Global warming Counter measures” by the spring of 2016. In response, the MLIT studied global-warming countermeasures (mitigation measures) to be incorporated into a new plan according to discussions held by the Council for Infrastructure Environment Committee and the Council for Transport Policy Transport System Subcommittee ; Environment Committee.

Even if mitigation measures were to be implemented to the maximum extent possible, it is widely believed that the impact of climate change cannot be completely avoided. As the importance of implementing adaptation measures to prepare for the negative impact of climate change has been indicated, we will promote adaptation measures to the utmost in addition to adopting energy-conservation measures and ushering in an era of renewable energy.



Source) MLIT

## 2 Promoting Global Warming Countermeasures (Mitigation Measures)

### (1) Promoting Low-carbon City Development

In urban areas with a considerable concentration of human residents and buildings, low-carbon urban development plans produced by municipalities according to “The Low- Carbon City Act”, which came into force from the standpoint of the desire to advance “low-carbon urban development” in accordance with the consolidation of urban functions, the promotion of the use of public transit in connection with this consolidation, and the promotion of green conservation and greening initiatives, came to be formulated by twenty-two cities by the end of fiscal year 2015. “Low-carbon urban development” will continue to be promoted for initiatives under these plans through statutory special measures, taxation systems, fiscal measures, and other means.

### (2) Promoting the Development, Distribution and Optimal Utilization of Environment-friendly Vehicles

#### a. Improving Mileage of Vehicles

Based on the Law Concerning Rational Use of Energy (Energy Saving Act), we are formulating fuel economy standards and disclosing fuel consumption for automobiles. We established the Automobile Fuel Economy Standards Subcommittee (a subordinate committee operating under the Council of Transport Policy) and have summarized the results of discussions pertaining to the introduction of the Worldwide Harmonized Light vehicles Test Procedures (WLTP).

Furthermore, the average fuel efficiency rate of gasoline passenger vehicles released in FY 2014 was approximately 4% higher compared to FY 2013, and we will continue in the efforts to further improve fuel efficiency.

#### b. Framework for promoting improvements in fuel efficiency

A program for evaluating and publicizing performance in terms of the fuel efficiency of automobiles is being run to make it easier for consumers to identify and select vehicles that offer exceptional performance in terms of fuel efficiency. Stickers are affixed to vehicles to enable fuel performance in terms of fuel efficiency to be outwardly discerned by consumers.

#### c. Promoting the dissemination of environment-friendly vehicles

After reviewing conditions for receiving eco-car tax reductions (vehicle weight tax and automobile acquisition tax) for an automobile offering excellent environmental performance (eco car) under the FY 2015 taxation system revisions, we implemented measures for obtaining preferential treatment in connection with the tax system by extending these tax reductions by two years and establishing a greening exemption tied to the light motor vehicle tax to go along with an exemption tied to the vehicle tax.

We are promoting urban development based on the use of environmental vehicles by providing subsidies for the acquisition of fuel-cell vehicles, electric vehicles, and micro-mobility vehicles from the standpoint of promoting global warming countermeasures. In addition, subsidies are being granted to truck and bus business operators for the acquisition of CNG automobiles <sup>Note</sup>, hybrid vehicles, and advanced environmental diesel trucks.

#### d. Development, application, and creating a usage environment for next generation heavy vehicles

Since FY 2015, we have been pursuing scientific research to promote the development and commercialization of technologies relating to high-efficiency next-generation diesel engines and next-generation large-sized vehicles known as large-sized liquefied natural gas automobiles from the standpoint of reducing carbon footprints and emissions.

**Note** Compressed Natural Gas Vehicles (Natural Gas Automobiles)

#### e. Promoting and disseminating ecological driving

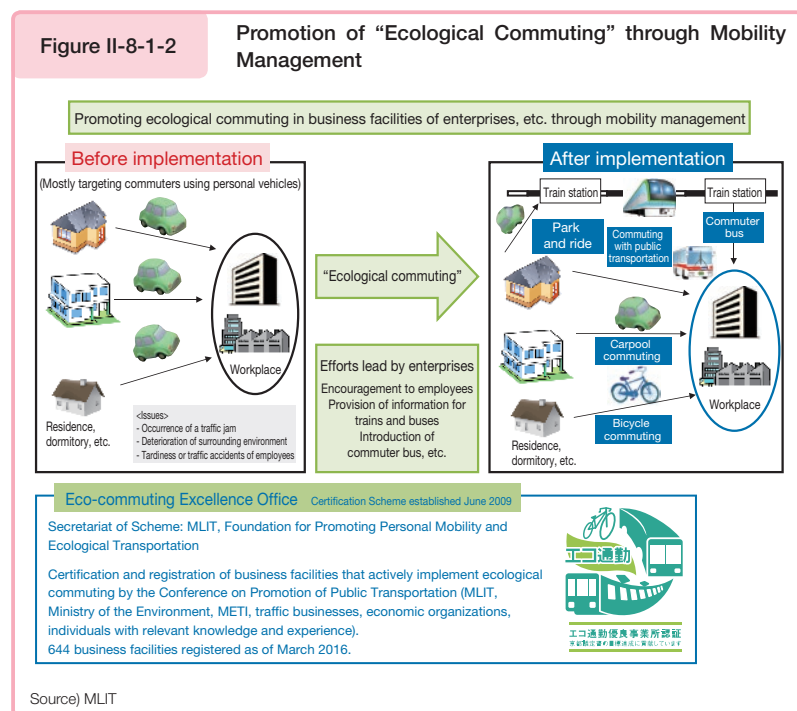
MLIT has promoted holding symposiums and events all over the country in cooperation with the relevant ministries and agencies of the government and the District Transport Bureaus. We also worked on promoting and spreading ecological driving based on the “10 Reasons for Driving Ecologically”. Furthermore, in order to promote and disseminate ecological driving by the Automobile Carrier businesses, MLIT supports the introduction of the Ecological-driving Management System (EMS) <sup>Note 1</sup>.

#### (3) Promotion of traffic flow improvement

Various traffic flow measures are being tried, since improving the driving speed by smoothing the traffic flow will improve the actual as mileage rate and decrease the carbon dioxide emissions from automobiles. Specifically, we are developing ring roads and other arterial road networks that are effective in reducing through-traffic in the urban center by providing them with alternate routes, working on grade separation of intersections and promoting serial railroad grade-separation projects to eliminate unopened grade crossings. In order to realize smooth, safe transportation services, we are also promoting initiatives for enabling roads to be used smartly, such as by contributing to the optimal use of existing networks through the use of ETC 2.0, a program for which full-scale adoption efforts have begun. We also work on providing improved road space for cyclists. In order to reduce carbon footprint, LED road lights are being introduced.

#### (4) Promoting the use of public transportation

The shift from private vehicles to public transportation reduces travel with vehicles and is a necessary facet of global warming countermeasures. For this reason, we are helping to promote the introduction of public transit IC cards and other computerization initiatives, make public transportation more convenient through the introduction of an LRT/BRT system and improvements to transfers and popularize ecological commuting at the business establishment-level through a scheme to certify offices for excellence in eco-commuting. Furthermore, information analysis and validation results of past activities for the Environmentally Sustainable Transport (EST) Model Project were provided nationwide to regions working to realize EST.



#### (5) Optimizing logistics

Exceeding 50% of the total domestic transportation modes in Japan, trucks account for the majority of the share ratio (ton kilometer basis in transportation). The CO<sub>2</sub> emissions base unit <sup>Note 2</sup> of trucks is greater than that of mass transportation such as railroads and domestic shipping, and trucks account for 90% of the CO<sub>2</sub> emissions in logistics. In order to reduce CO<sub>2</sub> emissions while sustaining domestic logistics, we must strive to utilize energy efficient transportation modes such as railroads and domestic shipping in addition to improving energy efficiency and transportation efficiency of trucks. With a view to establishing an efficient system of logistics with a lower environmental impact, we are providing support for initiatives concerning joint transportation, modal shifts, efforts to promote the dissemination of large CNG trucks and

**Note 1** Plan for the implementation of planned and continuous ecological driving of motor vehicles with the integration of evaluation and guidance.

**Note 2** The amount of CO<sub>2</sub> emitted by shipping 1ton of cargo for a distance of 1km.

other environmental vehicles, a smaller carbon footprint generated by logistical sites, and a smaller carbon footprint generated by ports and harbors. We are also promoting the dissemination of equipment containing natural coolants for use in warehouses for frozen and refrigerated goods. In addition to studying a matching framework for the promotion of joint transportation, promoting the use of containers on a round-trip basis, developing low-floor freight cars to accommodate the shipping of forty-foot tall containers by rail, and providing subsidies for the acquisition of thirty-one-foot containers for railways that are equivalent in size to ten-ton trucks, we are also promoting the construction of energy-saving vessels and otherwise invigorating the coastal shipping and ferry sector. We also work to disseminate the Eco Rail Mark (161 products (199 items) and 86 cooperating enterprises certified as of the end of August 2015), and the Eco Ship Mark (94 consignors and 110 logistics businesses enterprises certified as of the end of February 2015). In ports and harbors that are a hub for maritime transportation and overland transportation, we are endeavoring to reduce overland transportation distances for cargo by promoting the development of international maritime container terminals, development of international logistics terminals, and development of domestic logistics sites compatible with combined multimodal transportation. In ports and harbors, we are also engaged in efforts to support the introduction of energy-saving systems, promote modal shifts and transportation streamlining based on the use of marine transportation for reverse logistics facilitate the introduction and promote the use of recyclable energy, develop green tracts to contribute to CO<sub>2</sub> absorption, and create seaweed beds and other such ecosystems.

In addition, in cooperation with the relevant ministries and related organizations, we hold the Green Logistics Partnership Conference to give awards to the excellent operations through the collaboration of logistics operators and shipping companies and to raise public awareness.

Figure II-8-1-3

### Promotion of Activities through the Green Logistics Partnership Conference



#### Green Logistics Partnership Conference (Manager: Takehiko Sugiyama, Vice-Director General of the Institution for Transport Policy Studies and Director-General of the Institute for Transport Policy Studies)

- This conference was launched as a conference for promoting awareness of the importance of green logistics and stimulating interactions among cargo owners, logistics companies, and other concerned parties in order to advance CO<sub>2</sub> reductions in the logistics sector. Since FY 2015, this conference has been promoting not just initiatives to reduce amounts of CO<sub>2</sub> emissions but also initiatives to reduce other burdens on the environment, improve the productivity of logistics, and otherwise contribute to the establishment of sustainable systems of logistics.
- Organized by: Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Economy, Trade and Industry; Japan Federation of Freight Industries, Japan Institute of Logistics Systems  
Supported by: Japan Federation of Economic Organizations
- Established: April 2005
- Membership: 3,353 members (as of February 17, 2016) --- Logistics Companies, Cargo Owners, each of the industry associations, think tanks, research institutes
- Introduction and commendation of excellent businesses as well as holding discussions regarding Green Logistics aimed towards the expansion of voluntary efforts in the private sector aimed at reducing CO<sub>2</sub> emissions.

#### Summary of the awarded enterprises

[Purpose] To encourage enterprises to autonomously engage in initiatives and promote the dissemination and growth of the concept of green logistics by recognizing meritorious achievements in connection with initiatives carried out to successfully reduce burdens on the environment in the logistics sector, improve the productivity of logistics, or otherwise establish a sustainable system of logistics.

[Types of Awards] Ministers Award, Director-Generals Award, and a Special Award have been created.

Ministers Award --- Award from Minister of Land, Infrastructure, Transport and Tourism Award; Award from Ministry of Economy, Trade and Industry

Director-Generals Award --- Award from Ministry of Logistics Deputy from the Ministry of Land, Infrastructure, Transport and Tourism Secretariat; Award from Ministry of Commerce and

Distribution Safety Deputy from the Ministry of Economy, Trade and Industry Secretariat

Special Award --- Award on the level of the Ministers Award and the Director-General Awards for particularly superior initiatives (created in 2013)

#### Example of a case awarded by the Ministry of Land, Infrastructure, Transport and Tourism (In 2014)

##### ◆ Award from Minister of MLIT

Initiative Name: Endeavoring to promote comprehensive green logistics accompanying a modal shift; aiming to standardize palletizing operations and establish a diversity-oriented logistics network in anticipation of a driver shortage.

Companies: Kobe Modal Shift Promotion Council, Nestle Japan, Ltd., Zenkoku Tsu-un Co., Ltd., and Japan Freight Railway Company

##### ◆ Award from Ministry of Logistics Deputy of the Ministry of Land, Infrastructure, Transport and Tourism Minister's Secretariat

(i) Initiative Name: Reducing burdens on the environment by way of the efficient operations of transportation businesses and reduced amounts of CO<sub>2</sub> generated by these businesses through greater collaboration in the area of trunk-line shipping, the shared use of facilities, the joint administration of collection and delivery work, and the sharing of IT systems.

