

Chapter 7

Research and Systematic Observation

7.1 Comprehensive Government Policies and Fundraising for Research and Systematic Observation

In 1990, The Government of Japan established a budgeting system for the Global Environment Research Fund. This fund was for the research, observation and technological development concerning global environmental issues, for the comprehensive promotion of various types of research and studies on global environmental conservation, and for carrying out interdisciplinary and international global environmental research through cooperation among relevant ministries and agencies. In April 2001, the Global Environment Research Account for National Institutes was created to promote studies on global warming from both medium- and long-term perspectives.

In December 2000, the Cabinet drew up a new Basic Environment Plan, in accordance with the Basic Environment Law, with the long-term target of creating a society in which “recycling”, “symbiosis”, “participation” and “international measures” can be realized. The Plan strives to comprehensively and systematically promote measures for environmental conservation with a view towards the mid-21st century. It cites the promotion of global warming-related measures as one of its key strategic programs. It also specifies related measures for the government to take by including sections on “improvements in research and studies, monitoring, and observation, and promotion of proper technologies” and “ensuring international cooperation concerning research and studies, monitoring, and observation.”

In March 2001, the Government of Japan adopted the Second Science and Technology Basic Plan (from 2001 to 2005) in accordance with the Science and Technology Basic Law, and the academic field of Environmental Sciences was selected as one of four priority fields for allocating research and development resources. Accordingly, a sectoral promotion strategy for Environmental Sciences was decided in September 2001 by the Council for Science and Technology Policy (CSTP), chaired by the Prime Minister. The Council was established in 2001 as a central resource for comprehensive science and technology policy, strengthening coordination among related ministries and agencies in this sector. Under this promotion strategy, it was decided that the government as a whole will make it a top priority to “carry out observation and projection related to global warming; assess the effects of environmental changes, such as temperature increase and sea level rise, on nature, the economy, and society; and develop technologies and methods to avoid or minimize any detrimental effects” in its global warming-related research.

Along with the above strategy, Japan has been comprehensively promoting observation and projection studies on global changes including global warming. In March 2002, the country began operating the world's highest performance supercomputer system, the Earth Simulator, used for studying global warming projections and changes in the Earth's interior. The Earth Simulator's functions were updated in March 2009 for higher-precision projection studies.

In November 2004, in order to strategically promote comprehensive research in the climate change field and based upon outcomes from research activities until then, the Strategic Promotion of Climate Change Research Policy was compiled by the Global Warming Research Initiative, a directive for environmental research under the CSTP.

Furthermore, in March 2006, the Government of Japan adopted the Third Science and Technology Basic Plan (from 2006 to 2010) and the academic field of Environmental Sciences was again cited as one of the four priority fields for allocating research and development resources. The Basic Plan also set out specific policy objectives that the science and technology sector should pursue, and cited "overcoming of global warming and energy problems" as one such objective.

In 2008, the Government of Japan adopted the Cool Earth-Innovative Energy Technology Program and the Environment and Energy Technology Innovation Plan, both of which serve as the nation's technological strategy toward realizing a low-carbon society. The plans set out a roadmap for developing and spreading key technologies that will contribute to reductions in greenhouse gas emissions in energy-consuming sectors, including the energy supply and industrial sectors, the civilian sector (such as households and offices), and the transport sector. In July 2008, the Cabinet adopted the Action Plan for Achieving a Low-Carbon Society as an action plan for implementing these measures.

The results of global warming projection and process studies under the "Kyosei" Project have greatly contributed to the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) released in 2007. The "Kyosei" Project used both the Earth Simulator and results from other global warming-related natural science studies, including scenario-based climate change studies funded by the Special Coordination Fund for Promoting Science and Technology, Grants-in-Aid for Scientific Research (Kakenhi), and ordinary budget funds. In order to also contribute to the Fifth Assessment Report of the IPCC, Japan launched the "*KAKUSHIN Program*" (Innovative Program of Climate Change Projection for the 21st Century) as a new five-year program to succeed the "Kyosei" Project in FY2007, and to continue research activities using the Earth Simulator.

As for the area of systematic observation, Japan has been promoting the establishment of an

observation network that combines observation on the ground with observation by satellites, aircraft, and ships, and the following international and national observation activities are under way.

Internationally, at the Third Earth Observation Summit held in February 2005 in Brussels in accordance with an agreement reached at the June 2003 Group of Eight (G-8) Summit in Evian, France, the 10-Year Implementation Plan of the Global Earth Observation System of Systems (GEOSS) was formulated. Japan has been proactively contributing to GEOSS development by serving as a member of the Executive Committee of the Group on Earth Observations (GEO) and also co-chairing the GEO Architecture and Data Committee.

