Ministry of Economy, Trade and Industry		- Ultra low voltage device project for low carbon society -Silicon implementation support program for next generation semiconductor circuit architectures -Project to develop a platform for embedded systems -Program to develop and demonstrate key next-generation information technologies that incorporate high reliability and energy efficiency (Program of research and development and demonstration utilizing cloud computing) [literal translation] -Infrastructure project for a computer security early-warning system [literal translation] -Project for corporate and personal information security measures [literal translation]
	New Energy and Industrial Technology Development Organization (NEDO)	-GREEN-IT Project -Development of Functionality Innovative Three-dimensional Integrated Circuit (Dream Chip) Technology -MIRAI project -Developing technologies for next-generation process-friendly designing - -Spintronics nonvolatile function technology project -Development of high speed nonvolatile memory function technology -Development of core technology for the next-generation, large-size, low-power consumption display -Development of the next-generation high-efficiency network device technology -Project for development of the next-generation robot intelligence technology -Project for Open Innovation Promotion by Utilizing Basic Robotic Technology -Project for Strategic Development of Advanced Robotics Elemental Technologies -Project for industrialization of life assistance robots [literal translation]
	Information Technology Promotion Agency	-Task of creating an early warning system for computer security -Taking security measures for corporate and private information -Utilization promotion project for open software [literal translation]
Ministry of Land, Infrastructure, Transport and Tourism		-Study on unmanned work, inspection, and diagnosis by using subsea robots

3 Environmental Sciences

The environment sciences, considered a prioritized area by the 3rd Basic Plan, is an essential area of science for preserving the natural environment, including ecological systems with diverse forms of life, for maintaining human health and preserving individuals' living environment, and for maintaining the platforms for the survival of human beings in the future. In particular, addressing climate change, one of the most important issues facing the international community, the 4th Assessment Report prepared by the Intergovernmental Panel on Climate Change (IPCC) in 2007 pointed out that there was a high possibility that climate change had already influenced the global environment. In addition, the "New Growth Strategy," decided by the Cabinet in June 2010, has set forth the goal to spread and promote Japan's top level environmental technology to make it the world number one "Environment and Energy Country," by promoting the package of green innovation and comprehensive measures. Japan divides the environmental

field into six research areas, and is working on the following measures:

(1) Climate change

(Promotion of earth observation)

To find appropriate solutions to global environmental problems, it is necessary to obtain basic data in order to gain a comprehensive understanding of the situation with which the earth is currently faced and make predictions about its future. Japan has been promoting global environment observation using a variety of means, such as from satellites, land, and ocean, to contribute to the "Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan," which was agreed upon at the Earth Observation Summit.

As an Earth observation satellite system, earth observation from an artificial satellite is a very effective observation method for collecting a variety of information over an extensive area in a repetitive and continuous fashion. For that reason, satellite-based observation is promoted comprehensively in cooperation with other institutions both in Japan and abroad as a solution for global environmental problems.

Greenhouse Gases Observing Satellite "IBUKI" (GOSAT), which was launched in January 2009, is conducting a global observation necessary to obtain more accurate estimations of the absorption and emission of greenhouse gases and measures global density distribution of greenhouse gases and its fluctuations to help contribute to further promotion of measures against global warming. So far it made some successes on determining the global density distribution of carbon dioxide and methane and also on seasonal fluctuations. Furthermore, the National Institute for Environmental Studies (NIES) is operating a system to process the observational data of GOSAT (preparation of data processing/provision and validation of data quality).