Companies: Tonami Transportation Co., Ltd., Daiichi Freight System, Inc., Kurume-Trans Co., Ltd.

(ii) Initiative Name: Supporting initiatives to reduce burdens on the environment through operations of Yamaya Shoryu's distilled spirits center and next-generation modal shift.

Companies: Yamaya Shoryu Corporation, Senko Co., Ltd., Japan Freight Railway Company, Kokura Transportation Co., Ltd., Sendai Express Co., Ltd., SBS Logicom Co., Ltd., Japan Oil Transportation Co., Ltd.

##### ◆ Special Award from Green Logistics Partnership Conference

Initiative Name: Project to implement measures to deal with shortages of long-haul drivers and reduce amounts of CO<sub>2</sub> emission through the use of marine and rail modes of transportation.

Companies: Nippon Express Co., Ltd., Fujifilm Logistics Co., Ltd., MOL Ferry Co., Ltd., Japan Freight Railway Company



Award granted by the Minister of Land, Infrastructure, Transport and Tourism: standardization of palletizing operations



Award granted by the Minister of Land, Infrastructure, Transport and Tourism

(Source) MLIT

## (6) Promoting low carbonization of railways, ships, and aviation

### a. Initiatives contributing to further enhance environmental performance in the railway sector

While rail has a smaller environmental impact than other modes of transportation, we are promoting the adoption of railroad-related facilities tied to the Ministry of the Environment and systems that help railway carriages generate a smaller carbon footprint and save energy and promoting the development of technologies to help improve environmental

performance in order to further reduce the impact that rail has on the environment.

#### b. Initiatives for energy conservation and low carbonization in shipping

We are promoting energy conservation for ships in the area of coastal shipping by advancing the construction of vessels that contribute to energy conservation and supporting the demonstration of innovative energy-saving technologies. From the standpoint of advancing the development of an international framework and disseminating and promoting the development of technologies on an integrated basis in the area of international shipping, we have been supporting the private-sector development of technologies for the purpose of further reducing CO<sub>2</sub> emissions from vessels since FY 2013 and spearheading IMO discussions on progressively fortifying regulations governing CO<sub>2</sub> emissions (fuel-efficiency regulations) and on creating an international framework that includes a program for reporting fuel efficiency (by which fuel efficiency during actual operations can be visualized).

#### c. Initiatives to reduce CO<sub>2</sub> emissions in aviation

We are advancing the implementation of area navigation (RNAV), which enables shortening flight time and distance and the User Preferred Route (UPR) method, which allows the flight to have the most efficient altitude desired by the pilot, as well as enhancing aerial traffic systems by implementing the Continuous Descent Operation (CDO) which sustains minimal engine output by continuously descending without leveling out at any point during descent. We also promote the use of ground power units (GPU) for airplanes and ecological cars such as Ground Service Equipment (GSE) vehicles as a part of Eco Airport (eco friendly airport) activities. Furthermore, we are strengthening international initiatives, such as participating in the Asia and Pacific Initiative to Reduce Emissions (ASPIRE) where air traffic control authorities and airline companies cooperate to attain efficiency in flying. We are also leading the discussion to develop a global scheme to reduce CO<sub>2</sub> emissions from international aviation. Furthermore, the efforts to promote the use of alternative aviation fuels are being conducted, collaborating with the various stakeholders.

### (7) Enhancing energy-saving capabilities in housing and buildings

The rise in the amount of energy consumed by the civilian sector is more prominent than in other sectors, which makes improving energy-saving capabilities in housing and buildings an urgent task.

In response to the fact that the basic energy plan will progressively mandate that new dwellings and buildings comply with energy-saving standards by 2020, the Act for Improving the Energy-Consumption Performance of Buildings (Building Energy-Saving Act), which sets forth measures for mandating compliance with energy-saving standards on the part of buildings above a certain size other than dwellings and measures with respect to a program for certifying buildings demonstrating excellent energy-saving performance and a program for indicating energy-saving performance, was promulgated in July 2015.

In order to communicate energy-saving performance to consumers in an easy-to-understand manner, efforts are underway to upgrade and disseminate a housing-performance indication system, CASBEE, the Building Energy-efficiency Labeling System (BELS), and other such programs.

Aside from this, in order to promote energy saving/decreasing CO<sub>2</sub> emissions for housing and buildings, MLIT is supporting various efforts, such as businesses that award points—which can be exchanged with various merchandise—for building new eco-housing or doing eco-reforms, the introducing of cutting-edge CO<sub>2</sub> emissions decreasing technology and energy conserving renovation, as well as efforts by small and medium-sized contractors in building zero energy housing and certified low-carbon housing and buildings, while also lowering the interest rate by using the Japan Housing Finance Agency's securitization support business framework. In addition, it is working for the development and dissemination of things like the design and construction technology of energy-saving houses and buildings through holding workshops for design and construction professionals and providing support for the technological development of the leading private firms.

Furthermore, in order to stimulate energy-saving measures in pre-existing establishments, we are formulating supportive taxation measures for renovation work towards energy conservation in already existing residences and buildings.

### (8) Promotion of energy-saving methods in sewage

The reduction of carbon monoxide is being advanced by the implementation of energy-saving measures such as high



efficiency equipment for sewage treatment, and with new energy measures such as the processing of raw sewage into solid fuel, and the high temperature incineration of raw sewage.

#### (9) Promotion of environmental measures for construction machinery

MLIT is implementing a system that gives type approval for construction machinery, such as hydraulic shovels and bulldozers, that meet the fuel consumption standards for major construction machinery. In addition, we support the purchasing of construction machinery that has been certified by said system by things such as low-interest financing plans.

#### (10) Implementation of CO<sub>2</sub> sink measures through urban greening

Urban greening is considered re-vegetation activities, which is subject to the greenhouse gas sink reports according to the Kyoto Protocol. Based on the basic plans for greening as formulated by the municipalities, we are promoting maintenance of city parks and the greening of communal facilities and private land, such as roads and ports.

MLIT is also working on public awareness regarding the meaning and effect of CO<sub>2</sub> sink measures by making cities more low carbon and green by alleviating the heat island phenomenon through improvement in the thermal environment by things like improving ground covering.

### 3 Promotion of the Use of Renewable Energy

According to the “Energy Master Plan” which was approved by the Cabinet in April 2014 and based on the fact that that the introduction of re-usable energy is being expedited as much as possible for three years starting in 2013, MLIT is promoting use of the re-usable energy potential in extensive infrastructure spaces like airport facilities, as well as rivers and streams, and the stable yet abundant sewage biomass.

#### (1) Promotion of the use of marine renewable energy

Surrounded by the sea on all sides, Japan is blessed with abundant sources of marine renewable energy. Offshore wind-power generation is especially expected to grow and expand in the future and ports and harbors in particular are garnering attention as sites for the installation of wind-power generation facilities.

To this end, the Port and Harbor Bureau released a manual outlining the installation process in June 2012 and draft technical guidelines that can be technical determination standards to be applied when conducting screening for the granting of permission for the proprietary use of a water area in March 2015. In FY 2015, efforts were undertaken to create a system for determining, through public participation, parties able to apply for the proprietary use of areas corresponding to ports and harbors with a view to promoting the smooth installation of offshore wind-power generation facilities in ports and harbors. Operational guidelines have also been formulated along these lines.

For marine energy such as wave and tidal power, MLIT is working on guidelines to secure the safety/environmental aspects of floating power generating facilities and promoting the realization of new re-useable marine energy in cooperation with the concerned government ministries.

#### (2) Promoting small hydroelectric generation

As initiatives toward a low carbon society, the implementation of small hydroelectric generation by using rivers is being pushed forward. Specifically, MLIT is working on the thorough use of unused energy by the promotion of subsidiary power generating based on a registration system, providing project formation support by field contact points, and support for the introduction of small-scale hydropower facilities at sediment control dams, as well as the proactive introduction of power generation facilities for dam management at dams directly controlled by MLIT.

#### (3) Promotion of the use of Sewage Biomass

The MLIT is promoting the use of energy derived from sewage sludge and the use of sewage heat.

In May 2015, the Sewerage Act was amended, thereby allowing heat exchangers to be attached to sewage conduits by private businesses and mandating efforts to be undertaken by sewage administrators to reutilize sewage sludge as a source of energy or fertilizer. Through the use of PPP/PFI, we will promote the energy utilization of sewage sludge by the use of

bio-gas and solid fuel, as well as the use of sewage heat as renewable energy heat.

## Column

### Hydrogen production from sewage sludge, which can power cars!

The Sewerage Law amended in May, 2015, incorporates the obligation of public sewerage system administrators to make efforts to utilize sewage sludge as energy. The utilization of sewage sludge energy includes biogas power generation, solid fuel production, etc., but in recent years, the hydrogen production from sewage sludge has attracted attention.

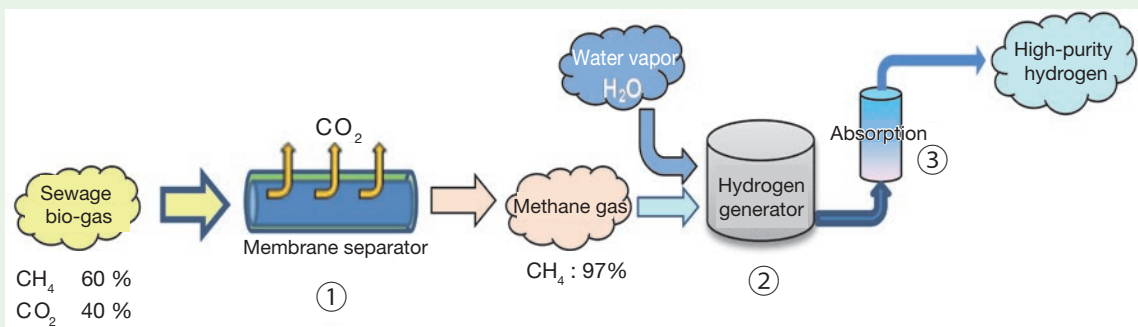
The sewage sludge-derived hydrogen has various merits in multiple aspects, such as reduction of environment loads because hydrogen production from fossil fuel emits  $\text{CO}_2$ , and contribution to local production and local consumption of energy through the use of regional resources, so people place big hopes on the hydrogen production from sewage sludge.

#### ■ Efforts to produce and utilize hydrogen from sewage sludge :

##### [Hydrogen Leader City Project - Demonstration of hydrogen generation from sewage biogas source -]

Under this project, four parties, including Mitsubishi Kakoki Kaisha, Ltd., Fukuoka-city, Kyushu University, and Toyota Tsusho Corporation, have constructed facilities at real-scale level for demonstrations and been conducting verification tests on whether hydrogen can be stably produced from sewage sludge. They have also been studying the use of  $\text{CO}_2$  generated in the process.

The project started in FY 2014, and so far, the test results have shown stable production of hydrogen.



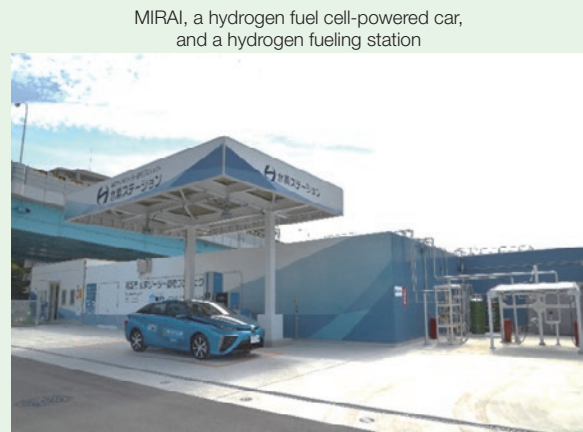
##### [Consideration of the use of hydrogen derived from sewage sludge]

In the “Review Committee on the utilization of sewerage resources in ‘Hydrogen Society’”, convened in FY 2015, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) carried out feasibility studies on the production and utilization of hydrogen from sewage sludge, while using wastewater treatment facilities of Hirosaki-city, Saitama prefecture, and Yokohama-city as models, and had discussions on issues in technical, institutional, and financial aspects, and on the solutions.

### ■ Future initiatives

The amount of biogas generated from sewage sludge in FY 2013 was approximately 330 million Nm<sup>3</sup>, but approximately 30% (89 million Nm<sup>3</sup>) was just incinerated, so the gas is not fully effectively used. If producing hydrogen from the unused biogas, the amount would be equivalent to that which can fill fuel cell vehicles 2.7 million times. Like this, the hydrogen production from sewage sludge has a great potential.

