

# Chapter 8

## Creating and Preserving a Beautiful and Healthy Environment

### Section 1 Promoting Global Warming Countermeasures

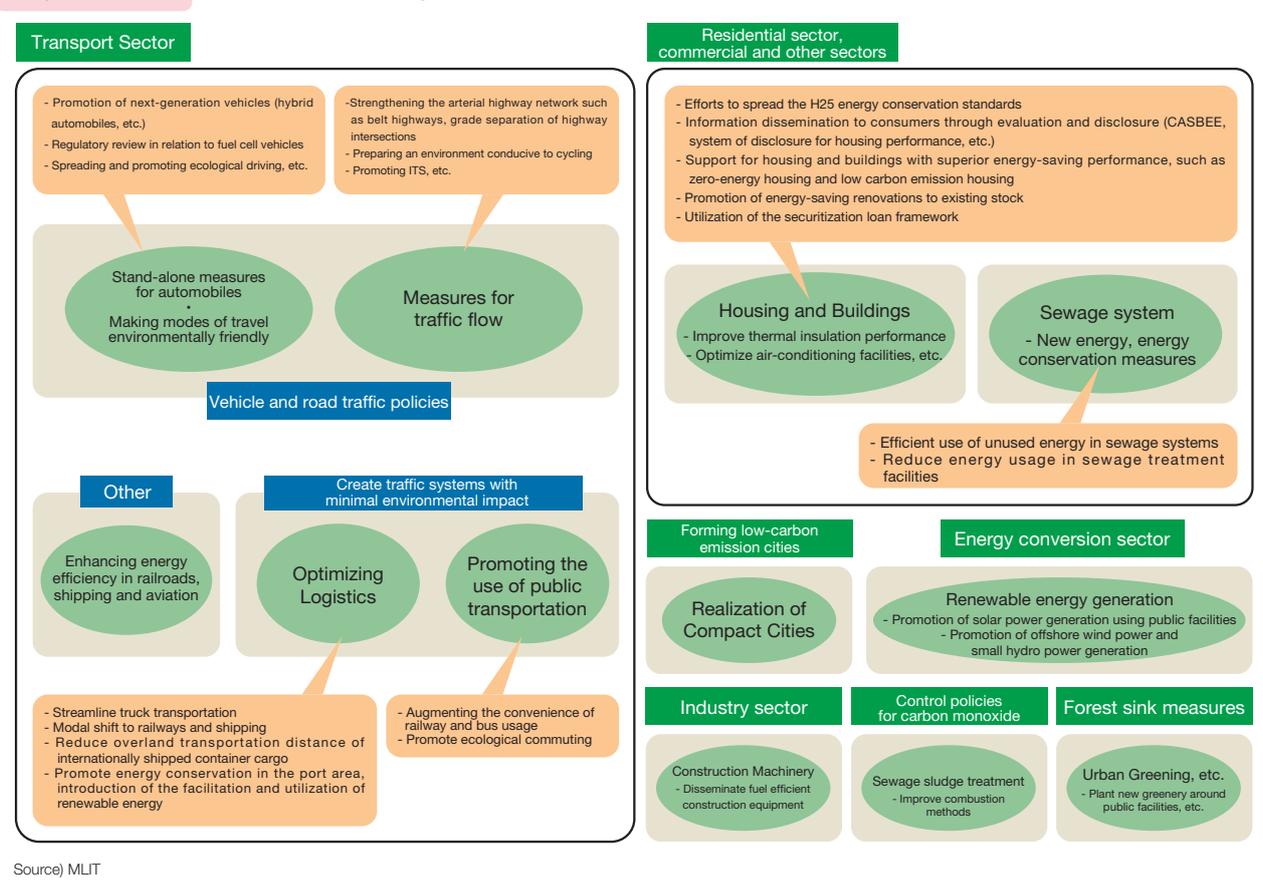
#### 1 Implementing Global Warming Countermeasures

The 5 year average of Japan’s Greenhouse Gas Emission Rate for the Kyoto Protocol First Commitment Period (FY2008 – 2012) has been 1,278,000,000 (1.278 billion) t-CO<sub>2</sub>, which although is an increase of 1.4% compared to FY1990, by taking into consideration the sinks countermeasures for greenhouse gas emissions such as tree planting, it is a 8.4% decrease compared to FY1990 which means the goal (6% decreased from FY1990 rate) set by the Kyoto Protocol has been attained.

Although Japan is not participating in the Second Commitment Period of the Kyoto Protocol (FY2013 to 2020), in order to continue promoting an approach at a level higher than thus far, new “Plan for Global Warming Countermeasures” are to be formulated for the future.

Taking into consideration this governmental movement, The Ministry of Land, Infrastructure, Transport and Tourism—with the Environmental Subcommittee of the Infrastructure Development Council and the Environmental Subcommittee of Transportation System Subcommittee of the Transport Policy Council at the center—is continuing to promote energy saving measures and deployment of renewable energy at most based on the Environmental Action Plan formulated in March, 2014.

Figure II-8-1-1 MLIT Global Warming Countermeasures



## 2 Promoting Global Warming Countermeasures (Mitigation Measures)

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

For the cities where the population and buildings are quite concentrated, in December 2012, “The Low-Carbon City Act” was enacted from the standpoint of promoting low-carbon city development through consolidation of urban facilities and the promotion of public transportation use, efficient use of energy such as area energy networks at the district level, conservation and promotion of greenery. 19 municipalities has formulated the “Low-Carbon City Plan” by the end FY2014. Government of Japan has been continually promoting “Low-Carbon City Development” through budgetary and tax measures as well as deregulation.

### (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. In 2014, the Subcommittee on Automobile Fuel Economy Standards (under committee of Council of Transportation Policy) was established and the deliberation results regarding the FY2022 Fuel Economy Standards for trucks (limited to vehicles with total weight of less than 3.5t) were summarized.

Furthermore, the average fuel efficiency rate of gasoline passenger vehicles released in FY2013 was approximately 50% higher compared to FY2004, and we will continue in the efforts to further improve fuel efficiency.

#### b. Schemes to stimulate improvements in mileage capabilities and reduction in exhaust gas

In order for consumers to easily identify and select vehicles with high mileage capabilities, we have implemented systems to evaluate and disclose mileage capabilities of vehicles to stimulate their dissemination. Additionally, for vehicles that emit lower amounts of harmful substances than the latest exhaust gas standards, we are implementing the “low emission vehicle recognition system,” according to how much less exhaust is emitted by the vehicle. The indication for mileage capabilities are marked by a “2020 Mileage Standard Fulfilling Vehicle” sticker.

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

In promoting the distribution of environment-friendly vehicles, such as putting into place tax incentives such as EcoCar Tax cuts (vehicle weight tax and vehicle excise tax) for vehicles with superior environmental performance (EcoCar) and the special provision for fuel reduction (vehicle tax), the number of vehicles sold in 2014 that are subject to the EcoCar tax cuts are approximately 87% (approximately 4,340,000 cars) of all vehicles sold.

Furthermore, to promote measures against global warming, MLIT has been facilitating city development that uses environment-friendly vehicles by providing assistance in introducing the use of electric cars and ultra-compact vehicles, and also helping Automobile Carrier Businesses introduce CNG Automobiles <sup>Note</sup>, hybrid cars, and advanced environment-friendly diesel trucks.

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

In order to promote the development and application of next generation heavy vehicles, from 2011, the technology development has been moving forward for things such as high efficiency hybrid trucks, electric plug-in hybrid trucks and high performance electric buses. We also began undertaking efforts to make possible the actual use of such vehicles, such as substantive driving tests under actual use conditions for experimental cars and the preparation of the necessary standards.