Greenhouse Gases Observing Satellite "IBUKI" (GOSAT)
Source: Japan Aerospace Exploration Agency

JAXA conducted an observation with the Advanced Land Observing Satellite "DAICHI" (ALOS) and is implementing research related to the reduction of the emission of greenhouse gases caused by deforestation and forest degradation in developing countries, Reducing Emissions from Deforestation and Degradation (REDD+). Furthermore, JAXA processes data acquired from Japan's Precipitation Radar (PR) onboard NASA's Tropical Rainfall Measuring Mission (TRMM) satellite and Japan's Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E) onboard the Earth Observation Satellite (Aqua) and then provides the data to researchers. In addition, JAXA also promotes global observation using the satellites in space through R&D on earth observation satellites and sensors that collect and provide various data related to the global environment, including precipitation, clouds, aerosols, vegetation, etc., in an effort to further contribute to the improvement of the accuracy of climate change forecasts. [Refer to Part 2, Chapter 2 "Transdisciplinary areas" 1 (2).]

Based on "Japan EOS Promotion Program (JEPP)," MEXT implemented observational research and the development of advanced equipment for the observation of small elements (nitrogen dioxide, ozone, etc.) and aerosols contained in the troposphere and built observation networks for unobserved areas.

In addition, MEXT implemented an environmental observation project under international cooperation

in Antarctica where the change of the global environment could be observed clearly. Japanese Antarctic Research Programs are centered at the National Institute of Polar Research, affiliated with the Headquarters for Japanese Antarctic Research Expedition (JARE) (Director: Minister of MEXT), and are operated in cooperation with relevant ministries.

FY 2010 was the first year of the VIII JARE observation plan (FY 2010-2016) that aims to clarify "global warming" added to the basic observation that continue over the MST (Mesosphere-Stratosphere-Troposphere) / (Incoherent Scatter) radar (PANSY) that is newly installed in Syowa Station. In addition, promoting an observational research to discover the role of extreme environment on global scale by comprehensively analyze the fluctuation mechanisms of various phenomena that occurs in extreme environment from the observation of areas such as upper atmosphere, ocean, snow and ice, and geological features..

While in effort to clarify the release and absorption mechanism of greenhouse gases of the industries such as agriculture, forestry and fishery, MAFF has been working on the development of technologies to reduce the release of greenhouse gases and to improve the absorption capability of forests, farmland and soil. In addition, while monitoring the greenhouse gases released from industries such as agriculture, forestry and fishery, MAFF is conducting assessment of impacts including development of highly precise prediction model of water resources and a model for predicting the yield and quality utilizing the latest climate change model. Furthermore, based on the assessment of impacts, MAFF is developing production stabilization technologies that can cope with the progress of global warming.

MIC is developing a differential absorption LIDAR[1], for remote sensing of CO2 at the National Institute of Information and Communications Technology (NICT). Furthermore, the ministry is implementing R&D on sensing network technology to resolve 3-dimensional structures in urban atmospheres, which will also have a large impact on environmental changes in Asia and the rest of the world. It also develops the next generation Doppler radar necessary to measure and project the risk of unexpected localized disasters. In addition, NICT developed a Superconducting Submillimeter-Wave Limb Emission Sounder (SMILES)[2] on-board the exposed facility of the Japanese Experiment Module "Kibo" on the International Space Station and is also researching technology related to the measurement of global environmental changes from space.

MAFF is creating a database of imaging data obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard NASA's global observing satellites Terra and Aqua and making it available on the Internet.

MOE promotes research studies conducive to the preservation of the global environment including research on the destruction of the ozone layer and global warming as well as the observation necessary for countermeasures against global warming, from a mid- to long-term perspective.

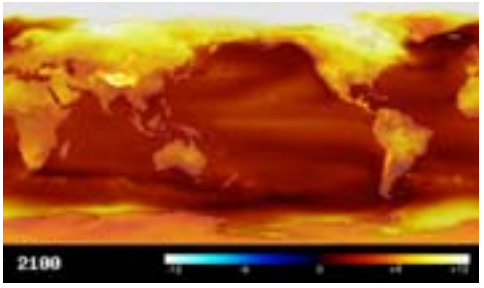
(Promotion of Research Useful to Climate Change Adaptation)

MEXT is executing the "Innovative Program of Climate Change Projection for the 21st Century" for

1 Differential absorption LIDAR: A device that measure the concentration with high precision by comparing (measure the difference) the strength of scattered light by sending the laser beam simultaneously that are absorbable wavelength and non-absorbable wavelength by specific atmospheric components.