MLIT promotes efforts toward realization of supply and utilization of hydrogen from sewage sludge, one of renewable energy, through support for technology development, for project formulation by feasibility studies, and for commercialization.



Source) MLIT

MIRAI, a hydrogen fuel cell-powered car, and a hydrogen fueling station

#### (4) Promotion of Solar Power Generation using Infrastructure Space

Based on the changes in energy supply and demand triggered by the Great Eastern Japanese Earthquake, and in addition to the effective utilization of the vast spaces of sewage treatment plants, ports and harbors, and airport facilities, steps have been taken to insure the installation and placement of solar power generation facilities by public entities in public infrastructure spaces, such as government buildings and railway stations, and for private businesses that can install such facilities in roads and urban parks.

#### (5) Promotion of contribution towards the hydrogen society

With the need for hydrogen energy expected to expand in the future, such as fuel cells for residential use (introduced to the market in 2009) and fuel-cell cars (introduced to the market in 2014), MLIT is working on realizing a hydrogen energy fueled society by preparing a conducive environment for the manufacturing, storage/transportation and usage of hydrogen.

##### a. Promotion of dissemination of fuel-cell cars

To work towards the world's fastest dissemination of fuel-cell cars, MLIT will support fuel-cell car introduction projects by private businesses. MLIT will also steadily pursue the technological development of hydrogen energy, as it is important to achieve early utilization of things like fuel-cell buses and fuel-cell forklifts, as they are projected to create a relatively consistent demand for hydrogen.

##### b. Initiatives for the commercialization of vessels powered by hydrogen fuel cells

We are developing a foundation for enabling private-sector companies to participate in efforts to promote the use of hydrogen in the maritime sector, such as by conducting studies on the commercialization of hydrogen fuel cell-powered vessels with exceptional environmental capabilities and formulating safety guidelines.

##### c. Setting up the marine transportation system for liquefied hydrogen

Since FY 2015, Kawasaki Heavy Industries and other companies have been producing hydrogen through the use of brown coal, an unutilized energy source in Australia, and implementing a project to establish a supply chain for transporting liquid hydrogen to Japan in connection with a project implemented by the METI to verify the establishment of a supply chain for hydrogen derived from unutilized energy sources.

To this end, the MLIT has, in conjunction with these initiatives, spearheaded efforts to set global safety standards needed for the safe marine transportation of liquid hydrogen on a multilateral basis through the IMO (International Maritime Organization). In order to establish a safe, highly efficient method of loading and unloading liquid hydrogen, energy carriers associated with the Strategic Innovation Promotion Program (SIP) have been engaging in research and



development since FY 2014 on loading systems for liquid hydrogen in collaboration with the Cabinet Office.

## 4 Promotion of Global Warming Countermeasures (Adaptation measures)

In order to comprehensively and systematically promote initiatives that are consistently backed by the entire government in response to the various consequences of climate change, the first national plan for adaptation to the impact of climate change was adopted by Cabinet decision in November 2015.

As the role ascribed to adaptation measures put forth by the MLIT, which has jurisdiction over the maintenance of national land and other areas and which is in charge of the safe and secure development of national land and regions, is considerable, the MLIT climate change adaptation plan, which summarizes adaptation measures to be implemented by the MLIT, was formulated and publicly released on the same day as the adaptation plan put forth by the government.

While the MLIT has proactively promoted measures for dealing with river water flooding, inland water flooding, sediment-related disasters, storm surges, droughts, and other water related disasters as part of adaptation measures taken to date, adaptation measures that are comprehensive in both structural and non-structural terms shall be studied and deployed based on the formulation of the MLIT climate change adaptation plan.

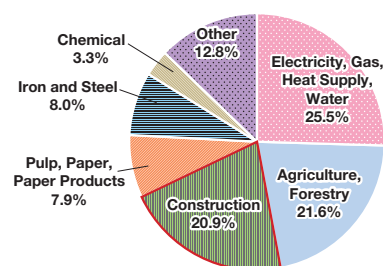
## Section 2 Promoting the creation of a recycling society

### 1 Advancing recycling in construction

Construction waste accounts for approximately 20% of all industrial waste, and 20% of final disposed amount. Suppression of the generation of construction waste, and recycling and reuse of those waste are major tasks. In FY 2012, approximately 73 million tons of construction waste was generated nationwide. The recycling/reduction rate stood at 96.0 percent, which is higher than it was for other industrial sectors. Despite such positive results, certain issues will need to be addressed at this point in time, including an increase in the amount of construction by-products generated by maintenance and renovation work required to prop up aging social infrastructure and by construction work relating to the Tokyo Olympic and Paralympic Games and an increase in the amount of construction-generated soil derived from large-scale tunneling projects.

Sewage sludge also accounts for 20% of all industrial waste, reaching approximately 77 million tons in FY 2013. We are working on recycling and reduction of sewage sludge.

Figure II-8-2-1 Amount of Industrial Waste by Industry Sector and Recycle Rate of Construction By-products



Source) Prepared by the MLIT from "Status on Production and Disposal of Industrial Waste" (FY2013 results) of the Ministry of Environment

Subject materials	Index	2005Performance	2008Performance	2012Performance
Asphalt, concrete clusters	Recycle rate (%)	98.6	98.4	99.5
Concrete clusters		98.1	97.3	99.3
Construction generated wood	Recycling and reduction rate (%)	90.7	89.4	94.4
Construction sludge		74.5	85.1	85.0
Construction mixed waste	Produced amount (ten thousand tons)	293	267 (6% decrease in comparison to 2005)	280 (5% decrease compared to 2005)
Total construction waste	Recycling and reduction rate (%)	92.2	93.7	96.0
Construction generated soil	Efficient utilization rate (%)	80.1	78.6	88.3

\*Reduction refers to reducing the amount of waste through incineration, dehydration, or other processes.

Source) MLIT "2012 Construction By-products Status Survey"

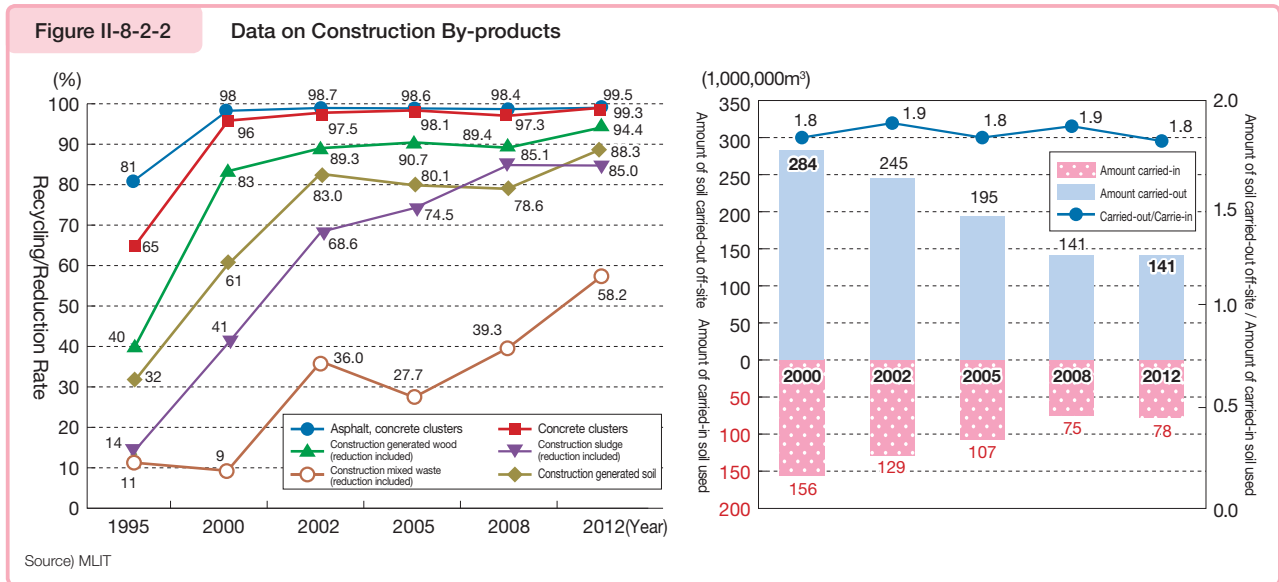
#### (1) Advancing recycling in construction

Based on the "Construction Material Recycling Act (Construction Recycling Law)", we are working to enforce proper measures through a simultaneous patrol throughout Japan.

In the "Construction Recycling Promotion Measures Subcommittee" that have been formed in both the Environment Committee of the Panel of Infrastructure Development and the Environment Committee of the Transport System Section of the Council for Transport Policy, the relevant parties involved in construction recycling put together the "Measures related to the Promotion of Construction Recycling", a recommendation to promote mid-term objectives for the recycling

and appropriate disposal of construction by-products for the future, and MLIT formulated the fourth action plan, the “2014 Construction Recycling Promotion Plan” in September 2014.

According to this plan, the MLIT will be promoting construction recycling by working on fortifying the monitoring of construction by-products distribution, inhibiting occurrence before the start of construction, promoting recycling/reduction by thorough on-site sorting and delivery to recycling facilities, promoting use of recycled materials, and promoting the efficient use and appropriate disposal of construction sludge.



## (2) Reducing sewage sludge and promoting recycling

MLIT is promoting the recycling of sewage sludge (FY 2013 recycle rate 62%) and moving forward with the use of sewage sludge made into solid fuel for energy, as well as the recovery and use of phosphorus from sewage sludge. Furthermore, we are proceeding with the Breakthrough by Dynamic Approach in Sewage High Technology Project (B-DASH Project) for proving innovative technology and systems for the effective use of sewage based resources.

## 2 Constructing a resource recycling logistics system

### (1) Forming a resource recycling logistics system by utilizing shipping

In order to form the “loop” of reusable resources for creating a recycling society, MLIT have specified 22 ports throughout Japan as Recycle Ports (Integrated Reverse Logistic Base Port) for wide-spread flows concerning reusable resources. At the Recycle Ports, they undertake activities such as securing coastal facilities like wharfs, aiding in establishing facilities for handling reusable resources, promoting the public-private partnership, and improvements in operations related to handling reusable resources. MLIT have partnered with the Ministry of the Environment to engage in efforts to promote modal shifting and lower the carbon footprint and costs of reverse logistics through improvements in transportation efficiency through the “Project to Promote Low-Carbon Type Reverse Logistics by Model Shift / Transport Efficiency”. In addition, as a participating member of “Disaster Waste Treatment Support Network (D-Waste-Net)” the Council to Promote Recycling Ports has been appointed by the Minister of the Environment.

Figure II-8-2-3 Specified Recycle Ports

## Recyclables Handling Support Facility

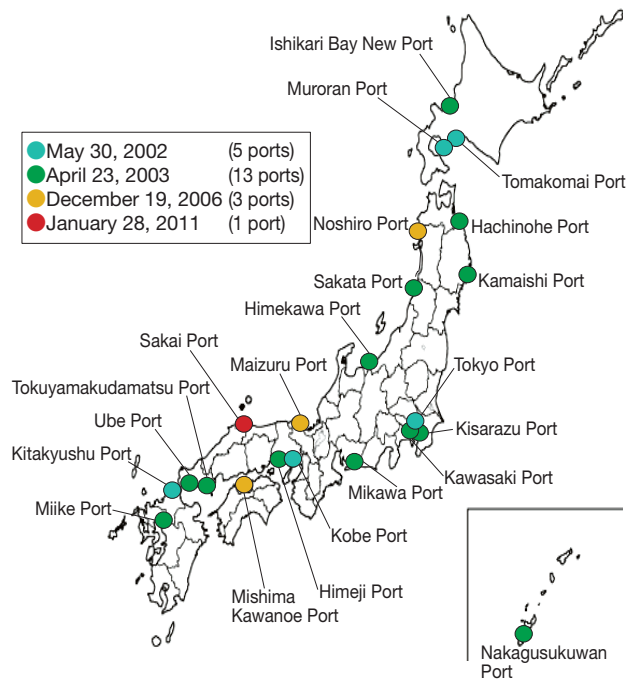


(Guard-fenced, tire-washing, and water-collecting facility)



(Storage facilities for contaminated soil, etc.)

Source) MLIT



## (2) Systematic acquirement of bay area landfill sites for waste

Bay area landfills are being prepared in order to receive dredge soil produced by harbor improvement, or to receive waste materials that have difficulty finding final landfill sites. In the Osaka Bay area in particular, regional waste disposal sites are being developed to receive waste generated around the Osaka Bay area through the Osaka Bay Phoenix Project [Note 1](#). Construction-generated soil generated in the Tokyo Metropolitan Area is transported by sea and used widely for land-reclamation purposes in ports and harbors across the country in accordance with the Super Phoenix Plan [Note 2](#).