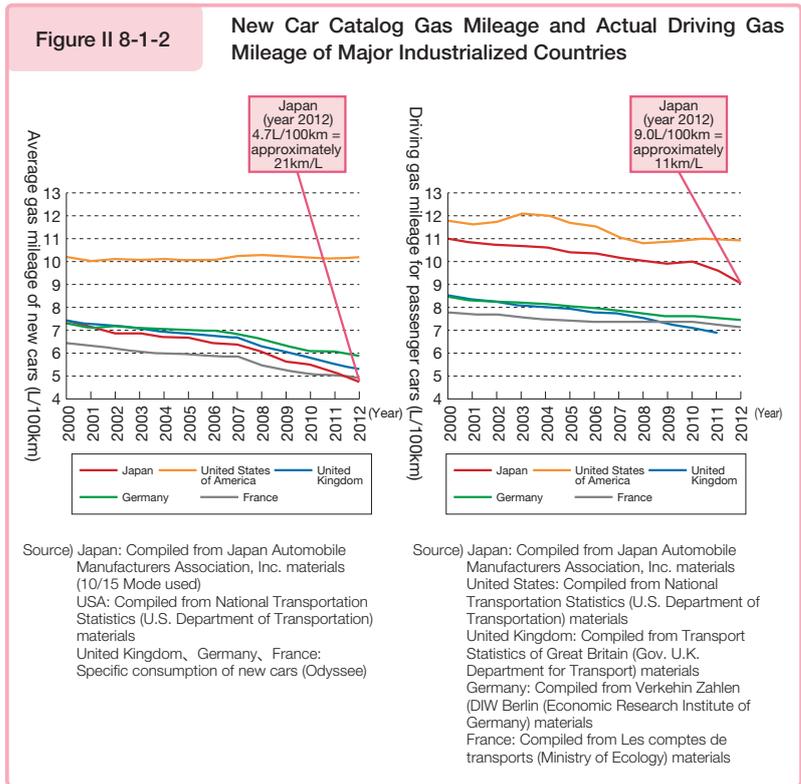
**Note** Compressed Natural Gas Vehicles (Natural Gas Automobiles)

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</sup>.

(3) Promotion of traffic flow improvement

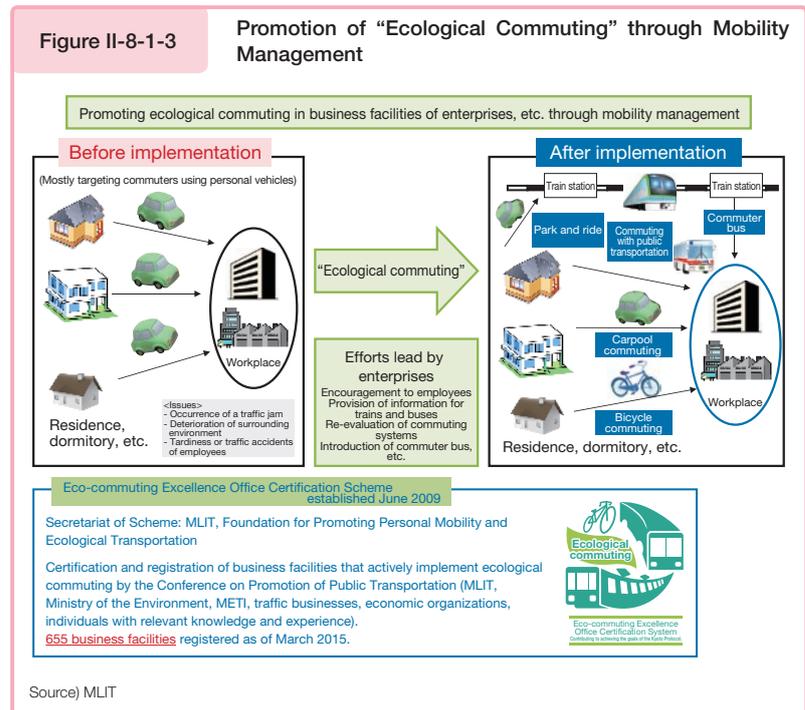
Japanese cars have the top-level cataloged gas mileage rates in the world, but actual driving gas mileage rates are about the same as the USA rates. For this reason, various traffic flow measures are being tried, since improving the driving speed by smoothing the traffic flow will improve the actual gas mileage rate and decrease the carbon dioxide emissions from automobiles. Specifically, in order to alleviate traffic congestion in urban areas, we are arranging the arterial expressway network with belt highways which curb the inflow of traffic to the inner-city by providing an alternative route for traffic moving through urban areas. Additionally, we are promoting three-dimensional intersections and the continuous grade separation project to eliminate railroad crossings that stop traffic, as well as promoting “Smart Use of Roads” such as utilizing the big data collected by means of ITS technologies, undertaking the most suitable usage of existing road networks in order to realize the smooth and safe traffic services, and advancing the creation of a bicycle transit space by redistributing road space. Also, in order to improve the low carbon emissions of road infrastructure, actions are being taken such as installing LED road lighting and making use of renewable energy.



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

#### (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 promoting automation such as implementing IC cards, introduction of Light Rail Transit/Bus Rapid Transit system and improving the convenience of public transportation through better transit connections. We also encourage ecological commuting in each business establishment through the Ecological Commuting Outstanding Business Certification Scheme, as well as spreading environment-friendly commuting by cooperating with regional schemes that promote ecological 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</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. And, to establish an even more efficient logistics system with low environmental impact, government support is being provided for joint transportation and delivery, modal shift, implementation of large CNG trucks, low-carbon logistics centers, and low-carbon emission of the port area. We implement a study on matching mechanism to promote joint transportation and delivery, survey on the promotion of railway transportation of export and import containers, aid for the deployment of 31ft railway containers of similar size to the 10-ton truck, and the demonstration experiments of a new style 12ft refrigerated railway container. We are also working to vitalize the coastal shipping and ferry industry by promoting the building of energy-saving vessels. We also work to disseminate the “Eco Rail Mark” (150 products (190 items) and 87 cooperating enterprises certified as of the end of February, 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, functioning as nodal points between overland and overseas transportation, we are implementing initiatives to conserve energy within ports and harbors, implementing, facilitating, and applying renewable energies and expanding carbon dioxide sinks. Moreover, we strive to reduce overland transportation distance of international cargo by renovating facilities such as international overseas container terminals.

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.

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

Figure II-8-1-4 Promotion of Activities through the Green Logistics Partnership Conference

## Substance of activities by the Green Logistics Partnership Conference

- In order to promote the reduction of CO<sub>2</sub> emissions of the logistics sector, meeting to promote exchange and sharing of the recognition of the importance of green logistics in those connected to the shipping and logistics business.
- 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: 3,331 members (as of January, 2015) --- 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] By awarding the achievements of the efforts made in the logistics sector for global warming countermeasures that produced remarkable results, promote the popularization and expansion of green logistics as well as motivating the voluntary efforts of businesses.

[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: "Distribution Solution for Efficient Shipping and for Minimizing Environmental Impact through Unified Management of Information regarding People, Vehicles and Goods"

Companies: Sagawa Express Co., Ltd.; Tobu Railway Co., Ltd.; Tokyo Tower Skytree Co., Ltd.; Tobu Town Solamachi Co., Ltd.

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

Initiative Name: "Realizing Environment-friendly Customer Deliveries through Modal Shift of Using Railways and Ships Combinations"

Companies: Kobe Modal Shift Promotion Council; Oji Transportation Co., Ltd.; Zenkoku Tsuun Co., Ltd.; Japan Freight Railway Company; Nestle Japan Ltd.

## ◆Special Award from Green Logistics Partnership Conference

◇Nippon Paper Industries Co., Ltd.'s Ishinomaki factory reduced CO<sub>2</sub> during disaster recovery time by changing the survey line layout and through the modal shift from using trucks to using Japan Railway containers for the delivery of waste paper. (Waste Paper Transport Modal Shift Promotion Council, Nanko Unyu Co., Ltd.; Japan Freight Railway Company; Nippon Paper Industries Co., Ltd.)

◇Promotion of modal shift to woody biomass fuel based on the round-trip transport of waste material efforts (Hokkaido JR Butsuryu Co., Ltd.; Hoku Netsu Corporation; Japan Freight Railway Company)



Source) MLIT

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

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

Although the railway has little environmental burden in comparison to other modes of transport, in order to further reduce environmental burden, we are promoting the technological development of next generation hybrid trains as well as introduction of equipment which contributes to low carbonization and energy saving to railway related facilities and railway vehicles in cooperation with the Ministry of the Environment.