2 SMILES: Superconduction Submillimeter-wave Limb-Emission sounder. Placing the antennas to the direction of atmosphere limb and receive submillimeter-wave radiated by the small amount of molecules within the atmosphere by utilizing the high sensitivity low noise receiver containing superconducting sensor and measures the ozone layer and etc.

the purpose of providing the scientific foundations necessary to project policies and measures aimed at global warming and its curtailment as part of its contribution to the IPCC Fifth Assessment Report due for release by around 2013 while promoting R&D on climate models and experiments on high precision and high resolution climate change projection under the Innovative Program of Climate Change Projection for the 21st Century utilizing the Earth Simulator one of the world's most powerful supercomputers. In addition, since FY 2010, MEXT launched the "Research Program on Climate Change Adaptation (RECCA)," and is promoting the necessary R&D in order to provide the results of climate change projections as scientific knowledge to the local governments coming up with climate change adaptation policies. Furthermore, MEXT promoted the establishment of a "Data Integration and Analysis System (DIAS)," which aimed to integrate and analyze various data and results of climate change projections obtained by satellite, terrestrial, and ocean observations, to provide scientific knowledge related to water resources and agriculture produce/water resource management for policymakers and researchers. [Refer to Part 2, Chapter 2, (Transdisciplinary areas) 1 (2).]



Global Warming Projection in 2100
Photo: Center for Climate System Research, the University of Tokyo/ National Institute for Environmental Studies /Frontier Research for Global Change, Japan Agency for Marine-Earth Science and Technology

Furthermore, Japan Agency for Marine-Earth Science and Technology (JAMSTEC) is performing fundamental research aimed at providing insight into the mechanisms behind global environmental change and achieving future projections, as well as R&D on technologies to improve the precision and speed of simulations using the Earth Simulator as well as to project global environmental changes.

The Meteorological Research Institute (MRI) of the Japan Meteorological Agency constructed a geographic earth observation system model for the projection of global warming in which analysis of aerosol and ozone was upgraded. For Japan, MRI is developing a local climate model with a high enough precision and resolution to display local cloud imaging specific to Japan and make spatially detailed regional warming projections.

(2) Hydrological cycles and solute transport in watersheds

Research is being carried out in the fields of research related to hydrological cycles and solute transport in watersheds to design scenarios for the realization of a society that is able to exist in harmony with nature while maintaining a healthy water cycle.

JAMSTEC has established a global earth observation system to observe and collect data and information on water, heat, and material circulation on a regional and global scale and is implementing R&D to monitor changes in water circulation on a global scale through in situ and satellite observation of atmosphere, oceans, and land surfaces.

MEXT and MLIT are working to improve the integrated ocean observing system (ARGO Project), which deploys about 3,000 mid-depth floats to observe and report data on water temperatures and salinity by moving through the range of the sea level to as far as 2,000 meters deep at various locations throughout the world as part of a cooperative international effort to monitor the status of oceans around the world in real time.

MLIT is working on the development of technologies, including land infrastructure technologies that can exist in harmony with nature, where development of reproduction and recovery technologies in the basin zone for comprehensive water circulation management that takes the entire basin zone into consideration can take place. The ministry is also promoting research on modeling of the behavior of high moisture fluid mud in inner-bay and comprehensive monitoring of the environment of inner bays, development of strategic stock management methods for housing and social capital, development of technology to reduce and recycle construction wastes, formation of waste flow systems to facilitate cyclical usage of resources, and research on the collection of biomass energy from sewage sludge and animal manure.

NICT has developed long-range ocean radars able to conduct continuous long-term observation of the flow field of the Kuroshio Current, etc. from shore, installed the radars at Ishigaki and Yonaguni Islands, and is observing the flow field of the Kuroshio Current south of the East China Sea.

(3) Ecosystem management

In research related to ecosystem management, research is being conducted to achieve an exact understanding of the ecosystem and various organisms that live within it in order to assure their maintenance and reproduction.