## 3 Recycling vehicles and marine vessels

## (1) Recycling vehicles

In accordance with the Act on Recycling, etc. of End-of-Life Vehicles (Act for automobile recycling), a system for confirming that end-of-life vehicles are scrapped, is being implemented. Where a deletion of vehicle registration as provided for in the Road Transport Vehicle Act is undertaken, the vehicle weight tax that had been levied on the used vehicle will be subject to a refund program. We are endeavoring to promote the proper disposition of used vehicles and prevent illegal dumping. In FY 2014, vehicles confirmed to have been scrapped numbered 1,463,151.

**Note 1** Business to promote the orderly development of the port by properly disposing in the sea landfill the waste generated from the 2 cities, 4 prefectures and 168 municipalities of the Kinki region.

**Note 2** A Mechanism for adjusting at the national level, the soil from construction in metropolitan areas to use it effectively as resources for port construction in ports that need landfill materials.

## (2) Recycling marine vessels

The recycling of large vessels (ship recycle) <sup>Note 1</sup> has generally been conducted in developing nations such as Bangladesh and India, where the frequent occurrence of human casualty accidents and marine pollution in the facilities continue to raise concern. In order to solve these issues, Japan lead discussions with the International Maritime Organization (IMO), which resulted in the adoption of the “2009 Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (tentative name) (Ship Recycling Convention)”. This convention mandates the inspection and retention of proof documents for marine vessels and ship recycling facilities respectively, and also bans the use of asbestos or polychlorinated biphenyl (PCB) in newly built vessels.

In Japan, studies are being carried out on enacting domestic laws required for conclusion of the Ship Recycling Convention with the aim of enforcing this convention as soon as possible. Conclusion by key recycling countries is also needed to put this convention into effect. At meetings held in 2014 and 2015 between Prime Minister Abe, representing Japan, and Prime Minister Modi, representing India—which is the world’s largest recycling country, requests were made for Japanese support concerning improvements to be made to ship recycling facilities based in India. The MLIT has extended technical support for making improvements to facilities in India and is promoting cooperation for concluding the Ship Recycling Convention. Through initiatives attributed to public-private cooperation in both countries, improvements are being made to certain facilities. In 2015, the facilities of four companies were certified as conforming to the standards as provided for in the Convention by a third-party organization (Nippon Kaiji Kyokai).

On other fronts, because privately owned pleasure boats are mostly made of fiber reinforced plastic (FRP), which is difficult to dispose, there has been a demand for a waste processing route for proper disposal. In response, we undertook activities in building a processing route, as well as developing recycling technologies for FRP boats. As a result, approximately 450 FRP vessels are properly recycled yearly under the leadership of the Japan Marine Industry Association throughout Japan since 2005.

## 4 Efforts in Green Procurement <sup>Note 2</sup>

In light of partial revisions to the basic government policies, based on the “Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Law on Promoting Green Purchasing)”, the “Policy for promoting the procurement of ecologically friendly goods, etc.” was adopted. Based on this policy, we are actively advancing the procurement of ecology-friendly goods for building materials, construction machinery, method of construction, and objectives in public construction work.

**Note 1** Vessels that have reached the end of their operational use are dismantled, and the majority of the parts are re-used as steel.

**Note 2** Procuring eco-friendly goods that are defined under Article 2 in the “Green Purchasing Law” is called Green Procurement here.

## 5 Promoting the use of wooden building materials

Because wood is an environment-friendly building material due to reasons such as requiring less energy to process in comparison to other materials, and long-term utilization in various applications contributing to preventing global warming and forming a recycling-oriented society, we strive to encourage the utilization of wooden materials in public construction.

Based on the “Act for Promotion of Use of Wood in Public Buildings”, etc., national implementation status of wood usage promotion is published every year, and the “Plan for the promotion of the use of wood in public buildings” was formulated to work on the use of wood as building materials and for the interior of buildings. MLIT is working to set up technical standards relating to designing and building, and to disseminate these standards.

In order to advance the development of wooden dwellings and buildings, various initiatives are being undertaken, such as by providing support for the development of long-life quality wooden housing and certified low-carbon housing made using local materials, zero energy houses, certified low-carbon buildings and other quality wooden buildings, and large wooden buildings incorporating pioneering design and construction technologies; developing local programs for the production of wooden housing; and training leaders.

Figure II-8-2-4

Examples of the Use of Wooden Building Material  
Conference room, Hiratsuka Government Office Building



Source) MLIT

## Section 3 National land development that revives and preserves the natural environment

### 1 Initiatives for preserving biodiversity

As efforts towards the Strategic Plan 2011 to 2020 (objective for the Aichi prefecture), adopted at the COP10 held in Nagoya city, Aichi prefecture in October of 2010, we are currently advancing activities for its achievement. Furthermore, the “National Biodiversity Strategy 2012 to 2020” was formulated in September of 2012, and we have decided to continue the advancement in activities for preserving, reviving, and creating animal habitats in rivers, urban green lands, coastal regions, harbors, and roads.

In October 2011, as reference material for municipalities formulating a basic plan for greening, the “Items for Technical Consideration in Securing Biodiversity in the Basic Plan for Greening”, which summarizes the items that need to be considered in securing biodiversity, was formulated. Further, in May 2013, MLIT formulated the “Urban Biodiversity Index (draft)” to evaluate the progress of the conditions and enforcement of biodiversity by the local governments, and is promoting the efforts of local governments to secure urban biodiversity. In March 2015, the Ministry of the Environment, together with the Ministry of Agriculture, Forestry and Fisheries formulated the “Non-native Species Damage Preventative Action Plan” in order to comprehensively and effectively promote Japan’s non-native species countermeasures as well as to protect and continually enjoy the rich biodiversity of Japan.

### 2 Creating rich and beautiful river environments

#### (1) Creating and conserving a healthy river environment

##### (i) Creating a rich river environment and stimulating revival

In river development, based on the “Basic Guideline for Rich River Development (established in October 2006)”, we work for the conservation and restoration of animal habitats and diverse river scenery, while concurrently sustaining safety over flood control.



While promoting the restoration of marshland by nature restoration projects and the improvement of the upstream and downstream migration environment for fish by fixing the fish passage ways, we are also promoting the protection and restoration of the watershed ecosystem with the goal of forming an ecosystem network <sup>Note</sup> by cooperating with various entities, as demonstrated in the project of rehabilitating storks to the wilds in Maruyama River (Toyooka City, Hyogo Prefecture).

Moreover, to effectively proceed with these activities, we are joining efforts with educated experts and various institutions, as well as utilizing research findings of government inspections of river areas and the Aqua Restoration Research Center, which has the largest experimental waterway in the world.

### (ii) Countermeasures for non-native species in the waterways

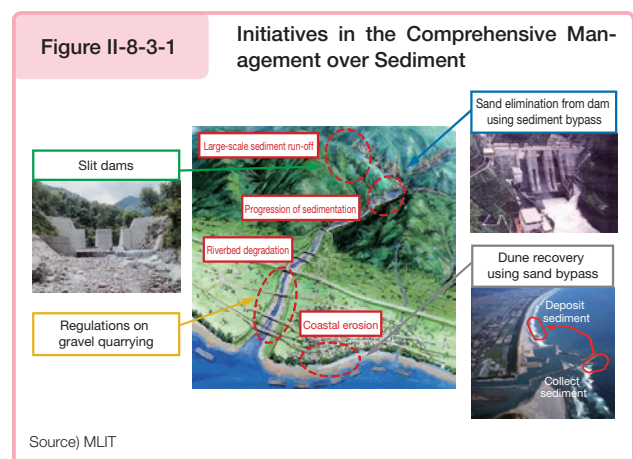
Non-native species, which are one of the threats against biodiversity, have been expanding their habitat in the waterways all over Japan. As a countermeasure, we have circulated information such as the “Guideline for Countermeasures for Non-native Plants in Rivers” and “Examples of Countermeasures for Non-native Fishes (December 2013)” and are implementing measures against foreign species in various locations.

### (2) Initiatives to recover the water supply in rivers

In order to preserve a healthy river environment, it is essential to sustain a rich supply of water. For this reason, we have specified the required amount of water in the basic policies for river improvement, based on the habitat of plants and animals, scenery, and water quality. In addition to working to sustain the supply, we are proceeding with activities for clean river recovery in recession areas downstream from dams of hydroelectric power plants. Meanwhile, in order to preserve the river environment downstream of dams, flowing water is being retained in flood-control reservoirs to the extent that flood-control functions are not impeded and usable discharge dams are subject to elastic management practices and elastic management testing. (Water was retained using eighteen dams in total in FY 2015, sixteen of which were subject to the usable discharge of water.) Initiatives concerning medium-sized flash discharging to cause changes in river formations are also being undertaken. Furthermore, we are working to restore the water supply of rivers in urban areas, where the average amount of naturally flowing water has diminished, by pumping treated water from sewage plants.

### (3) Promoting activities in the comprehensive management of sediment from mountains to coastal areas

Concerned that water systems will accelerate problems such as variation in river environments caused by changes in sedimentary flow, diminishing sand supplies to the coast, and coastal erosion caused by changes in littoral drift, relevant institutions are working in cooperation to comprehensively control sediment flowing down from mountains to coastal areas. Specifically, in order to deal with the problem caused by the sediment flowing in mountain streams, dams, waterways and the coasts, in cooperation with the relevant organizations, MLIT is working on projects for formulating comprehensive sediment management plans for effective sediment management and building check dams, making existing dams permeable so that sediment can be effectively washed downstream, creating an effective flow of sediment by sediment bypasses for dams, and recovering of sandy beaches by such methods as appropriate sand and gravel extraction of the waterways, sand bypass and littoral nourishment.



**Note** Using districts which have excellent natural conditions as core areas and by connecting them organically to ensure the appropriate placement and connections between habitat spaces.

#### (4) Environmental education on rivers

As natural environments close to communities, recently, rivers host a variety of activities such as environmental studies and natural experience activities. In addition, we are promoting projects and disseminating of information so children can safely learn and play by riversides. Because there are hidden dangers and proper knowledge is essential for safe activity, we cooperate with the NPO River Activities Council (RAC), a citizens' groups which played a central role in establishment, to promote the cultivation of river administrators.

Also, in order to widely disseminate environmental education on rivers in the schools, MLIT is providing information to textbook publishers to introduce environmental education projects.

##### ○ Children's Riverside Rediscovery Project

With the cooperation of citizens' groups, educators, and river administrators, rivers are registered as Children's Riversides and receive various means of support from the Center for Supporting Children's Riverside Activities. 300 locations are registered as of the end of March 2015.

##### ○ Riverside Fun School Project

Utilization is encouraged for riversides that are registered as Children's Riversides and undergo riverside improvements required for enhancing experiential activities. 286 locations are registered as of the end of March 2015.

##### ○ National Aquatic Organism Study

Conducted with the goal to increase interest in rivers through a survey of life forms found in nearby rivers. In FY 2014, 59,053 people participated. 61% of the inspection points (2,252 points) were judged to have "clean water".

### 3 Preserving and improving coastal environments

Because we must preserve animal habitats, care for scenery, and sustain appropriate usage of beaches, while protecting the coast from storm surges, tsunamis, and high waves, we are proceeding with maintenance and conservation that balances between "defense", "environment", and "usage".

In addition, based on the "Law for Protecting Beautiful and Rich Nature through the Promotion of Disposing Beached Coastal Waste contributing to the Preservation of Coastal Scenery and Conservation of the Environment (Coastal Waste Disposal Promotion Act)", we implement effective measures for beached waste in close cooperation with relevant institution in the future.

Support is being provided for efforts to deal with large-scale debris that drifts ashore and impedes the functions of coastal protection facilities through an emergency project for dealing with large driftwood and other debris items coming ashore in connection with disasters. This project enables concerned parties to process such debris in a concerted, efficient manner.