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

Efforts for conserving energy are being promoted in coastal shipping through comprehensive measure for eco-friendly ship transportation such as the dissemination of energy-saving ships and by subsidizing the deployment of new technologies and facilities that contribute to energy conservation and low carbonization of ships. For international shipping, in addition to supporting the world's leading marine environment technology development since 2013 with the goal of further decreasing CO<sub>2</sub> emissions from ships, MLIT is leading the discussion to develop international frameworks such as stepwisely strengthening ships energy efficiency regulations and ship fuel consumption data collection system ("visualization" of fuel consumption in actual voyages) in international shipping, in order to jointly promote the establishment of international frameworks and technology development and dissemination.

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. For this reason, the energy conservation standards were reviewed in 2013, with full enforcement of the standards for buildings being in effect as of April 2014, and full enforcement for residential housing being planned to be in effect in April 2015.

Furthermore, in order to display energy conserving performance in a way that is easy for consumers to understand, in addition to improving and popularizing the “residence performance labeling system” and CASBEE (Comprehensive Assessment System for Built Environment Efficiency), the Building Energy Conservation Performance Labeling System (BELS) was started in April 2014.

Also, in light of the fact that as a part of the Energy Master Plan it will be mandatory for new housing and buildings to comply in stages to the energy conservation standards by 2020, in October 2014 the Minister of Land, Infrastructure, Transport and Tourism consulted the Chairman of the Panel on Infrastructure Development regarding “ways to handle energy conservation measures for housing and buildings going forward”. In January 2015 the initial report was completed, and on March 24th of the same year the compliance obligation to the energy conservation performance standard for buildings other than residential housing larger than a certain size was created, and the Cabinet approved the “Bill for Improving Energy Consumption Performance for Architectural Structures”, which takes steps to establish an accreditation system for the energy consumption capability improvement plan.

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 buildings, while also implementing a lowering of 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 meets 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 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

Japan that is surrounded on all four sides by the sea, and is blessed with abundant marine renewable energy.

Of these, the wind power over the ocean, which is vast compared to land and where a stable, strong wind blows, is expected to be widely used in the future and interest is increasing especially in the port and harbor areas.

Therefore, the Bureau of Port and Harbor has decided to organize the installation procedure to the port and harbor and first published in June 2012 “Regarding Wind Power at Ports and Harbors – The Manual for Coexistence with the Administration and Operation of the Port and Harbor”. In March 2015, to work towards the structural stabilization of ocean wind power facilities and securing the safety of ship navigation, MLIT published the (proposed) technical guidelines that will become the technical criterion to be used in the screening for water occupancy permits.

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

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.

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

Early construction of a liquefied hydrogen carrier that allows mass transport of liquefied hydrogen is expected. However, as this carrier will be the world's first, there are no existing safety standards which makes it necessary to determine the safety requirements as soon as possible. Therefore, in 2014 we put together the safety requirements for ships and ship crews that take into account the special qualities of hydrogen. Also, in regards to a project progressing in Australia to produce liquefied hydrogen for bulk shipment to Japan, a conference was held with Australia on proposed safety standards formulated by Japan, and an agreement was reached in February 2015. Going forward, we will be leading the international standardization of the safety standards within the International Maritime Organization (IMO).

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

For the effects of global warming that cannot be avoided even with the most stringent mitigation measures, it is essential to have measures (adaptations) to prevent or reduce the damage to a minimum, or even take advantage of the opportunities for benefits. Therefore, we plan to formulate an "Adaptation Plan" for the entire government, to be completed by summer of 2015.

As a part of the adaptation measures, MLIT has already been proactively promoting countermeasures against water disasters such as floods, sediment-related disasters, tidal waves and draughts. Furthermore, taking into account the most recent findings on global warming that had been summarized in the IPCC's Fifth Assessment Report which was published over 2013-2014, the "Subcommittee for Flood Control Measures adapted to Climate Change under the Waterway Sectional Committee of the Panel for Infrastructure Development" held discussions regarding the kind of adaptation measures to be taken against climate change in the field of water disasters, and published the mid-term summary in February 2015. In terms of coastal areas, the "Committee to Consider the Effect of Climate Change on Coastal Areas (Harbors, Shores) and Determine the Direction of Adaptations" held discussions regarding the direction to be taken for adaptation measures. In addition to these deliberations, MLIT will summarize adaptation measures covering various aspects including transportation infrastructure and heat island as the "MLIT Adaptation Plan" (tentative name), and—along with reflecting the government's adaptation plan—work on the planning and application of comprehensive adaptation measures from both the structural and non-structural aspects.

## Section 2 Promoting the creation of a recycling society

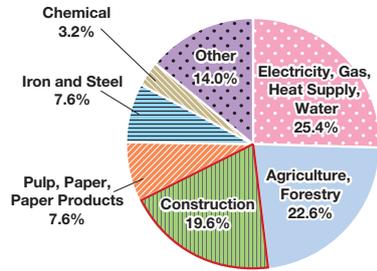
### 1 Advancing recycling in construction

Construction waste accounts for approximately 20% of all industrial waste, 20% of final disposed amount, and 80% of all illegally discarded waste. Suppression of the generation of construction waste, and recycling and reuse of those waste are major tasks. The national construction disposal amount was approximately 73 million tons in FY2012, with a recycling/reduction rate of 96.0% which was an improvement compared to 93.7% in FY2008. However, there are still issues such as maintenance and renewal construction for the aging social infrastructure, increase in construction by-products generated from construction related to the Tokyo Olympics and Paralympics, and increase in construction generated soil from the

construction of large-scale tunnels.

Sewage sludge also accounts for 20% of all industrial waste, reaching approximately 76 million tons in FY2012. We are working on reduction and recycling of sewage sludge.

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



Subject materials	Index	2005 Performance	2008 Performance	2012 Performance
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 <small>(8% decrease in comparison to 2005)</small>	280 <small>(5% decrease compared to 2005)</small>
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

Source) Prepared by the MLIT from "Status on Production and Disposal of Industrial Waste" (FY2012 results) of the Ministry of Environment

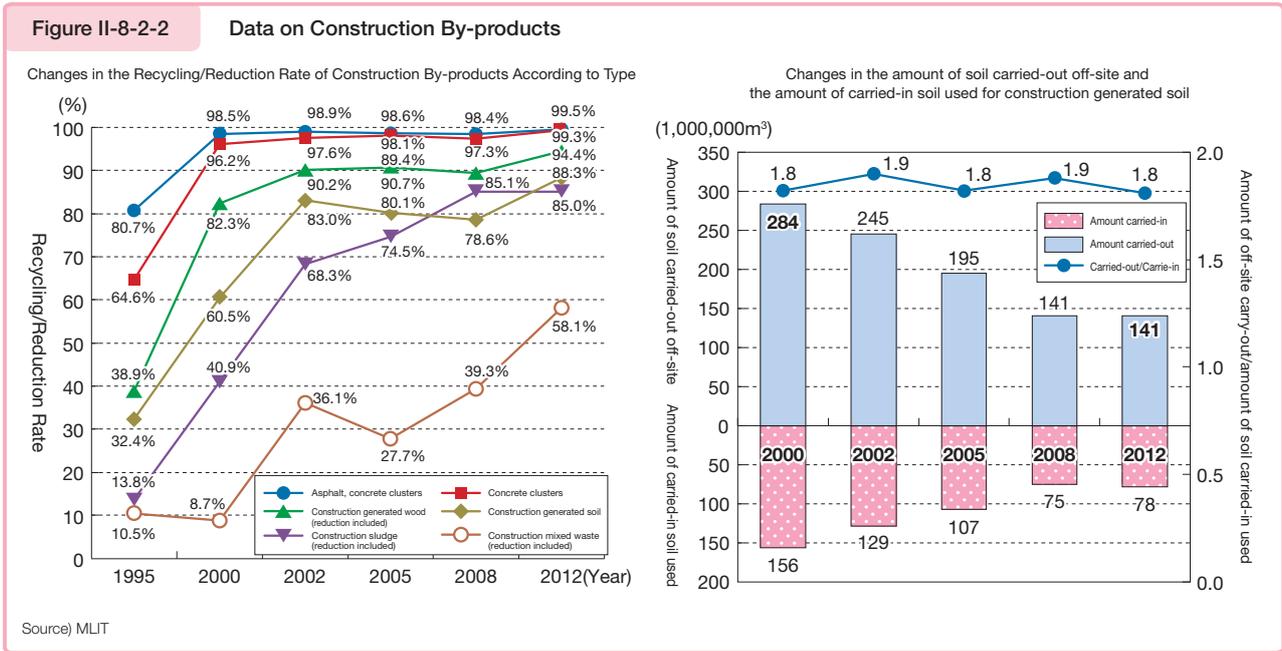
\*Reduction refers to reducing the amount of waste through incineration, dehydration, or other processes.  
Source) MLIT "2012 Construction By-products Status Survey"