MAFF is implementing development of indicators of biodiversity and evaluation techniques for the effective promotion of related measures that are considerate toward biodiversity and environmental conservation agriculture. Moreover, the ministry is developing methods to clarify the relationship between marine resources and large-scale changes, and to manage marine resources continuously through clarification of the influence of climate change on the marine ecosystem.

MOE is promoting research into the projection of and countermeasures against the effects of decreases in biodiversity. Furthermore, the ministry is also promoting research in a variety of fields, including those concerned with the preservation of a sound ecological system and human contact with nature, and those concerned with the maintenance and reproduction of a sound ecological system.

(4) Chemical risk and safety management

Chemical substances are used in various products and are increasingly becoming an essential part of people's lives. However, in order to utilize the benefits of these substances sufficiently, it is necessary to understand the risks scientifically and address that risk appropriately while simultaneously working to develop a society with a good sense of balance between risk and benefit. Surveys, R&D, and the formation of an intellectual foundation are all activities currently being conducted most notably by relevant ministries for the development of risk evaluation/management methods for chemical substances, the collection and provision of information on safety, and the development of necessary testing/measurement methods.

MHLW is conducting research on the advancement and expeditiousness of health risk evaluation methods on chemical substances, the effects on vulnerable groups such as children, and health effect of new materials such as nanomaterial.

METI is promoting the development of methods for overall risk evaluation and management throughout the life cycles of chemical substances.

MOE is promoting the R&D of methods for risk assessment tests and measurement methods for chemical substances including the development of an intellectual foundation in an effort to contribute to countermeasures aimed at the environmental risks posed by chemical substances. MOE is also conducting surveys and research for related information to determine countermeasures to be taken toward hazardous metal from an international standpoint.

(5) 3R Technologies

In the research related to 3R[1] technologies, research and technology development on the achievement of a cycle-based socioeconomic system and solutions to the various problems related to waste are being promoted.

METI has worked on a variety of projects that are able to overcome environmental restrictions and material restrictions and to construct a sustainable recycling-based society. More specifically, it has conducted research to develop technology that is able to recover rare metals from high performance magnet motors, lithium-ion batteries, etc. and technologies concerned with the classification of high-grade raw materials in plastic. Furthermore, METI and MOE conducted joint research on technologies to collect and appropriately dispose of rare metals from used compact consumer appliances.

MOE is promoting research and technology development that contributes to solutions for problems related to waste and the building of a recycle-based society, including "research for promoting the 3Rs," "research for promoting the use of waste-derived biomass," "social-scientific research for building a recycle-based society," and "technology advancement on 3R and recovery of energy" while establishing a "special budget for rare metals" as per the previous year, to conduct research on technology and techniques concerned with the recovery of rare metals from used products and other disposed goods where rapid development of these technologies are expected.

(6) Biomass utilization technologies

In the research related to biomass utilization technologies, relevant ministries are promoting the development of biomass utilization technology suited to regions in a way that enables effective energy retrieval.

RIKEN is promoting research and technology development to recycle carbon dioxide by utilizing biotechnology from the production of wood biomass, efficient degradation and materialization of wood biomass using new enzymes and establishing streamlined innovative bio-process for creation of bio-plastics.

METI is focused on the promotion of technology development on effective production of next generation biomass fuel using cellulose based biomass from rice straw, woods, and microalgae that would not compete with food, with a view to develop and import biofuel produced overseas into Japan.

MAFF is mainly implementing the development of cultivating resource crops for use in domestically produced biofuel and methods for low-cost cultivation of such crops, the development of highly efficient biofuel production technologies, and the building of biomass-use models for the comprehensive use of biomass fuel and materials.

1 Reduce, re-use, and recycle

MOE has developed technologies against global warming for practical utilization, such as technologies for efficient production of bioethanol from orange juice residue, and various wood based wastes.

(7) Other

MOE is conducting research on material cycling mechanisms and oceanic pollution caused by hazardous chemical substances in order to help preserve the global marine environment.