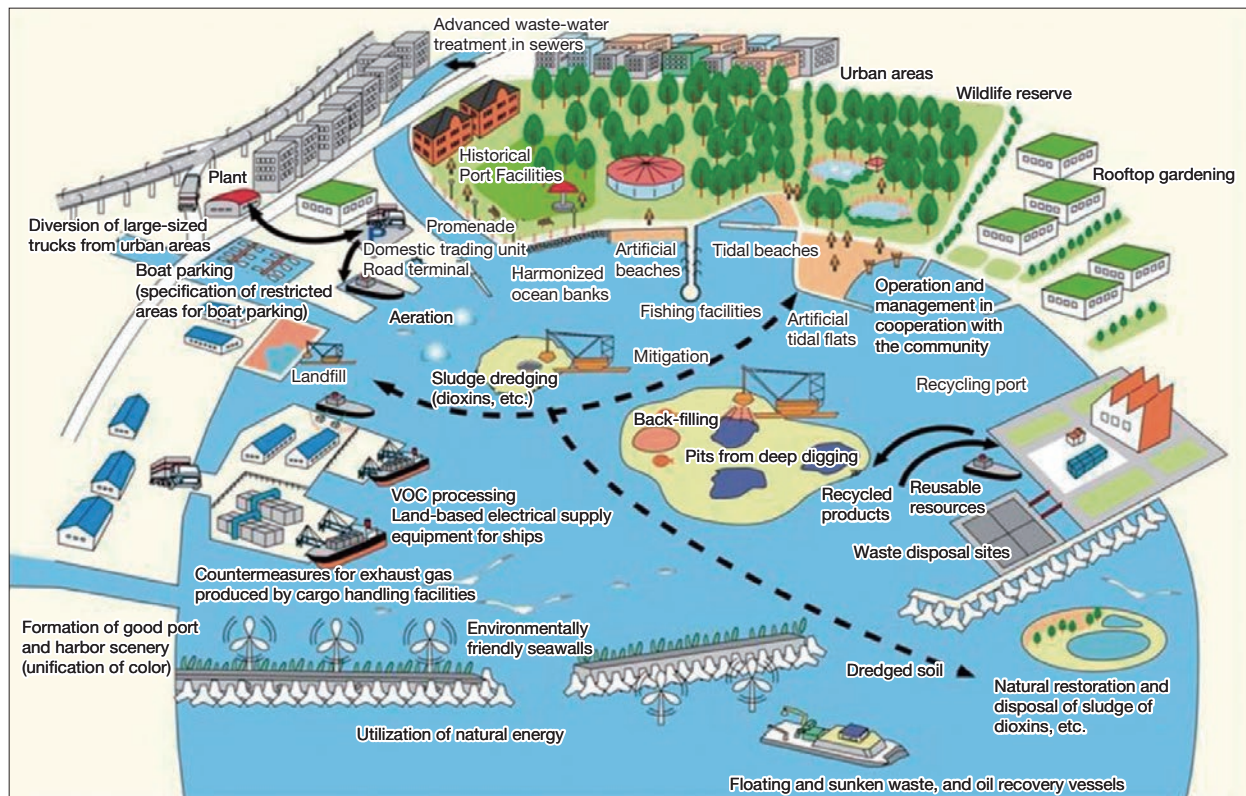
We are also providing support for the processing of neglected and stranded vessels and the removal of slime that abnormally accumulates in sea areas in order to secure the functions of coastal protection facilities, conserve the coastal environment, and facilitate the proper use of coastal areas.

### 4 Greening port and harbor administration

#### (1) Basic direction of future port and harbor environment policies

In order for ports and harbors in Japan to uphold their position as grounds for logistics, industry and living, and sustain continual growth, they must recover as much degraded or lost nature as they can, and incorporate environmental conservation in various port functions. For this reason, we are working towards greening port administration, which involves the two parts of port and harbor development and utilization, and conservation, revival, and creation of environments in to one consolidated subject.

Figure II-8-3-2 Greening port administration



Source) MLIT

## (2) Actively preserving, reviving, and creating a healthy environment

We strive to efficiently utilize dredged sediment derived from harbor maintenance, by usage in creating tidal flats, sand capping, filling pits from deep digging, and disseminating port facilities that can coexist with organisms. After the projects have been started, we will continuously monitor the status after maintenance by implementing adaptable management methods. Various organizations such as administrative agencies and research institutes will register environmental data and construct a sharable database on the ocean environment; gathering, accumulating and analyzing data. Together, we actively work to preserve, revive and create a rich natural environment in coastal areas.

In addition, the “Seaside Nature School”, which utilizes the areas preserved, revived or created, is being held in various locations throughout Japan as an effort to create opportunities for learning the importance of the natural environment.

## (3) Initiatives in measures for preventing illegal boat parking

As there is concern that parked boats may mar the scenery, affect the navigation of other vessels, and cause secondary damage in the event of a tsunami, regulatory measures are being implemented, such as by improving the mooring and storage capacity of small vessels and by designating no-parking zones.

In order to verify the effects of measures as provided for in a promotion plan consisting of comprehensive measures for properly managing pleasure boats and improving their usage environment, as formulated in May 2013, a national survey of actual pleasure boat conditions was conducted in 2014 and the results of this survey were publicly released in June 2015.

## 5 Greening roads and promoting natural environmental measures

Greening roads is crucial for providing a comfortable atmosphere for those who use them, creating favorable scenery that matches the surrounding scenery, and as a countermeasure against heat island effects. To this end, we are promoting the favorable greening of roads and the appropriate management of this process in accordance with technical standards pertaining to the greening of roads. To prepare for the Tokyo Olympic and Paralympic Games in 2020, we are also endeavoring to green roads and initiatives for comprehensive measures to keep road surface temperature from rising.

Figure II-8-3-3

Example of Greening Roads (Chiyo-da-ku, Tokyo)



Source) MLIT

## Section 4 Maintenance or Recovery of a Healthy Water Cycle

### 1 Aiming to maintain a society in which the blessings of water can be savored for a long time to come

Thus far, the development of water resources development facilities were promoted because of the priority placed on ensuring the balance of water supply and demand in response to the rapid increase in water demand in the post-war high-growth period. On the other hand, there is concern that global warming will usher in reduced amounts of annual precipitation, reduced amounts of snowfall accumulations, the earlier melting of snow, and lower amounts of water that can be supplied. In anticipation of large-scale-disasters, society demands measures to deal with the obsolescence of water-related infrastructure, improvements to the water environment, and the maintenance or recovery of a healthy water cycle. Various challenges that are coming to a head will also need to be addressed, such as in terms of our presence in the area of international contributions and the fortification of our competitiveness in international markets.

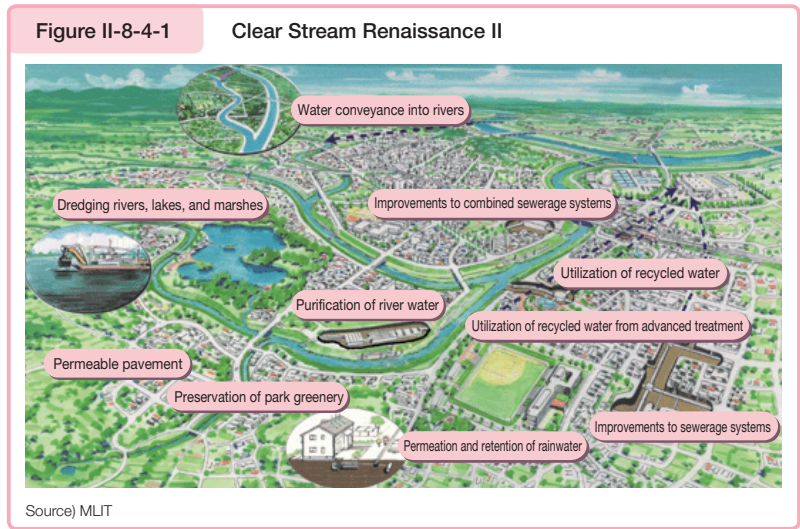
Against such a backdrop, it is important that we shift from efforts to promote the development of water resources on a demand-driven basis to efforts to secure a stable supply of water on a risk-management basis in order to advance comprehensive measures for water resources that are shaped by different priorities, including water quality and the natural environment in addition to the quantity of water, even as we adopt a long-term perspective under conditions of constraint that affect resources consisting of people, goods, and money. More specific studies will be conducted to ensure the safety and security of the lives of citizens and of our socio-economic activities and to build a society in which the necessary use of water can be accommodated.



## 2 Initiatives in improving the water environment

### (1) Promoting water purification

The MLIT is implementing purification of contaminated water in rivers with seriously deteriorated water environments and water purification of dredged bottom mud. In addition, the local municipalities that are proactively working on the water environment improvement and related institutions, such as river administrators and sewage work administrators are working together to formulate the “Second Water Environment Improvement Urgent Action Plan (Clear Stream Renaissance II)” and implementing the plan (formulated in 32 locations).



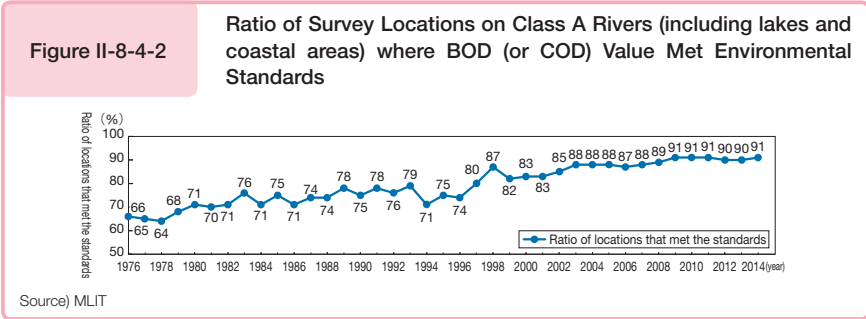
### (2) Water Quality Survey and Water Quality Accident Response

Water quality surveys are vital in conserving and maintaining a favorable water environment. In 2014, surveys were done at 1,080 locations on 109 water systems of Class A rivers.

MLIT is creating of water quality survey maps and conducting surveys of aquatic organisms in cooperation with citizens. As a result of surveys—which were based on the new water quality index with a multi-faceted evaluation of the river such as amount of garbage and odors—being conducted on Class A rivers in cooperation with the local residents, in 2014 approximately 22% (65 locations/ 301 locations) were judged to be “rivers that look clean enough for swimming.”

On the other hand, in 2014 there were 1,238 water quality accidents in Class A rivers due to spillage of oils and chemical substances. In terms of water pollution prevention, Water Pollution Prevention Liaison Councils composed of river administrators and related institutions have been put in place for all 109 waterways, and they are working on prompt information communication for incidents of water quality accidents as well as damage prevention by building oil fences.

- For Class A Rivers (including lakes and coastal areas), the proportion of survey sites that met the environmental standards for BOD (biochemical oxygen demand) or COD (chemical oxygen demand) value was 91% in 2014.
- For environmental standard items relating to the protection of human health (27 items such as arsenic), the proportion of survey sites that met the environmental standards was approximately 99%, with most sites meeting the standards.



### (3) Improving the water environment of enclosed coastal seas

Regarding the enclosed coastal seas of the Tokyo Bay, Ise Bay, Osaka Bay, and the Seto Inland Sea, because of the polluting load draining from land and deterioration of purification capacity in ocean areas due to the loss of tidal flats and seaweed forests, the fishing industry has suffered damages from the occurrence of red and blue tides. In addition to this,



there have been occurrences of environmental deterioration, as well as navigational obstacles to vessels, due to drifting debris and oil.

To resolve the current state, we advance activities to revive beautiful oceans by (1) sediment dredging, sand capping, and back-filling pits from mining to improve the substratum, (2) creating habitats for organisms by reviving tidal flats and seaweed forests and disseminating buildings that can coexist with nature, (3) removing floating waste and oils by using sea environment maintenance ships, (4) reducing the amount of pollutants released into the ocean by improving sewage treatment facilities, and (5) developing a system to get various entities to improve the environment in collaboration with one another.

#### (4) Stimulating sewage maintenance to improve the water environment

We will appropriately formulate and review the comprehensive basin-wide planning of sewage systems, and promote high temperature incineration to remove nitrogen and phosphates which contribute to the eutrophication of enclosed bodies of water. In addition, we are working for early advancement in improving water quality and stratified advanced water treatment by partially renovating equipment and facilities in treatment plants that have not yet reached their scheduled renewal period.

As for the combined sewerage system, we plan to complete implementation of measures by the end of FY 2023 through controlling the amount of water and the frequency at which untreated water is released in to streams during heavy rains.

### 3 Cultivating water and using it efficiently

#### (1) Stable supply of water resources

In order to secure stability in the utilization of water, there must be various policies corresponding to the situation of communities from both standpoints of supply and demand. Specifically, in the facet of demand, there are measures to strengthen the recovery and reuse of water, and increase awareness for conserving water. In supply, there are measures to build and maintain facilities to supply water which are water resource development facilities such as dams, implement countermeasures for aging facilities, and develop crisis management measures, etc. In addition to the sustainable conservation and use of groundwater, and promotion of utilizing rainwater and recycled water, based on the “Special Measures for Water Source Area Act”, work is being done to develop the living environment of the water source area and the industrial infrastructures, along with prevention of water pollution of the dam reservoirs.

There is concern that climate change caused by global warming will lead to more frequent, severe droughts that last longer and give rise to more drought-related damage. For this reason, the MLIT will promote measures to prevent/mitigate the damage caused by drought, such as strategies to minimize damage at the time of critical droughts.