### (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, 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

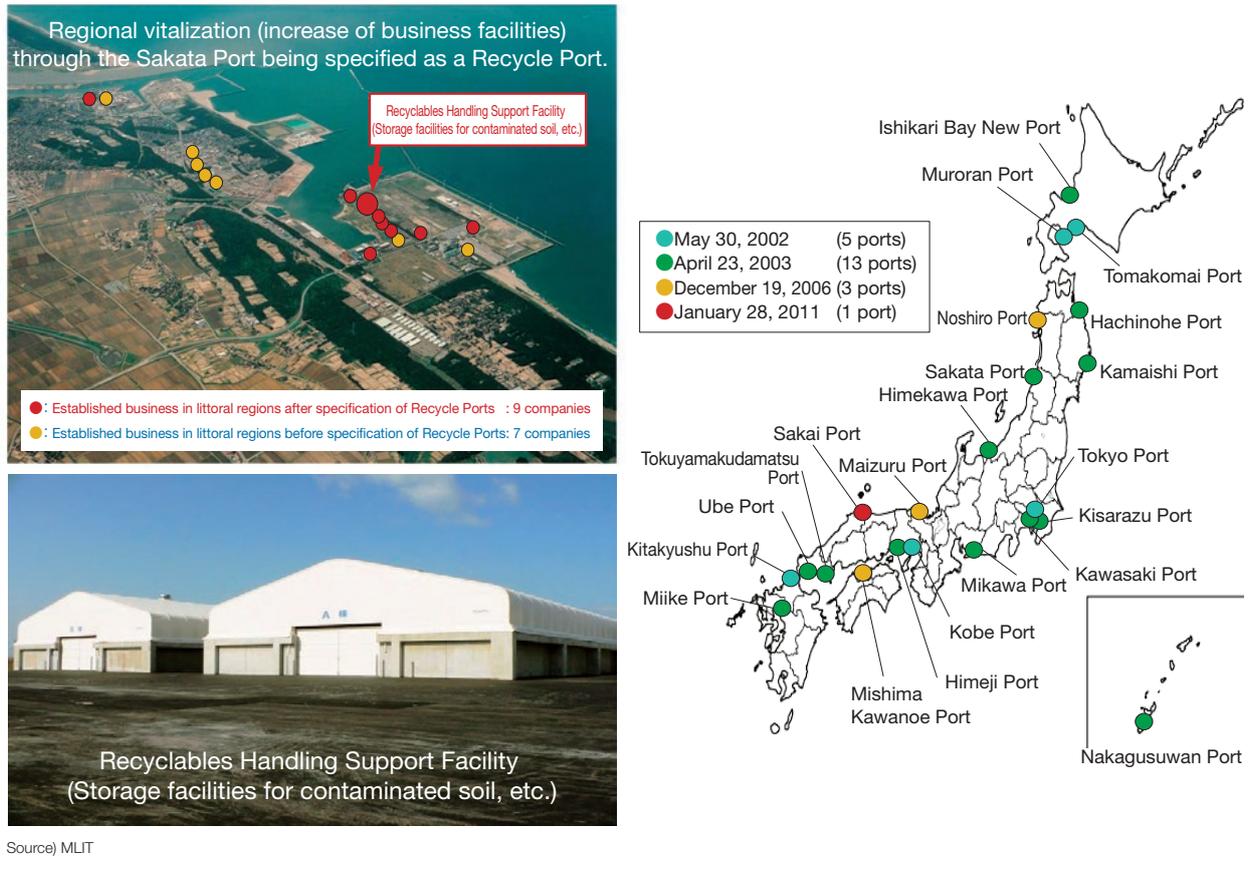
MLIT is promoting the recycling of sewage sludge (2012 recycle rate 58%) and moving forward with the use of sewage sludge made into solid fuel for energy, as well as the recovery and use of phosphorus from sewage sludge. Furthermore, we are proceeding with the Breakthrough by Dynamic Approach in Sewage 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 “cycling” of reusable resources for creating a recycling society, we 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 cooperation between civilian and government sectors, and operations related to handling reusable resources. Furthermore, from 2014, MLIT has begun the “Project to Promote Low Carbon-Type Reverse Logistics by Modal Shift/Transport Efficiency” and started efforts to make reverse logistics more low carbon and low cost by promoting modal shifts and transport efficiency.

Figure II-8-2-3 Specified Recycle Ports



## (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. Particularly in the Osaka Bay, regional waste disposal sites are being improved through the Osaka Bay Phoenix Project <sup>Note 1</sup> to receive waste from the 168 municipalities in the 6 prefectures of the Kinki region. In addition, based on the Super Phoenix Plan <sup>Note 2</sup>, surplus soil produced from construction in the Tokyo Metropolitan Area is being shipped to various ports and harbors and being widely used as landfill material.

## 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. When deleting vehicle registrations from the “Road Transportation Vehicle Law,” the scheme for returns in vehicle weight tax is also conducted, in order to promote the proper disposal of end-of-life vehicles and prevent illegal dumping. Based on these systems, 1,501,084 vehicles were confirmed to have been scrapped in 2013.

**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** 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. Various guidelines to supplement the implementation of this convention were formulated under the initiative of Japan and were all adopted in October 2012.

With the goal of an early enforcement of the Ship Recycling Convention, Japan is moving forward by reviewing domestic legislation that will be necessary to ratify the Ship Recycling Convention. As a condition of enforcing the Convention, the ratification by a major recycling country is necessary. India, the world’s largest recycling country—in the meeting between Prime Minister Abe and Prime Minister Modi, as well as the meeting between MLIT Minister Ohta and Shipping Minister Gadkari held in September 2014—made a request that Japan provide support for improving the ship recycling facilities in India. MLIT will be providing technological support to India’s ship recycling facilities and working towards the cooperation of the two countries for the ratification of the Convention.

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 600 FRP vessels are properly recycled yearly under the leadership of the Japan Boating 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

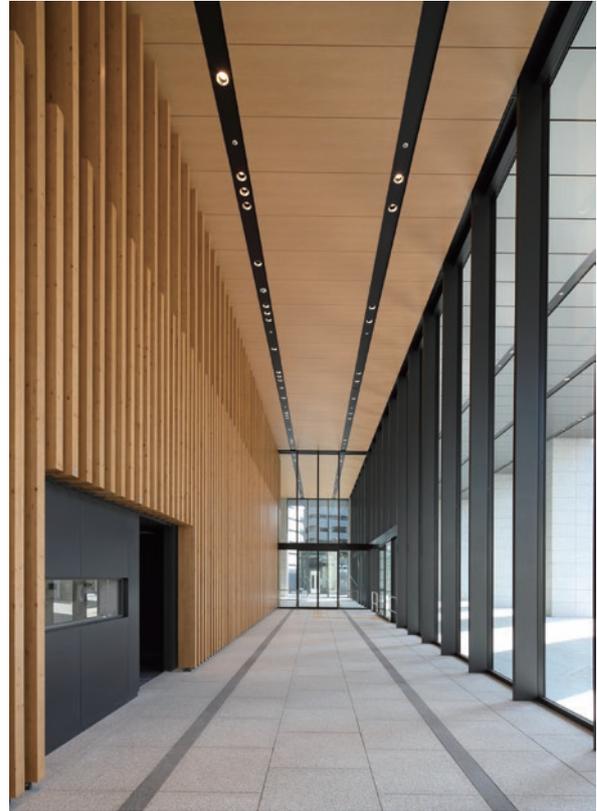
Because wood is an environment-friendly building material due to reasons such as requiring less energy to process in comparison to other materials, and long-term utilization in various applications contributing to preventing global warming and forming a recycling-oriented society, we strive to encourage 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 in May 2011, 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 addition, to promote the development of wooden houses and buildings that utilize local materials, the Ministry is working to support building of wooden long-term quality housing and certified low carbon buildings that use local materials, and the development of large-scale wooden buildings which will make use of cutting edge design and construction technology, as well as the development of leaders and wooden house production system in the region.