Major research subjects conducted in the environmental area in FY 2010 are listed in Table 2-2-4

Table 2-2-4/ Major Research Projects in Environmental Sciences (FY 2010)

Ministry	Research organization	Subject
Ministry of Internal Affairs and Communications	National Institute of Information and Communications Technology (NICT)	-R&D of next generation Doppler Radar technology -R&D on remote sensing [literal translation] -Research on measurement technology for global environmental changes -Research and development of technologies for the measurement of subtropical Earth environments -R&D on sensing network technology
	Fire and Disaster Management Agency	-Ensuring security corresponding to the utilization of new technology/materials
Ministry of Education, Culture, Sports, Science and Technology	Japan Agency for Marine-Earth Science and Technology, Japan Aerospace Exploration Agency, National Institute for Environmental Studies, RIKEN, and universities, etc.	-Earth Observation and Ocean Exploration System -Research on global environmental changes -Research Program on Climate Change Adaptation (RECCA) -The Innovative Program of Climate Change Projection for the 21st Century - Japan Earth Observation System [EOS] Promotion Program -Data integration and analysis system (DIAS) -Biomass engineering
Ministry of Health, Labour and Welfare	Chemicals Risk Research Project [literal translation] (Health and Labour Sciences Research Grants)	-Research on acceleration and sophistication of the evaluation of harmful chemicals [literal translation] -Research on evaluating the impact of chemicals on children [literal translation] -Research on methods to evaluate the impact of nano-materials on human health
Ministry of Agriculture, Forestry and Fisheries	National Agriculture and Food Research Organization, National Institute for Agro-Environmental Sciences, Japan International Research Center for Agricultural Sciences, Forestry and Forest Products Research Institute, Fisheries Research Agency, etc.	-Development of biomass utilization technology for local revitalization -Development of mitigation and application technologies toward global warming countermeasures in the agriculture, forestry and fishery fields [literal translation] -Development of technology to predict/control population out break of marine life in relation to environmental change -Development of indicators and assessment technologies of biodiversity applicable in agriculture [literal translation]
Ministry of Economy,		-Project for the development of alternative rare metal materials -Development of a highly efficient recovery system of rare metals

Trade and Industry	National Institute of Advanced Industrial Science and Technology	-Evaluation of CO_2 absorption in forests and oceans [literal translation] -Evaluation of influence of carbon dioxide capture and storage on environment -Development of chemical substances and production technology to minimize the emission of environment loaded substances -Development of risk evaluation methods of industrial nano-materials [literal translation] -Development of recycling technology for rare metals, other metals, and chemical products [literal translation] -Development of purification technology to reduce the environmental load -Development of environmental restoration technology by enhancing natural purification functions.
	New Energy and Industrial Technology Development Organization (NEDO)	-Regional biomass heat usage field test project -Development of methods for assessment of the hazardous properties of oil refinery substances, etc. -Development of evaluation methods for the properties of nanoparticles -Development of risk trade-off analysis method aiming for optimum control of chemical substances -Development of hazard assessment via structure-activity correlation methods - Development of alternative technology for harmful chemical substances. -Project on development of innovation production system for cellulose based ethanol -Project on technology development of strategic next generation biomass energy application
Ministry of Land, Infrastructure, Transport and Tourism	Institute for Land and Infrastructure Management	-Research on sustainable disposal at landfills in coastal areas -Research on the preservation of marine environments in Japanese waters
	Meteorological Research Institute, Meteorological Agency	-Comprehensive projection of climate and environmental change for establishing climate change adaptability
	Hydrographic and Oceanographic Department, Japan Coast Guard	-Research on water temperatures, ocean currents, salt, and other aspects of the Western Pacific ocean region
	Public Works Research Institute	-Development of a regional system for the recycling of biomass, centered around joint biogas plant(s) -Development of dam technology to preserve the natural environment -Development of technology to alleviate environmental risks in daily life -Development of technology to preserve/restore water ecosystems -Research on the intensive land use of coastal areas in cold regions -Development of design technology for river basins and channels that coexists with the environment in the field of rivers in cold regions
	National Maritime Research Institute	-Research conducive to the prevention of air pollution due to gas emissions from ships -Research on the development of technologies to reduce volatile organic solvent from painting on ships [literal translation]
Ministry of Land, Infrastructure, Transport and Tourism	Port and Airport Research Institute	-Suggestions on management methods for persistent organic pollutants accumulated in inner bays [literal translation] -Discussion on numeric indicators related to stability and health of coastal natural infrastructure [literal translation] -Research on modeling of the behavior of high moisture fluid mud in inner-bay -Permanent consecutive observation and statistical analysis of environments in closed inner bays [literal translation] -Creation of assessment chart on bio-environment based on development of tidal mud bio-ground research -Survey and experiment on feeding behaviors of species in higher trophic