#### (2) Efficient use of water resources

##### a. Initiatives towards expanding the utilization of recycled water derived from sewage

Stable amounts of recycled water can be secured and is a valuable water resource in urban areas. Of all the treated sewage, approximately 1.5% undergoes treatment according to purpose, and recycled water is used in streams, sustaining water levels of rivers and the sanitation of toilets. We aim to further expand the utilization of recycled water.

##### b. Promoting the utilization of rain water

In order to efficiently utilize water resources, initiatives are being promoted to treat and use rainwater and wastewater from facilities for sanitation of toilets and sprinklers. There are approximately 2,000 facilities utilizing treated water as of the end of FY 2014, and they use over 8.1 million m<sup>3</sup> a year. The “Law for Promoting the Use of Rainwater (2014 Laws, Issue 17)” was enacted on May 1, 2014, and in March 2015 the “Basic Policy for the Promotion of Rainwater Use” and the “Goal for Establishing a Facility for the Use of One’s Own Rainwater in Cases Where the Building is Equipped by the National Government or an Independent Administrative Agency” were established in order to promote the use of rainwater and thereby facilitate the effective use of water resources. Additionally, the government will formulate and enact comprehensive measures for the purpose of contributing to the containment of concentrated drain of rainwater to the sewers and waterways.

**(3) Securing safe, quality water**

With the spread of the waterworks systems, the demand from citizens for safe, delicious water has increased in recent years, making even greater efforts that emphasize water quality vital.

**(4) Promoting measures concerning the permeation of rainwater**

Due to the spread of impervious areas in recent years by urban development of drainage basins, more rainwater flows into rivers in short periods of time instead of being absorbed into the ground. In addition to reducing flood damage from heavy rains by absorbing as much rainwater as possible into the ground, improvement to rainwater storage penetration facilities are being promoted through tax measures, for cultivating groundwater, contributing to the revival of springs, and building a healthy water cycle system.

**(5) Advancing the conservation and use of sustainable groundwater**

It takes an extremely long time to recover from damage caused to groundwater, such as in the form of groundwater pollution or saline contamination. In particular, ground subsidence is an irreversible phenomenon. For this reason, we will engage in groundwater management in accordance with local conditions in order to prevent groundwater damage, conserve the ecosystem, protect local groundwater sources, and advance the conservation and use of sustainable groundwater to be used as a water resource.

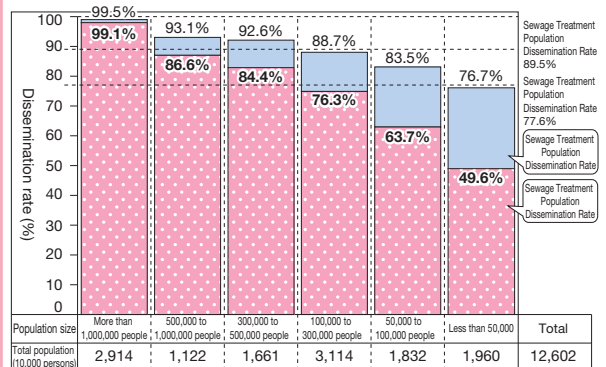
**4 Realizing amenity by promoting improvements to sanitary drainage**

Sewage is the indispensable social infrastructure for the development of healthy cities, treating waste, and preventing floods. In recent years, sewage systems have been asked to take on new roles in helping to form a low-carbon, recycling-oriented society and in maintaining or restoring a healthy water cycle.

**(1) Dissemination of sewage processing with sanitary drainage**

Although the dissemination of sewage treatment plants reached around 89% (with the dissemination of sewage systems at around 78%) of Japan as of the end of FY 2014 (total of 46 prefectures, excluding Fukushima due to the effects from the Great Eastern Japan Earthquake), there is a large gap between regions. In particular, the dissemination rate of sewage treatment plants in small to medium communities with populations of less than 50,000 people remain low, only reaching a ratio of approximately 77% (dissemination rate of sewage systems approximately 50%). Focusing on improvement in areas with high population density, the advancement of efficient development in accordance to condition of communities and the rectification of the gap between communities are seen as being of the utmost importance for developing sewage systems in the future.

**Figure II-8-4-3 Sewage Treatment Population Dissemination Rate by Size of City (FY2014 year-end)**

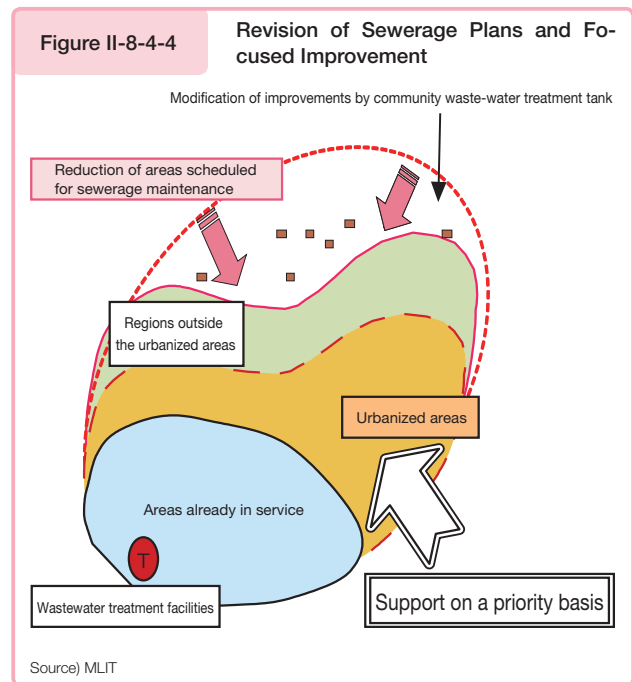


(Note) Due to the Great Eastern Japan Earthquake, the Fukushima prefecture was excluded from the survey.

Source) Prepared by the MLIT from information materials provided by the Ministry of Environment and Ministry of Agriculture, Forestry and Fisheries

### a. Initiatives towards the septic system overview in roughly 10 years

In regards to the maintenance of sewage treatment facilities, individual disposal by using septic tanks are economical in areas where households are widely distributed throughout a region, while the collective disposal with sewerage systems and drainage facilities for agricultural communities become more economical as the population density rises. For this reason, each prefecture has established a “Prefectural Plan”, a compiled maintenance plan over sewerage treatment which reflects considerations over regional characteristics such as the economic efficiency and importance of protecting water quality. Currently, in light of the population decline of recent years, MLIT is promoting an immediate re-examination of prefectural schemes and the creation of mid-term (action plan)/long-term equipping plans, in order to work towards a septic system overview in roughly 10 years. In addition, efficient means of maintenance are also being actively promoted through the implementation of cooperative schemes between other waste water treatment facilities such as cross-jurisdictional wastewater treatment.



### b. Sewage quick project

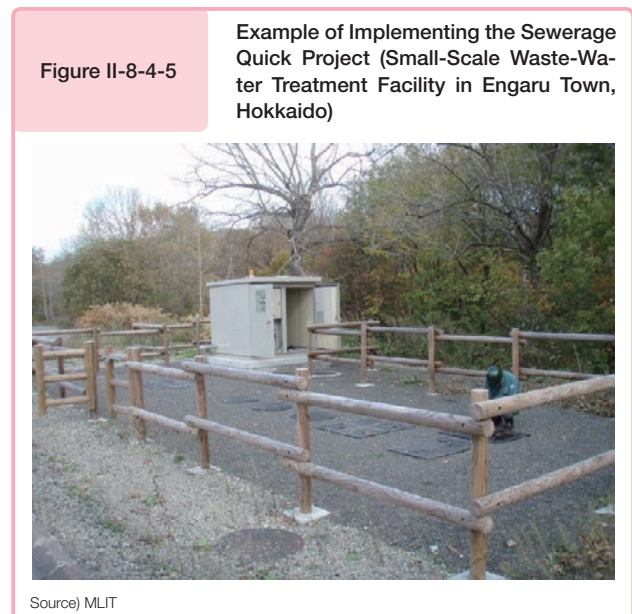
Taking into account the population decline and the difficult fiscal situation, this project seeks to widely introduce—with the cooperation of the district citizens and verification of the performance by a committee of experts—maintenance methods that are not stuck in technological standards of the past, that meets the current conditions of the district, and that are low-cost, while making early and flexible maintenance possible. By FY 2014, a social experiment was conducted in 14 municipalities, and 6 technologies—such as the “Small-Scale Waste-Water Treatment Facility (contact oxidation method)” —were determined to be effective, leading to a user’s guide being put together for the use of these technologies. The verification/evaluation of the other technologies is in progress to make nationwide usage possible.

## (2) Attaining durability in sewerage projects

### a. Proper stock management

Sewage systems possess enormous amounts of stock consisting of approximately 460,000 kilometers of pipes and conduits and approximately 2,200 terminal treatment stations (as of the end of FY 2014).

As these systems were rapidly developed during and after the period of high economic growth, aging facilities are expected to rapidly increase in number in the future. Although in FY 2014, mainly small scale issues were arising, road collapses have occurred in 3,300 places due to corrosion caused by hydrogen sulfide and aging of the conduit facilities. Because the sewage system is an important social infrastructure which supports the safe and secure social and economic activities of urban living and provides a lifeline that is difficult to replace with alternative means, there is a necessity to sustain the required functions by conducting efficient, planned measures to deal with aging facilities through the introduction of stock management that practices preventative maintenance, while at the same time considering the



introduction of comprehensive private consignment and efficient pipe inspection methods.

In May 2015, the Sewerage Act was amended and standards for maintaining and repairing sewage systems were established. In response, it was decided that drainage facilities at significant risk of corrosion would be inspected at an appropriate frequency of at least once every five years and initiatives to ensure sustainable sewage functions are being undertaken. Under these amendments, a council meeting program for engaging in necessary discussions on widening the geographic scope of sewage works and forming partnerships among the administrators of sewage works shall be established and the provision of support to local governments will otherwise be reinforced to ensure the durability of sewerage projects.

#### b. Reinforcement of business infrastructure

In the operation of sewerage projects, although it is a fundamental rule to cover costs (excluding portions covered by public expense) for treating waste water with money acquired from usage fees, the initial establishment requires a lump sum of funds. Due to the business characteristic in which income begins to stabilize as sewerage systems develop, there are cases where funds fall short during construction. Accordingly, prospects for income and expenditures tied to individual projects will need to be examined not on a short-term basis but rather on a long-term basis by taking the length of the service life of the given facilities into account. Therefore, with the “Guide for restoring financial health in sewerage management” we are pushing initiatives in each municipality for the restoration of financial health in sewerage business management.

#### c. Consigning facility management to private sectors and acquiring technical capabilities

Deliberations for the introduction of public facilities governance method for sewerage projects, and efforts for making further use of private sector consignment <sup>Note 1</sup> for the maintenance management of sewage treatment plants, are both moving forward. Based on demands from local public organizations, the Japan Sewerage Works Agency provides technical support for constructing sewage facilities, as well as for optimizing their operation and maintenance, and cultivating technical experts at local public organizations, while developing new technology.

### (3) Revitalizing communities through sewage

The proper treatment of wastewater through improvements in sewage, and the preservation or creation of healthy water environments, stimulates promotion of tourism and industry. In addition, by creating river fronts using recycled water from advanced wastewater treatment, stimulating regional activities through the operation and management of water amenity spaces by citizens, utilizing space above wastewater treatment facilities, transferring sewage heat to be used as district heating, utilizing bio-gas as energy and efficiently using sewage resources, sewage contributes to regional vitalization in numerous facets.

### (4) Promoting environmental education in the field of sewage

Working groups, consisting of elementary school teachers and sewage administrator representatives, created teacher edition textbooks that were well suited for classroom use for sewage education. In order for teachers to freely make use of these teaching materials regarding sewers, they are being offered through the “Sewer Systems, the Path of Circulation Environmental Education Portal Site” <sup>Note 2</sup>. Additionally, subsidies

Figure II-8-4-6 Environmental Education regarding the Sewerage Sector

Project for Sewerage Environmental Education for Elementary Schools in Hamamatsu City, Shizuoka



Source) MLIT

**Note 1** A method of facility management that reflects original ideas of private contractors by consigning details of operation methods in order to optimize operation while charging the responsibility to secure a specified level of capabilities such as sustaining the quality of released water to optimize operation.

**Note 2** “The Path of Recycling Sewerage Environmental Education Portal Site”  
<http://www.jswa.jp/kankyo-kyoiku/index.html>



are granted to each elementary and middle school for supporting environmental education on sewage.