Figure II-8-2-4

Examples of the Use of Wooden Building Material  
Entrance Hall of Central Government Building No.8



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 in 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 and 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

#### a. Creating a rich river environment and stimulating revival

In river development, based on the “Basic Guideline for Rich River Development (established 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.

#### b. 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 of 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.

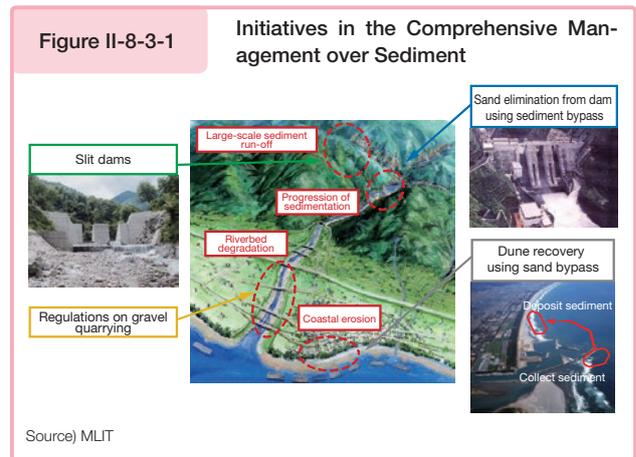
### (2) Initiatives to recover the water supply in rivers

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 and improve river environment downstream of dams, we are implementing flexible dam operation and tests for flexible operation (conducted in 20 dams throughout Japan as of 2014) to efficiently utilize a portion of the flood control capacity without hindering flood regulation. 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.

**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.

**(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 such as 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.



**(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. 298 locations are registered as of March 2014.

○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. 285 locations are registered as of March 2014.

○National Aquatic Organism Study

Conducted with the goal to increase interest in rivers through a survey of life forms found in nearby rivers. In 2013, 59,053 people participated. 59% of the inspection points (2,258 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 billows, we are proceeding with maintenance and conservation that balances between “defense,” “environment,” and “usage.”

Due to beached waste originating from foreign countries, in recent years, the diminishing coastal functions and deterioration of the environment, scenery, and ecosystem, and the effects on safe navigation for ships and the fishing industry have become severe. In response, 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 plan to implement effective measures for beached waste

in close cooperation with relevant institution in the future.

In addition, we are advancing the “Emergency Large-Scale Disposal Project for Beached Waste related to Disaster”, where personnel from “Multiple Beaches” from a wide area work to integrally and efficiently dispose of waste, especially for emergency disposal of large amounts of beached waste, which disrupt the functions of coastal protection facilities. With the goals to secure the functions of coastal protection facilities, to protect the coastal environment and to promote the appropriate use of the coast by the public, the Infrastructure Maintenance Comprehensive Fund is providing aid to dispose of grounded ships that have been abandoned and to remove sludge that is accumulating in unusual amounts in the coastal waters.

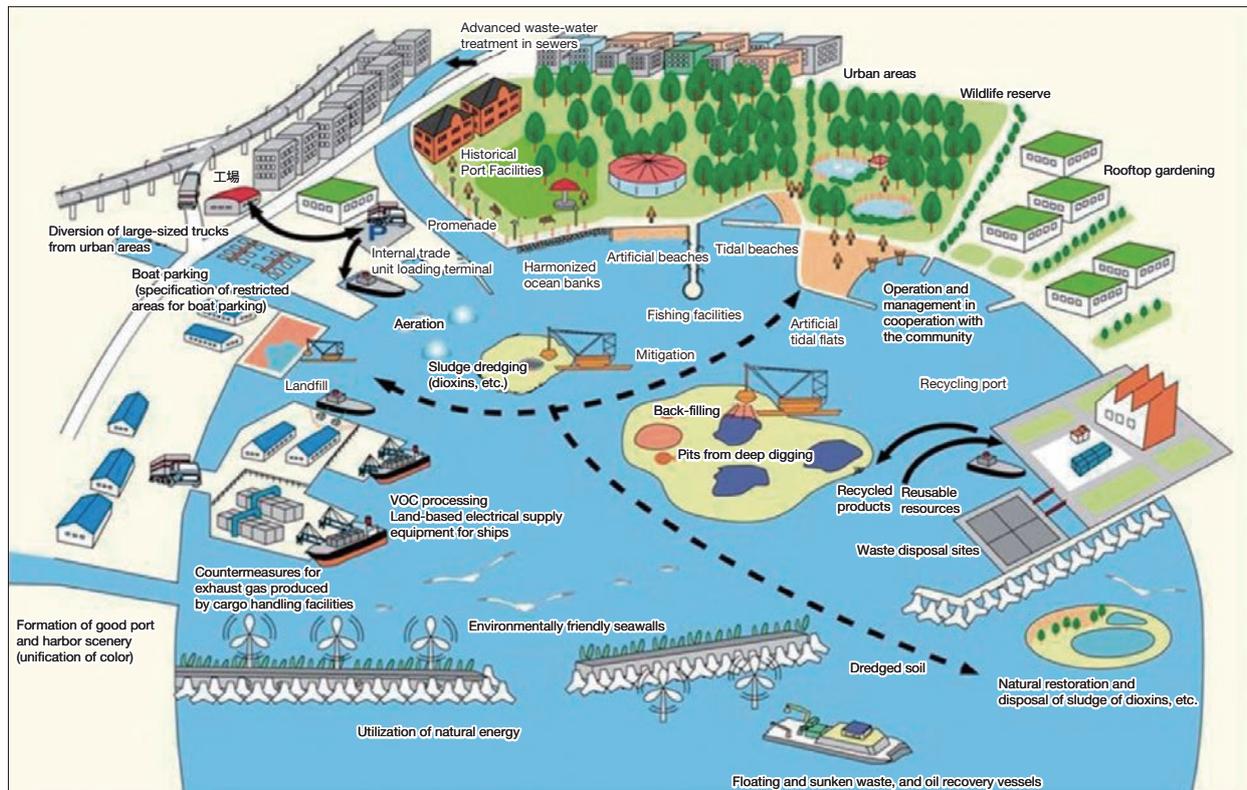
Furthermore, in June 2014, the Coast Act was revised to make it possible to issue a removal order to the owner of vessels that become grounded in the coastal conservation area in order to protect the coastal conservation facilities from damage.

## 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

Because illegally parked boats affect the navigation and anchorage of vessels, coastal recreation, and fishing activities, as well as raising concerns over secondary damages from tsunamis, regulatory measures are being implemented for the specification of parking prohibited zones and the enhancement of mooring capabilities for small vessels.

In May 2013, the Ministry developed the “Promotion Plan for comprehensive measures for the proper management of pleasure boats and the improvement of their use environment” in working towards the elimination of abandoned boats.

## 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. For this reason, the technology standards relating to greening roads are being reviewed to promote favorable greening of roads as well as their efficient maintenance. In addition, we strive to preserve and revive the environment by avoiding road construction, even in the planning stages, in areas that are valuable natural environments, or to try to minimize the effects or implement alternative measures if it cannot be avoided.

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 Becoming a society that can enjoy the blessings of water

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 pressure to respond to the various challenges that have emerged such as the vulnerability of water infrastructure like the occurrence of long-term, wide-area suspension of water supply resulting from large-scale disasters and aging facilities, the risk of climate change due to global warming, societal demands for maintaining and recovering a healthy water cycle as well as strengthening Japan’s presence in contribution on an international level and competitiveness over international markets.