		levels of the coastal ecosystem [literal translation] -Development of simulators of water quality and ecosystem of inner bays for seas filled with living creatures [literal translation] -Survey and experiment on the enhancement of CO2 absorption in coastal ecosystems [literal translation] -Promotion of projection methods on effects of environmental repair by using dredged soil [literal translation]
Ministry of the Environment		-Comprehensive research on evaluation of the impacts of global warming and adaptability policy - Comprehensive research to clarify the broader air pollution in East Asia and to promote atmospheric environment management with consideration for compatibility with measures against global warming [literal translation] -Research on countermeasures for geomorphic and water resource changes in small island states consisting of atolls [literal translation] -Research on the promotion of a long-term ecosystem monitoring and data network for Asian continental carbon cycle observation [literal translation] -Observation of greenhouse gases over Asia-Pacific region utilizing commercial aircraft -Real-time measurement of nitro compounds in the exhaust of diesel vehicles using PTR-TOFMS [literal translation] -Development of fast and inexpensive analytical systems for inorganic soil pollutants [literal translation] -Research on the development of methods for estimating various types of bear population [literal translation] -Development of systematic methods of evaluating the impacts of ecological risk using microcosms [literal translation] -Research on safety of materials used in detoxification of amosite -Development of high selective separation technologies for rare metals using biomass from food waste -Development of catalytic cracking technology to convert used food oil to light oil -Development of technology on practical application of an urban biomass energy system for the use of dry methane fermentation [literal translation] -Development of energy conservation and low cost bio-ethanol production system from various wooden waste materials -Development of effective production technologies to produce bioethanol from the residue of orange juice [literal translation] -Production cost of observational research equipment equipped on satellites -Investigative research on the biological effect of environmental nanoparticles -Survey of POP residues in the general environment [literal translation] -Basic research for hazardous heavy metal countermeasure strategy -Provision of information on hazardous property classification, label investigation, and label information on chemical substances
	National Institute for Environmental Studies	-Clarification of the regional characteristics and mechanisms of long-term changes in the concentration of greenhouse gases [literal translation] -Observation of carbon dioxide using satellites and estimation of global carbon balance distribution [literal translation] -Risk assessment of global warming by integrating climate, influence, and land use models [literal translation] -Overall assessment of vision construction and measures for the achievement of an anti-global warming community [literal translation] -Design and evaluation of resource recycling system and policy and

		management techniques for the near future [literal translation] -Planning and evaluation of measures for the management of the recycling of reusable or toxic substances [literal translation] -Development of Win-Win type resource recycling technologies for biomass waste [literal translation] -Construction of a proper management network and technical system that supports international resource recycling [literal translation] -Exposure level evaluation by integrated analysis of combined factors related to the exposure of chemical substances [literal translation] -Assessment of the impacts of chemical substances on health, focusing on factors of sensitivity [literal translation] -Assessment of the bio-kinetics of environmental nanoparticles and their impact on health [literal translation] -Development of assessment techniques for environmental impact from the viewpoint of biodiversity and ecological function [literal translation] -Development of atmospheric environmental evaluation techniques in Asia [literal translation] -Development of assessment system for the circulation of water and substances in East Asia [literal translation] -Development of environmental impact evaluation techniques for valley ecosystems [literal translation]

4 Nanotechnology and Materials

The nanotechnology and materials field contributes to the progress of S&T and to problem solving in fields such as life sciences, information and telecommunications, and environmental sciences. It forms important technology seeds that realize the development of industry, affluent lifestyles for all, and a comfortable society that is safe and secure.