## Section 5 Protecting the marine environment

### (1) Control policies over large scale oil pollution

In order to eliminate the substandard vessels (a major factor for large scale oil pollution), Japan actively participates in international initiatives, such as the formulation of the international shipping database (EQUASIS), while also strengthening Port State Control (PSC), which checks if vessels meet standards, by conducting on-site inspection of vessels that enter Japanese ports. While the flag states government have the duty to implement and enforce regulations and standards developed at the International Maritime Organization (IMO), in order to assess the flag states governments' performance of their duties, IMO assembly meeting established the Voluntary IMO Member State Audit Scheme in 2005, based on the Japan's proposal. In 2016 the scheme became mandatory, on the bases of evaluation of the progress in addressing the scheme globally.

In other fronts, as countermeasures for occurrences of large scale oil pollution in the Sea of Japan, Japan is working on strengthening international cooperation and collaborative systems by drawing up plans such as the "NOWPAP Regional Oil and HNS Spill Contingency Plan" through the "Northwest Pacific Action Plan (NOWPAP)", the framework for joined efforts between Japan, China, Korea and Russia for protecting the marine environment. As for large-scale oil spillages that occur in domestic waters, measures have been established for prompt and precise response through the utilization of large-sized trailing suction hopper dredgers.

The MARPOL Convention <sup>Note 1</sup> imposes controls on the discharge of oil and garbage by vessels. In Japan, taxation and other forms of support for the development of facilities to receive waste oil generated inside vessels are being provided and the (draft) "Guidelines for Reception Facilities of Ship-generated Garbage in Ports and Harbors" have been formulated to ensure that oil and garbage are appropriately received in ports and harbors.

### (2) Control measures on air pollution from ships

Since sulfur oxide (SO<sub>x</sub>) can negatively affect the human body and cause acid rain, the International Maritime Organization (IMO) regulates SO<sub>x</sub> emitted by vessels according to the MARPOL Convention, which stipulates standard values of sulfur concentrations in fuel oil used by vessels according to the sea area in which vessels operate. Presently, the MARPOL Convention stipulates a maximum concentration of 0.1 percent in certain sea areas subject to strict controls (emission control areas) and a maximum concentration of 3.5 percent in all other seas areas (general sea areas). With respect to general sea areas, the MARPOL Convention provides for the lowering of the current standard value to a maximum of 0.5 percent from as early as January 1, 2020. (The IMO will determine the availability of compliant fuel oil. If it is determined that compliance with regulations on January 1, 2020 by vessels is impossible, the date from which this change will take effect shall be January 1, 2025.)

In addition to participating in IMO discussions pertaining to SO<sub>x</sub> emission reductions, Japan has engaged in other initiatives with a view to disseminating natural gas-fueled ships that can significantly reduce the amount of SO<sub>x</sub> emission, such as by formulating safety standards and codifying them into international rules and providing construction support. Domestically, Japan's first natural gas-fueled ship went into service in September 2015.

### (3) Responding to issues of invasive aquatic species carried by ships

Control measures on invasive aquatic species carried by ships It is pointed out that the transfer of aquatic species via ships' ballast water <sup>Note 2</sup> and ships' biofouling would threaten marine ecosystem in waters where these ships navigate in. In order to prevent the transfer of invasive species, "International Convention for the Control and Management of Ships' Ballast Water and Sediments in 2004" and "the 2011 Guidelines for the Control and Management of Ships' biofouling to minimize the transfer of invasive aquatic species in 2011" were adopted at the IMO. With the necessity to take action to prevent the disruption to the ecosystem caused by the harmful ballast water from international shipping and to fulfill the international responsibility under the international cooperation, the Government of Japan proposed the law to implement the Ballast Water Management Convention (amendments Act on Prevention of Maritime Pollution and Maritime Disaster)

**Note 1** International Convention for the Prevention of Pollution from Ships.

**Note 2** Sea water loaded as weight to balance the ship when it carries no cargo.



to the 186th ordinary session of the Diet, and it passed with an unanimous vote. <sup>Note</sup> Japan concluded the convention in October 2014 and has made efforts to develop on environmental development work to enable the early entry into force of the convention.

## Section 6 Improving living environments by preventing atmospheric and noise pollution

### 1 Policies for environmental issues related to road traffic

#### (1) Measures for individual vehicles

##### (i) Exhaust gas reduction measures

Statutory amendments were passed in July 2015 with respect to exhaust gas measures applicable to new vehicles in order to further reduce exhaust gas generated by trucks, buses, and motorcycles. Concerning trucks and buses, we consequently introduced the Worldwide Heavy-Duty Certification procedure (WHDC), reinforced regulatory values applicable to nitrogen oxides, introduced exhaust regulations for off-cycle emissions, and mandated that vehicles be equipped with advanced on-board diagnostic systems. Concerning motorcycles, we reinforced regulatory values applicable to exhaust gas, introduced fuel evaporative gas measures, and mandated that vehicles be equipped with on-board diagnostic systems. We have been successively applying these changes since October 2016. In order to introduce the Worldwide Harmonized Light vehicles Test Procedure (WLTP) for testing exhaust gas and fuel efficiency with respect to passenger vehicles, we are preparing revisions to concerned laws and ordinances and will begin applying these procedures progressively in 2018.

In connection with Volkswagen emissions scandal that emerged in September 2015, relevant statutes and ordinances were amended in November of the same year and the use of software to activate emission control devices on passenger cars only during testing and to turn deactivate them when the vehicle is operating under real-world conditions was banned. Review meetings chaired by experts were held jointly with the Ministry of the Environment to study reviews of emissions test procedure for passenger vehicles.

In order to help consumers identify and select vehicles that perform exceptionally well in terms of reducing the amount of exhaust gas generated, a program for certifying low-exhaust gas vehicles according to the given level of reduction has been implemented for vehicles that reduce harmful substances by more than the regulatory values for exhaust gas that apply to them.

Exhaust gas measures for in-use vehicles (vehicles already in usage) such as those based on the Amendment Act on Reduction of Total Amount of Nitrogen Dioxide and Particulate Matters Originating from Automobiles in Designated Areas (Automobile NOx PM Law) are being implemented.

##### (ii) Reinforcing noise regulations

With respect to measures to deal with noise pollution generated by vehicles, regulations govern noise generated from accelerating the vehicle, steady running noise, and proximate exhaust noise. In order to introduce noise regulations tied to tires as a measure to reduce the noise generated by tires on four-wheeled vehicles that contribute considerably to the noise generated by normal operations, statutes and ordinances were amended in October 2015; these provisions will begin to be progressively applied in April 2018.

In order to harmonize noise regulations governing four-wheeled vehicles with international standards that will reinforce regulations in two stages, statutes and ordinances were amended in April 2016; these provisions will begin to be progressively applied in October of the same year.

**Note** Also, a proposal to obtain the approval for conclusion of the Convention was submitted to the 186th ordinary session of the Diet, and the proposal passed with unanimous vote.

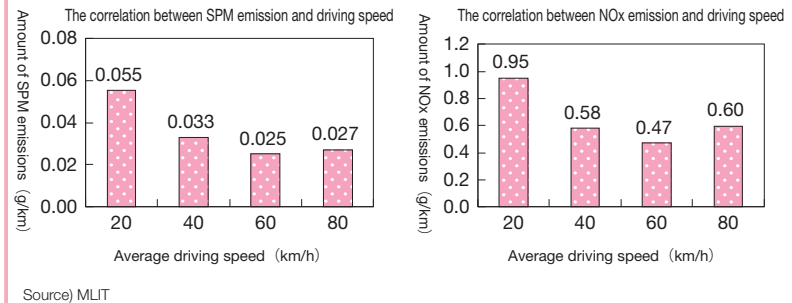
## (2) Promotion of traffic flow Measures

### (i) Countermeasures for Air Pollution

The volume of particulate matter (PM) and nitrogen oxide (NOx) emissions from automobiles is increasing because of the increasing frequency of stop-and-go traffic and the reduced travel speed. For this reason, we are advancing the shift through traffic in urban areas to bypasses as a way to improve the roadside environment.

Figure II-8-6-1

#### The Correlation Between Driving Speed and the Emission of Particulate Matter and Nitrogen Oxides (NOx) from Vehicles



### (ii) Countermeasures for noise pollution

Japan is proceeding with the lamination of low-noise pavement, installation of noise barriers, and maintenance of environmental roadside facilities. Based on the “Law for the Improvement of Areas along Trunk Roads”, in addition to preventative measures for issues caused by traffic noise, financial assistance is being provided for buffer buildings and noise insulation work for housing in construction projects in areas alongside roads.

## 2 Environmental measures for airports and surrounding areas

In Japan, we have been steadily implementing various measures to deal with aircraft noise through improvements in materials made possible by the introduction of low-noise aircraft, restrictions on departures and arrivals imposed via regulations governing night-time flights, improvements in flight methods based on noise-abatement operations, upgraded airport structures, and measures concerning the peripheral environment, including sound-insulation work and the provision of compensation for relocation. In recent years, the growing popularity of low-noise aircraft accounts for a reduced impact that aircraft noise is having on areas surrounding airports even as the number of departures and arrivals by aircraft is rising.

We will need to strive to accommodate the growth of areas surrounding airports and the desire to conserve the local environment by continuing to take comprehensive measures to deal with aircraft noise while gaining the understanding and cooperation of local residents in accordance with changes in such conditions as the demand for air travel.

## 3 Countermeasures for Railway Noise

In terms of the noise control for Shinkansen bullet trains, countermeasures for noise are being taken, such as the installation of sound barriers, the raising of track level, etc. For the construction of new railways for Shinkansen bullet trains, for regions where the measures mentioned are difficult to implement, Japan is providing financial aid for sound insulation work in already existence housing.

As for noise control measures for existing lines, each railway company is instructed to lower noise levels below a fixed value when constructing new railways and renovating already existing railways, more than previously in large-scale improvement projects, based on the “Guidelines for Noise Abatement Measures in the Construction of New Lines and Large-scale Improvement of Conventional Railways.”

## 4 Countermeasures for urban heat islands

Heat island effect refers to the phenomenon where a metropolitan area is significantly warmer than its surrounding rural areas. The global annual mean temperature has risen at a rate of around 0.7°C per century. At the same time, annual mean temperature averaged for locations in Japan that are likely to be only minimally affected by urbanization is expected to rise at a rate of about 1.5°C per century. In contrast, annual mean temperatures in major metropolitan areas will rise by

approximately 2-3°C, such that urbanization will likely aggravate the global warming trend and render temperature increases more prominent.

In order to advance comprehensive and effective measures for dealing with the urban heat island effect, we are engaged in various initiatives according to the Outline of Measures for Dealing with the Heat Island Effect, which systematically summarizes specific measures put forth by relevant ministries and agencies. These initiatives include the following : initiatives that reduce artificial heat emitted by air-conditioning systems and automobiles, initiatives that improve ground surfaces based on the greening of public spaces and the use of water, initiatives that consist of urban development projects that take wind channels into account, and initiatives for which observations, monitoring, and surveys are conducted with respect to the heat island phenomenon.

## 5 Countermeasures for sick building syndrome and soil contamination

### (1) Countermeasures for sick building syndrome

Sick building syndrome describes a situation where materials used in the interior of a building disperses chemical substances which are hazardous to health. Japan is taking measures such as regulations on building materials and ventilation in the “Building Standard Act”, and formulating performance labelling systems based on the “Housing Quality Assurance Act.”

In the maintenance of government facilities, Japan has implemented restrictions over the usage of building materials containing chemical substances, as well as measuring the indoor concentration of airborne chemical contaminants after completing construction.

### (2) Countermeasures against issues related to dioxins

Studies over the water and earth quality of class A river systems throughout Japan are being conducted for dioxins specified in the “Act on Special Measures concerning Countermeasures against Dioxins.” In FY 2014, the sediment of all locations and the water quality of 98% (219 locations out of 224) of the locations satisfied environmental standards.

For rivers, ports, and harbors, we have implemented dioxin countermeasures as required according to the Manual on Measures to Deal with Dioxins at the Bottom of Lakes (proposed), which was revised in April 2008, and the Technical Guide on Measures to Deal with Dioxins at the Bottom of Ports and Harbors (revised edition). Support for programs involving pollution-prevention measures is being provided for rivers, ports, and harbors where dioxins exceeding standards have been detected in samples taken from the bottom of these locations.