Based on the above conditions, on October 22, 2013, the Minister of Land, Infrastructure, Transport and Tourism submitted a queried the National Land Development Council regarding the “Direction to be taken on future water resources policies”. The response to this query was given on March 25, 2015.

Taking into account that a long-term vision is vital for the first year of the next-generation water policy, the response made the recommendation to switch from the current demand-based water resources policy—which responds to an increase in water demand by facilitating the increase in supply quantity with the building of new water resources development facilities—to policies that aim to facilitate further advancement, one with a “social system with bandwidth” to secure a stable water supply, and countermeasures against the aging water infrastructure, so that the blessings of water will be secured for the future against all kinds of risks such as large-scale disasters like earthquakes and critical droughts. The response also included a summary of the action items.

## 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).

Figure II-8-4-1 Clear Stream Renaissance II



Source) MLIT

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

Water quality surveys are vital in conserving and maintaining a favorable water environment. In 2013, surveys were done at 1,074 locations on 109 water systems of Class A rivers.

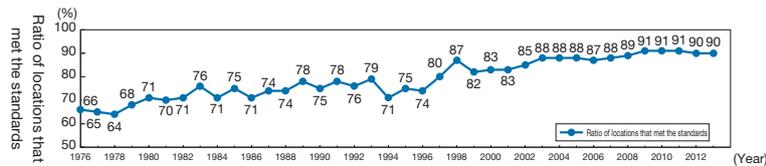
MLIT is creating of water quality survey maps and conducting surveys of aquatic organisms in cooperation with citizens. As a result of surveys—which were based on the new water quality index with a multi-faceted evaluation of the river such as amount of garbage and odors—being conducted on Class A rivers in cooperation with the local residents, in 2013 approximately 26% (79 locations/ 308 locations) were judged to be “rivers that look clean enough for swimming.”

On the other hand, in 2013 there were 1,233 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 90% in 2013.
- Of surveyed locations in the rivers, 94% of the locations had good water of 3.0mg/L of BOD 75%, in which salmon and sweetfish can thrive.
- 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.

Figure II-8-4-2

Ratio of Survey Locations on Class A Rivers (including lakes and coastal areas) where BOD (or COD) Value Met Environmental Standards



Source) MLIT

### (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, and (4) reducing the amount of pollutants released into the ocean by improving sewage treatment facilities.

### (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 2022 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.

Furthermore, the effect of climate change due to global warming has been noted, and has lead to predictions that there

will be a rise in the number of droughts, resulting from an increase in the number of days with no precipitation and the decrease in the amount of snowfall. For this reason, 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 waste water from facilities for sanitation of toilets and sprinklers. There are approximately 2,000 facilities utilizing treated water as of 2013, and they use over 800 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 and delicious 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) Promoting measures concerning groundwater

As a result of excessive utilization of groundwater for industrial purposes during the period of high economic growth, adverse affects emerged in various locations such as land depression and salination of water supplies. In the Noubi plain, Chikugo and Saga plains, and the Northern parts of the Kanto plain, where ground subsidence has widely occurred, activities for preventing land depression and preserving groundwater are being conducted by considering the actual situations in those regions, based on the Guideline on Measures for Prevention of Ground Subsidence.

## 4 Realizing amenity by promoting improvements to sanitary drainage

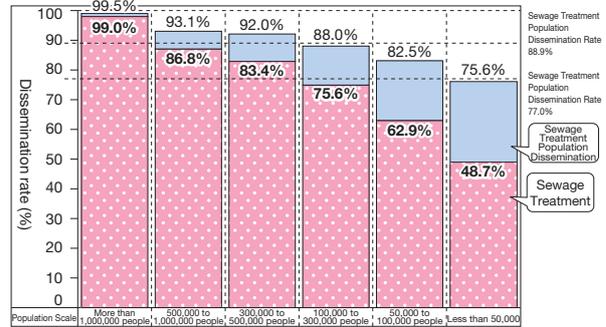
Sewage is the indispensable social infrastructure for the development of healthy cities, treating waste, and preventing floods. In recent years, new demands are being made of sanitary drainage, including forming a low carbon, recycling society and a healthy water circulation system.

(1) Dissemination of sewage processing with sanitary drainage

Although the dissemination of sewage treatment plants reached around 89% (dissemination of sanitary drainage systems of around 77%) of Japan as of the end of FY2013 (total of 46 prefectures, excluding Fukushima due to 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 76% (dissemination rate of sewage systems approximately 49%). 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 (FY2013 year-end)



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

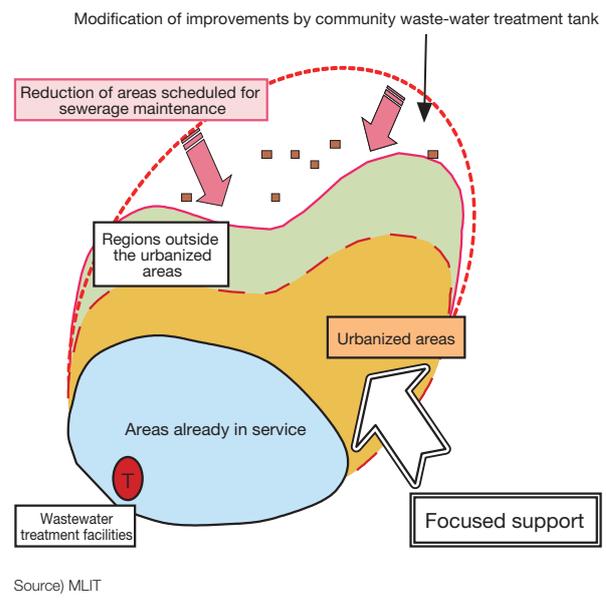
Source) Prepared by the MLIT from information materials provided by the Ministry of Environment and Ministry of Agriculture, Forestry and Fisheries

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 an 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 waste water treatment.

Figure II-8-4-4

Revision of Sewerage Plans and Focused Improvement



Source) MLIT

### 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 FY2013, 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.

Figure II-8-4-5

Example of Implementing the Sewerage Quick Project (Small-Scale Waste-Water Treatment Facility in Engaru Town, Hokkaido)



Source) MLIT

## (2) Attaining durability in sewerage projects

### a. Proper stock management

With the progress of sewerage systems, at year-end of 2013, there is a vast stock of approximately 460,000km of sewer line extension facilities as well as approximately 2,200 sewage treatment plants.

Because these sewerage facilities were built rapidly starting around the high economic growth period, the number of aging facilities is expected to increase rapidly from now on. Although in 2013, mainly small scale issues were arising, road collapses have occurred in 3,500 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.

### 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. Therefore, with the “Guide for restoring financial health in sewage management” we are pushing initiatives in each municipality for the restoration of financial health in sewage 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</sup> for the maintenance management of sewage treatment plants, are both moving forward. Based on demands from local public organizations, the Japan Sewage 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.

**Note** 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.

### (3) Revitalizing communities through sewage

The proper treatment of waste-water 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 waste water treatment, stimulating regional activities through the operation and management of water amenity spaces by citizens, utilizing space above waste water 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 1</sup>.” Additionally, subsidies are granted to each elementary and middle school for supporting environmental education on sewage.

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

## 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. As for systems for audit if flag state governments are fulfilling their duties in monitoring and supervising ships from their own country, an arbitrary system proposed by Japan was authorized for establishment by the IMO Convention. However, in light of progress in initiatives, the system is now scheduled to be mandatory by January, FY2016. In order to enhance the effectiveness of audit, Japan will participate in discussions in reviewing the manner of operation.

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. On January 5, 2015, an emergency dispatch of “Kaishomaru”, a dredger-cum-oil recovery vessel, was made to recover oil from an oil spill found offshore of Shimane Prefecture.

Moreover, the amount of allowable oil and waste excreted from vessels is regulated by the MARPOL Treaty <sup>Note 2</sup>. The regulation over waste generated by vessels was further reinforced in January 2013 with the amendment on annexes of the protocol. In order to attain proper disposal measures in ports and harbors, Japan is providing support for improving reception facilities for waste oil generated by vessels by means of tax policies and the formulation of the “Guideline for Reception Facilities of Ship Generated Waste for Ports and Harbors (Plan)”.