(1) Nano-electronics

Aiming to bring forth rapid development and overcome the technical and performance limitations of future information and communication technology, NICT is conducting R&D of fundamental technologies, such as advanced quantum control technologies, photon level signal control technologies, technologies for unused spectra, technologies to control and use atomic/molecular structures, and others; utilizing atoms, molecules, and other new materials such as superconductors.

National Institute for Materials Science (NIMS) is developing information and communication technology materials utilizing nanotechnology

METI is developing nano-electronics technology based on the operating principles of near-field optics to realize optical devices that include low-loss and high-function polarization control components.

(2) Bionanotechnology and biomaterial

NIMS is developing biomaterials utilizing nanotechnology.

MAFF is working on the development of processing and assessment technologies for developing new food materials utilizing nanotechnologies.

METI is developing image diagnosis system to detect functional changes in cells and detect cancer at an ultra early stage as well as devices that will be able to specifically target and treat cancer cells with pinpoint accuracy.

(3) Materials

MEXT is promoting the strategy for rare elements to develop innovative catalysts for structural design and control at the nano-scale and technologies to scientifically elucidating roles of elements that determine the characteristics and functions of substances and materials to help ensure the replacement and reduction of using rare element. In addition, it also promotes fundamental R&D for breakthroughs in environmental technologies as part of the "Program for development of environmental technologies utilizing nanotechnology."

Besides promoting R&D on common basic technology for nanotechnology such as basic technology of measurement and analysis and nano-structure control technology, research on creation of innovative seeds that hold the key to the next generation and structural control based on structural and organizational control at the nano level, NIMS is also promoting R&D to increase the sophistication of environmental and energy materials as well as R&D of materials that are highly reliable and safe.

METI is developing fundamental processing technologies related to welding and forging technologies for structural control at the nano-scale to ensure further reliability, higher strength, and lighter weight by taking advantage of the special characteristics inherent to high-class steel products that have been structurally-controlled to that level.

(4) Promotion platform for nanotechnology/material

MEXT is preparing in anticipation of its shared use in FY 2011 of the "X-ray Free Electron Lasers (XFEL) Facility," which enables instant observation and analysis of ultra-fine structures at the atomic level and the ultra high-speed movements of chemical reactions. (Refer to Part 2, Chapter 2, [Transdisciplinary areas] 1 [5].) Furthermore, the ministry is promoting the commoditization of state-of-the-art research facilities and equipment owned by research institutions such as universities and independent administrative institutions through the "Nanotechnology Network" in an effort to promote research field integration that will produce achievement and spawn innovation.

SiAlON Phosphor developed by NIMS (Above) and the applied products (white LED) (Below)

Excellent resistance with high efficiency, increasingly used practically as LED illuminations and backlights in LCDs

Photo: National Institute for Materials Science

METI is promoting the project "Challenges for Nanotechnologies in the Fusion of Interdisciplinary Industries and Fields [literal translation]" to strengthen the vertical collaboration between upstream and downstream industries and cross-industrial and cross-field collaboration in an effort to improve the technical capacity and international competitiveness of Japanese industries. In addition, METI is also implementing the "development of advanced assessment standards for functional semiconductors" to clarify the impact of new materials used in semiconductor manufacturing on the functionality of finished products.

The National Institute of Advanced Industrial Science and Technology (AIST), the National Institute for Materials Science (NIMS), the University of Tsukuba, and industries are working in collaboration to promote the formation of a world-class advanced nanotechnology research center, "Tsukuba Innovation Arena (TIA-nano) in the City of Tsukuba.