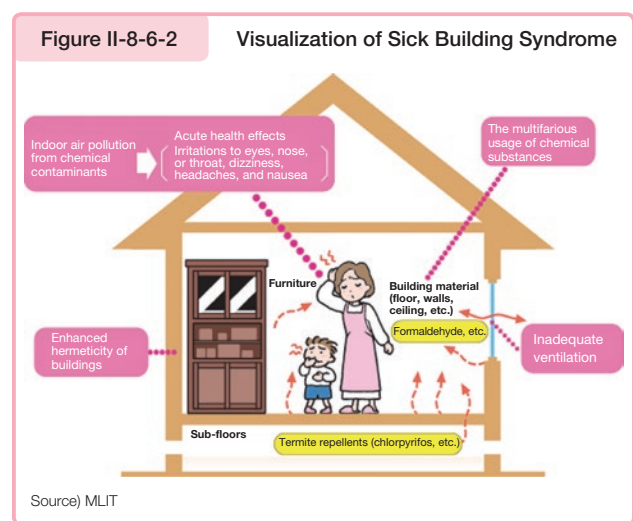
### (3) Measures against asbestos

Issues concerning asbestos are life-threatening. As buildings that were built in the 1970s—when mass amounts of asbestos was imported to Japan—each their dismantling period, it is important to implement pre-emptive measures to prevent injuries from occurring.

In order to accurately and efficiently determine the actual use of asbestos building materials, investigators are being trained based on the system for investigators of structures containing asbestos building materials, which was created in 2013.

Also, based on the “Building Standards Law”, the removal of sprayed asbestos when renovating a building is required, auxiliary system of comprehensive grants for social capital development is in place to promote the asbestos removal in existing buildings and follow ups are being done for the situation of the removal and anti-scattering of asbestos in the existing facilities under the jurisdiction of national ministries and agencies.

Furthermore, Japan is promoting the dissemination of information in efforts such as compiling data bases on referential cost estimates for removal work of spray-applied asbestos insulation, documents useful for identifying building materials



containing asbestos (Visually identifiable building materials containing asbestos) and information on such materials, as well as pamphlets for measures related to asbestos in buildings.

## 6 Environmental measures in construction

The gas emissions measures (NO<sub>x</sub>, PM) for construction machinery that are not driven on public roads, the registration, certification and approval are being handled based on the “Act on Regulation, Etc. of Emissions from Non-road Special Motor Vehicles”. Things like the low interest loan system is in place to provide assistance for the purchasing of construction machinery that have been adapted to be environment-friendly by meeting the latest emission standards and having reduced noise.

## Section 7 Observing, Monitoring, and Forecasting Changes in the Global Environment

### 1 Observing and monitoring the global environment

#### (1) Observing and monitoring climate change

In order to grasp the status of greenhouse gases (GHGs), the Japan Meteorological Agency (JMA) is observing CO<sub>2</sub> trends in the atmosphere at three stations in Japan. CO<sub>2</sub> concentrations in the marine atmosphere, as well as those in the sea surface water are being observed in the western North Pacific by research vessels. GHGs in the upper troposphere in the western North Pacific is also being observed. Furthermore, JMA is not only monitoring climate changes, but also observing solar and infrared radiation at domestic five stations in order to reduce an uncertainty of global warming projections.

In addition, JMA observes sea level rise accompanied by global warming, and publish information on the long-term change in sea levels around Japanese coasts.

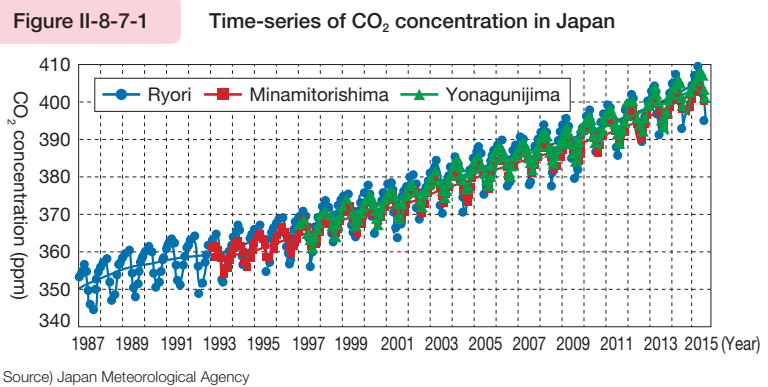
In addition, in order to improve the accuracy of seasonal weather forecasting and monitoring of climate change, JMA produced the Japanese 55-year reanalysis (JRA-55), a historical global atmospheric data with homogeneity in space and time.

Moreover, “Climate Change Monitoring Reports” and “Report on Climate Change and Extreme Weather” (in Japanese) are compiled based on results from observation, and future projection of climate changes, extreme weather events and global warming is disclosed to the public. Serving as the World Data Centre for Greenhouse Gases (WDCGG) of the World Meteorological Organization (WMO), JMA also archives and provides observation data on greenhouse gases around the world.

#### (2) Observing and monitoring extreme weather events

The Japan Meteorological Agency (JMA) monitors unusual weather events occurring in Japan and elsewhere in the world and summarizes and releases periodic and extraordinary information concerning weather disasters and areas where extreme high and low temperatures, heavy and light rainfalls, and other such events have been observed. Also, when extreme weather conditions are occurring that significantly affect the public, summary reports are given covering the information regarding features, factors and the outlook.

Furthermore, as a Regional Climate Center of the World Meteorological Organization (WMO), JMA provides information such as monitoring and analysis of extreme weather as well as technical assistance through training and dispatch of experts to National Meteorological and Hydrological Services in Asian countries to support the climate service in the Asia Pacific region.





**(3) Observing and monitoring with geostationary meteorological satellites**

The Japan Meteorological Agency launched Himawari-8, a new geostationary meteorological satellite, into space on October 7, 2014; this satellite began operating on July 7, 2015. There is also a plan to launch Himawari-9 in FY 2016. By using these satellites-in addition to improving the disaster prevention function against such things like tropical cyclones and torrential rainfalls-Japan is leading the world in strengthening its monitoring function of the Earth’s environment, including global warming.

**(4) Observing and monitoring the ocean**

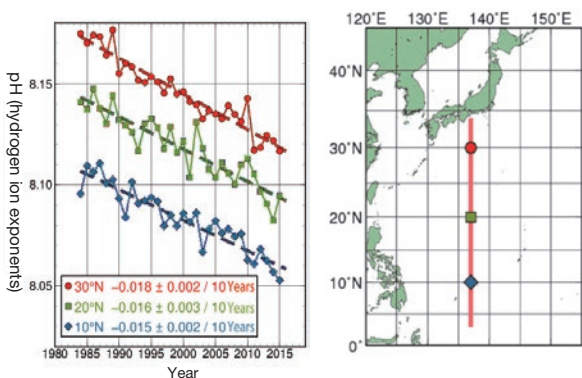
The ocean is greatly impacting the earth’s climate by storing a much larger amount of heat than the atmosphere, and it is also easing the progression of global warming by absorbing CO<sub>2</sub> discharged by human economic activity. In order to monitor global warming, an accurate grasp of oceanic conditions is essential.

The Japan Meteorological Agency (JMA), under the international cooperative structure, monitors oceanic conditions by carrying out ocean observation with high accuracy from research vessels in the western North Pacific along with using data from satellites and Argo floats, or profiling floats to automatically observe the ocean interior.

JMA website “Marine Diagnosis Report” provides information on the present status of the ocean such as ocean temperatures, ocean currents, sea level, sea ice, as well as the prospect for the future.

The Japan Coast Guard constantly monitors fluctuations in the Kuroshio Current in waters surrounding the Izu Islands, using high-frequency radar, and publishes the observation data. In addition, the Japan Oceanographic Data Center collects and manages data obtained by Japanese marine research organizations, and discloses it to relevant institutions and to the public.

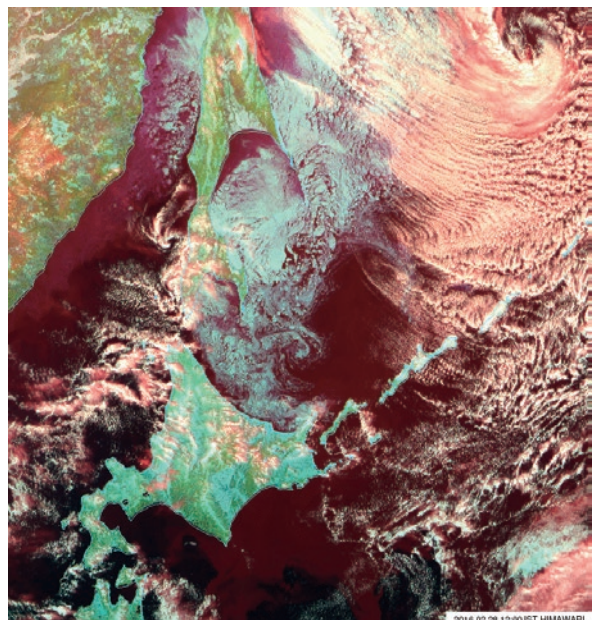
**Figure II-8-7-2** Monitoring the Global Environment using research vessels



The long-term changes in hydrogen ion exponents (pH) at latitudes 10, 20, 30 degrees north along 137 degrees east meridian (left) and the area map for data analysis (right). The numbers in the graph indicate the decreasing rates per 10 years. The lesser pH indicates the more progress of “ocean acidification”.

Source) Japan Meteorological Agency

**Figure II-8-7-3** Example of a “Marine Diagnosis Report” published on the Japan Meteorological Agency Website



[Satellite imagery of the southern part of the Sea of Okhotsk (Himawari, a geostationary meteorological satellite)]  
 A satellite image of the southern part of the Sea of Okhotsk as observed by Himawari-8, a geostationary meteorological satellite.  
 By using and processing multiple channels of images taken by satellites, sea ice is shown in blue, oceans are shown in black, and cloud is shown as ranging from white to red. (Satellite imagery on February 28, 2016)  
 Shown in light blue, sea ice is revealed to be distributed across an area from the east coast of Sakhalin to the Hokkaido coast facing the Sea of Okhotsk.

Source) Japan Meteorological Agency

### (5) Observing and monitoring the ozone layer

The Japan Meteorological Agency annually publishes the outcome of observations on ozone and ultraviolet radiation. According to these studies, the global amount of ozone continues to be low from a long-term perspective. Additionally, in order to prevent adverse effects to the human body by ultraviolet radiation, information on the topic is published daily using a numerical index (UV index) for easy comprehension of the intensity of ultraviolet radiation.

### (6) Promoting routine operational observation in the Antarctic

The Geospatial Information Authority of Japan facilitates activities carried out by Antarctic research expeditions. At the same time, it makes geodetic observations, produces and updates topographical maps, and develops satellite image maps on the Antarctic region in order to contribute to international activities relating to research on global environmental changes and geodetic surveys.

The Japan Meteorological Agency continues to conduct observation of ozone, solar and infrared radiation, surface and upper-air at the Syowa Station (Antarctica). Accumulated meteorological data contribute to monitor and research the global environment, such as the changes in Antarctic ozone hole and global climate, and are utilized for the formulation of international policies.

The Japan Coast Guard is conducting topographical studies on the sea floor. The observation data is being used for compiling nautical charts and as the basis for research related to past environmental conditions such as glacial erosion and sedimentary environments. In addition, they conduct tidal observations and monitor the fluctuations in sea levels, which are closely tied to global warming.

## 2 Research and Prediction of the Global Environment

The Japan Meteorological Agency and the Meteorological Research Institute are developing prognostic models on changes in climate around Japan and the world, and actively participate in international research programs such as the World Climate Research Programme (WCRP). Earth system models that track the carbon cycle process and other changes and higher resolution regional climate models are being developed, and research for making warming predictions is being conducted. Proactive contributions were made to the release (in FY 2012) of “Global Warming Projection Vol.8” which shows the detailed warming predictions for the area around Japan based on a highly developed regional climate model, the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC) (released in 2013-2014), and the plan for adapting to the impact of climate change (Cabinet decision of November 2015).

The National Institute for Land and Infrastructure Management released the results of research into climate change adaptation conducted from the standpoints of flood control, water utilization, and the environment through the Interim Report on Research into Climate Change Adaptation (2013) and other documents. These results have been incorporated into various materials, including Adapting to Climate Change in the Area of Water Disasters (August 2015), a report issued by the Social Development Council, and a plan for adapting to climate change (November 2015) as formulated by the MLIT.

## 3 Promoting Global Mapping Project and the world geodetic network

The Geospatial Information Authority of Japan is in charge of the secretariat of the Global Mapping Project (in which 183 countries and regions are participating as of January 2016), continuously leading the project which develops and releases digital geospatial information on land areas around the globe. The activities using geospatial information toward to disaster risk reduction and the effort to understand and analyze the global environment are promoted. In addition, Japan contributes to global scale observations and researches through the activities, e.g., international VLBI (Very Long Baseline Interferometry is a space geodetic technique using radio waves from quasars) and SLR (Satellite Laser Ranging is a method for measuring the range between an artificial satellite with retroreflectors and a ground station by laser pulse), tide observations, absolute gravity measurements, and participation in International GNSS Service (IGS).