**Note 1** “The Path of Recycling Sewerage Environmental Education Portal Site”  
<http://www.jswa.jp/kankyo-kyoiku/index.html>

**Note 2** International protocol for preventing pollution by marine vessels.

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

As nitrogen oxides (NOx) would cause acid rain and provide adverse impacts on human health, the International Maritime Organization (IMO) regulates the NOx emissions from ships based on the MARPOL Convention. Currently, NOx Tier II limits are in effect, which reduce the NOx emissions by 20% compared to NOx Tier I limits. Further, the MARPOL Convention provides NOx Tier III limits which reduce NOx emissions by 80% compared to the NOx Tier I limits for emission control area. The NOx Tier III limits were proposed by Japan, as one of the world's leading engine manufacturing countries. In proposing NOx Tier III limits, Japanese engine manufacturers conducted developments of exhaust gas after-treatment devices (SCR equipment) which significantly reduce NOx emissions from ships as well as in-engine combustion technologies and demonstrated availability of those technologies through onboard tests. As the results of the technological developments, it was shown that reduction of NOx emissions for Tier III limits could be achieved.

The MLIT has contributed to reduce NOx emissions from ships by retaining the effective date of NOx Tier III standards as 1st January 2016 in accordance with the MARPOL Convention, while some countries claim it should be postponed.

## (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 1</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 to the 186th ordinary session of the Diet and it passed with an unanimous vote. Moreover, Japan concluded the Convention in October 2014 <sup>Note 2</sup>.

## 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

##### a. Reinforcing exhaust gas regulations

For exhaust gas measures of new vehicles, seeking to further reduce nitrogen oxides and particulate matter emitted by vehicles, Japan established the most stringent regulations among global standards (post-new long-term regulation) in 2008, and began its consequent enforcement beginning in October 2009. In addition, for diesel heavy vehicles, new Off-Cycle measure was deployed and regulations have been sequentially enforced since October, 2013. For diesel special vehicles, in January 2014 the regulations related to the further reduction of nitrogen oxides and measures for blow-by gas were newly revised and have been sequentially enforced since October 2014.

Meanwhile, 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; Japan is working to bolster exhaust gas measures.

**Note 1** Sea water loaded as weight to balance the ship when it carries no cargo.

**Note 2** 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.

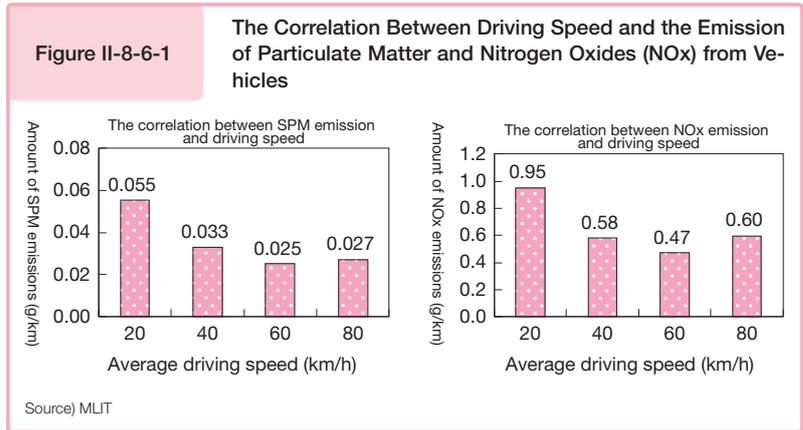
b. Development and practical application of next generation heavy vehicles

In order to promote the development and practical application of next-generation heavy vehicles, from 2011 the technological development of high efficiency hybrid trucks, electric/plug-in hybrid trucks, and high performance electric buses was started. Efforts for practical application was also started, such as driving tests of prototype vehicles under actual use conditions, and formulation of the necessary standards.

(2) Promotion of Railway Crossing Measures

a. Countermeasures for Air Pollution

As the emission of particulate matter (PM) and nitrogen oxides (NOx) from automobiles is increased by the number of starts and stops, as well as the decrease of running speed, traffic flow improvement measures are being promoted from the standpoint of improving the roadside environment by, for example, building trunk road networks, pursuing countermeasures for bottlenecks, and instituting transportation demand management (TDM) measures.



b. 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

The most effective means of curbing aircraft noise is the implementation of low-noise equipment. In comparison to the past DC8, the current B767 only produces 80dB (A) <sup>Note</sup> of noise which has an approximately 90% smaller range of noise impact. For the areas where there is still noise impact in spite of the use of low-noise equipment, measures such as insulation work for private residences and relocation compensation projects are necessary. Most of the sound insulation work for housing, excluding continued maintenance, has been completed. Although the issues related to aircraft noise are progressing towards improvement and noise control zones in each airport are being sequentially reviewed, further measures are needed to reduce noise pollution in the future in order to promote harmonious development around airports and surrounding areas.

**Note** The noise (sound pressure) level weighed by A-frequency (frequency adjustments to evaluate sounds close to that of human senses, because the sensitivity of human ears differ depending on frequency).

### 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. Though the global temperature has only elevated around 0.7°C in the last century, Japanese metropolitan areas have seen elevations of around 2 to 3°C, indicating the significant progression in heat island phenomena compared to the global warming trends. The main cause of this phenomenon is said to be increases in artificial heat from air-conditioning, the reduction of greenery and water surface, and the modification of land surface by urban development.

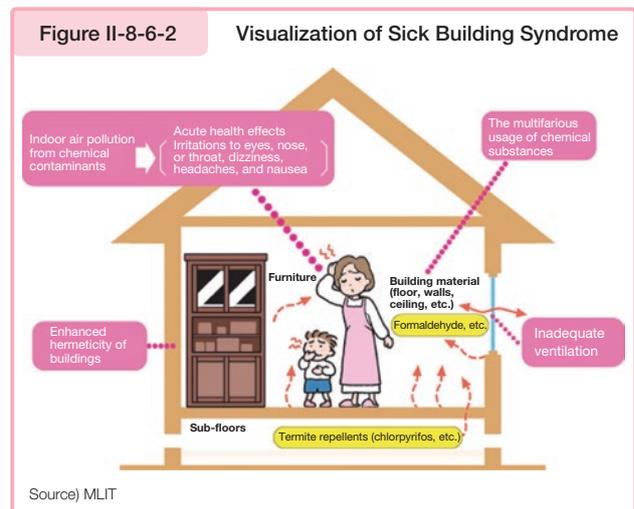
In order to promote comprehensive and effective countermeasures against urban heat islands, Japan is administering improvements to the “Heat Island Monitoring Network”, a collection of specific measures systematically compiled in 2013 by relevant ministries and agencies. Improvements included the addition of the four objectives for promoting policies to alleviate health effects on people: reducing artificial heat emission, improving land surfaces, urban morphology, and lifestyle. The MLIT focuses on promoting policies for the swift acquisition of greenery and open spaces.

### 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 FY2013, the sediment of all locations and the water quality of 97% (215 locations out of 221) of the locations satisfied environmental standards.

For rivers and harbors where sludge containing dioxin levels exceeding environmental standards were found, basic concepts over measures for rivers and harbors were integrated, and measures are being implemented based on the “Manual for countermeasures against contaminated sediment with dioxins encountered in harbors (revised edition)” and the “Manual for countermeasures against sediment with dioxins encountered in rivers and lakes”, which were revised in April

2008. In addition, Japan is supporting pollution prevention projects in rivers and lakes with dioxins levels detected to be exceeding standards. In addition, support is being provided for pollution prevention enterprises for harbors and rivers for which dioxins exceeding the standards have been detected in the bottom sediment.

### (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

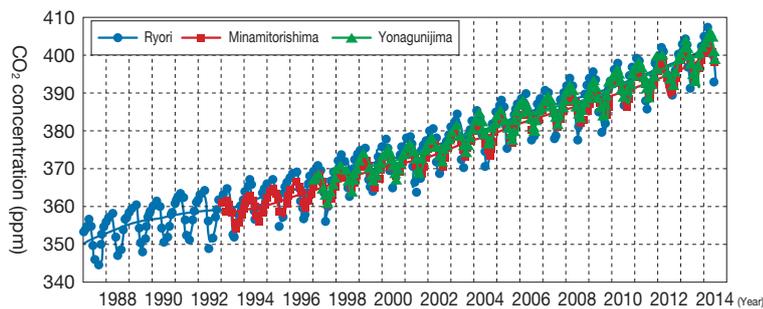
#### (1) Observing and monitoring climate change

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 northwest Pacific by research vessel. GHGs in the upper troposphere in the northwest 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 Center for Greenhouse Gases (WDCGG) of the World Meteorological Organization (WMO), JMA also archives and provides observation data on greenhouse gases around the world.

Figure II-8-7-1 Shifts in CO<sub>2</sub> concentration throughout Japan

Source: Japan Meteorological Agency

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

The Japan Meteorological Agency (JMA) monitors the extreme weather that occurs in Japan and many parts of the world to compile and then report on a regular basis their observations regarding areas with extreme high and low temperatures or rainfall as well as weather disasters. Also, when extreme weather conditions are occurring that significantly affect the public, progressive reports are given summarizing 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) Initiatives aimed to operate next-generation geostationary meteorological satellite

On October 7, 2014, the next-generation geostationary meteorological satellite “Himawari-8” was launched, and it is expected to start observation operations in mid-2015. There are also plans to launch “Himawari-9” in 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, starting with global warming.

## Column

### The launch of next-generation geostationary meteorological satellite “Himawari-8” and capturing the first images

The next-generation geostationary meteorological satellite <sup>Note</sup> “Himawari-8” was launched on October 7, 2014, and on December 18, the first images were successfully captured. It is expected to start observation operations in mid-2015. In 2016 “Himawari-9” will be scheduled to be launched, and after its role as the backup to Himawari-8 is completed, it is expected to start observation operations in 2022.

“Himawari-8” is the world's most advanced next-generation geostationary meteorological satellite and compared to the current satellite “MTSAT-2”, its observation functions have been extensively strengthened. For example, MTSAT-2 makes an observation of the East Asia/Western Pacific area every 30 minutes, but Himawari-8 will make an observation every 10 minutes and further, it can concurrently observe the Japan area and tropical cyclone vicinities every 2.5 minutes. The number of image types will also increase from 5 types to 16 types, and will be able to create color images by combining 3 types of visible images (images that observe light in the 3 colors of red, green and blue). The horizontal resolution will become double. With these improved functions, its contribution to the field of Earth's environment can be anticipated for not only the live monitoring of tropical cyclones and cumulonimbus clouds that bring heavy rains and volcanic ash, but also for things such as sea surface temperature, sea ice, yellow dust, etc.

**Note** Japan Meteorological Agency website “Meteorological Satellites -JMA-”  
<http://www.jma.go.jp/jma/jma-eng/satellite/index.html>

Launch of "Himawari-8"



Source) Mitsubishi Heavy Industries, Ltd.

Exterior Appearance of "Himawari-8 & Himawari-9"



Source) Japan Meteorological Agency

First image from "Himawari-8"



(Note) Color image combining 3 types of visible images.  
Source) Japan Meteorological Agency

#### (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 Ocean along with using data from satellites and Argo floats, or profiling floats to automatically observe the ocean interior.

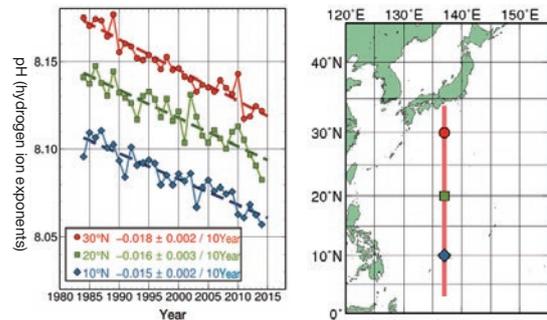
JMA website "Marine Diagnosis Report" provides information on the present status of the ocean such as ocean temperatures, ocean currents, sea level, sea ice, as well as the prospect for the future.

In order to supplement data obtained from Argo floats, 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 by research vessels

The long-term changes in hydrogen ion exponents (pH) in 10, 20, 30 degrees latitude north along the 137<sup>th</sup> longitude line (left) and the analysis results (right). The numbers in the graph indicate the variation ratio per 10 years. The progression of "oceanic acidification" is indicated by how much the pH decreases.



Source) Japan Meteorological Agency

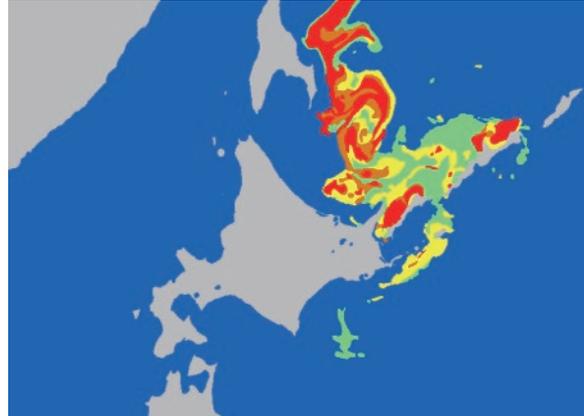
### (5) Observing and monitoring the ozone layer

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.

Figure II-8-7-3

Example of a “Marine Diagnosis Report” published on the Japan Meteorological Agency Website

[Sea ice outflow in southeast waters past Cape Erimo in April 2014]  
 · In April 2014, sea ice was observed in the waters southeast of Cape Erimo. This was the first occurrence in April since 1971 when the use of the current method of sea ice analysis was started.



[Sea ice analysis chart (April 22, 2014)]

Legend: 

(0 degrees proximity from left (open water), 1-3, 4-6, 7-8, 9-10)

(Note) The proximity degree of sea ice (ratio of the area of sea ice in the sea waters) is color coded into 4 levels. For sea ice analysis, coastal sea ice observation data and observation data from satellite, aircraft and vessels are used.

Source) Japan Meteorological Agency

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

The Geospatial Information Authority of Japan is conducting geodetic observation of the Antarctic regions, creating and updating topographic maps, and developing satellite image views. The achieved results contribute to the smooth and safe activities of Antarctic research expeditions, and contribute to the research of global environmental changes etc., as well as international activities related to, geodetic surveys and geospatial information.

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 topological studies on the sea floor. The observation data is being used for creating hydrographic charts and also 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 Program (WCRP). The Meteorological Research Institute conducts research on global warming predictions as well as development of Earth System Models including the carbon cycle processes, and actively contributed to the Fifth Assessment Report (published 2013 – 2014) of the Intergovernmental Panel on Climate Change (IPCC). In addition, the Japan Meteorological Agency published the “Global Warming Projection Volume 8 in 2012, which showed a warming prediction around Japan more detailed than any in the past by using a sophisticated regional climate model.

In 2013, the National Institute for Land and Infrastructure Management published the results of research conducted

thus far as the “Research on Climate Change Adaptation Policy (Interim Report)” that presented the technical infrastructure that is required in order to consider and establish measures, from a multi-faceted standpoint of irrigation and flood control as well as the environment, which can respond to future climate change.

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

Japan serves as the secretariat for the International Steering Committee for Global Mapping, collaborating with the national geospatial information authority of various nations to sketch the Global Map (digitalized geospatial information on global terrain), leading Global Mapping Project (183 participating nations and regions as of January 2015), and advancing the utilization for understanding and analysis of the global environment through the United Nations Committee of Experts on Global Geospatial Information Management (UNCE-GGIM) and others. In addition, by participating in international observation, utilizing VLBI (Very Long Baseline Interferometry is a type of ranging method using radio waves from quasars) and SLR (Satellite Laser Ranging is a method for measuring the range of an orbit by deflecting laser off of retro-reflectors on an artificial satellite), tide observation, observation of absolute gravity, and International GNSS service (IGS), Japan is conducting observations and research on global scale tectonic activity. Furthermore, the analysis of satellite data is being used to conduct “National Environment Monitoring”, which shows land use and change in vegetation.