Domestically, in response to the deepening international discussions toward the establishment of GEOSS, the CSTP drew up the Earth Observation Promotion Strategy in December 2004. Based on this Strategy, the Earth Observation Promotion Committee was established under the Council for Science and Technology of the Ministry of Education, Culture, Sports Science and Technology (MEXT) in February 2005 in order to annually elaborate upon the Earth Observation Implementation Policy. Currently the relevant ministries and agencies, as well as other concerned organizations, are working together toward the realization of a comprehensive, needs-driven Earth observation, based on the Implementation Policy, to be revised annually. In addition, under the Earth Observation Promotion Plan, a competitive research funding program started in April 2005, allows Japan to effectively implement research and development programs which directly contribute to the establishment of advanced Earth observation systems and GEOSS development through mobilizing highly competent research institutes.

Furthermore, in the Kyoto Protocol Target Achievement Plan formulated by the government in April 2005 and based on The Law Concerning the Promotion of Measures to Cope with Global Warming, there is a section on the “promotion of research on climate change and strengthening of observation and monitoring systems.” The plan states that it is a basic policy of the Government of Japan to strengthen comprehensive observation and monitoring systems.

7.2 Research

7.2.1 Basic Principles

- Under the Global Warming Research Initiative included in the sectoral promotion strategy of Environmental Sciences in the Second Science and Technology Basic Plan decided by the CSTP in September 2001, individual research projects which had been implemented by various ministries were integrated into the following research programs. Consequently the

related research and development has been collaboratively promoted among industry, academia and government:

- a Comprehensive monitoring program for global warming
 - b Research program for projecting global warming and climate change
 - c Research program for assessing impacts and risks of global warming
 - d Program for developing technologies to fix and sequester greenhouse gases
 - e Technological development program for controlling greenhouse gas emissions caused by human activities, such as energy generation
 - f Policy research program for controlling global warming
- The Third Science and Technology Basic Plan (from 2006 to 2010) adopted by the Cabinet in March 2006 again cited the academic field of Environmental Sciences as one of the four priority fields for allocating research and development resources. The Basic Plan also set out specific policy objectives that the science and technology sector should pursue, and cited “overcoming of global warming and energy problems” as one such objective.
- Japan participates and cooperates in the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme of Global Environmental Change (IHDP), and other international global environmental research programs, conducts research and studies based upon the appropriate international division of tasks, and otherwise promotes joint research and other initiatives with overseas research organizations.
- Through the Asia-Pacific Network for Global Change Research (APN), Japan promotes research on global environmental change in the Asia-Pacific region in cooperation with researchers throughout the region, thus developing and improving a regional research network on global environmental change.
- In an effort to contribute to the development of government policy on climate change and global warming, Japan actively promotes research on global environmental problems from a human and social perspective, academic research integrating the natural and social sciences, and research on socioeconomic systems. Japan is also working to expand the international network of the Institute of Global Environmental Strategies (IGES) established in March 1998 as an international research institute for the study of political and practical strategies to help realize sustainable development on a global scale, particularly with regard to the Asia-Pacific region.

- As agreed at the G-8 L'Aquila Summit, the Government of Japan will continue to contribute to the development of GEOSS, promote the establishment of an integrated observation network employing satellite, oceanic and land observation systems, particularly in the Asia-Pacific region, monitor and evaluate the impact of climate change in the Asia-Pacific region, and provide information to national governments.

7.2.2 Priority Fields

Regarding research and studies on climate change and global warming, the Government of Japan, while taking into consideration the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, is comprehensively promoting research and studies on the observation and projection of global warming and its impact, the fixation, sequestration and reduction of greenhouse gases, global warming control policies and other countermeasures, and adaptation measures for environmental changes associated with global warming. In particular, since the issue of uncertainties of climate change projections were identified by the Fourth Assessment Report (AR4) of the IPCC, Japan has been addressing the reduction of these uncertainties mainly through the “*KAKUSHIN Program*” and by the Global Environment Research Fund. The latest results from this endeavor are expected to contribute to the Fifth Assessment Report of the IPCC, and some of the projection results are provided to developing countries for their regional adaptation studies. Furthermore, as bilateral cooperation, Japan-EU workshops and Japan-US workshops on global change projection studies are held biennially, in order to exchange information and compare projection results. The Government of Japan will also formulate guidelines for the compliance of the post-Kyoto Protocol and establish methods for assessing the absorption of greenhouse gases by forests.

The Government of Japan will also give priority to the promotion of research into the following areas: [1] climate, [2] ecosystems, biodiversity and land use, [3] changes in the atmospheric, terrestrial and marine domains, [4] utilization of resources and the path to sustainable development, and [5] cross-sectoral issues and collaboration between science and policy, in accordance with the strategic plan adopted at the Tenth Inter-Governmental Meeting of the Asia-Pacific Network for Global Change Research (APN), where these were identified as priority research subjects for the Asia-Pacific region.

7.2.3 Main Research Fields

7.2.3.1 Research on Climate Processes and the Climate System, Including Paleoclimate Research

Research and studies have been carried out on the following subjects: study on the spatio-temporal variability and climate change impact of ozone and black carbon in Asia; analysis of seawater temperature in the Asian monsoon region based on coral dendroclimatology; study on highly uncertain physical processes in climate models, such as the indirect effect of aerosols and the effect of radioactivity forced through clouds. In the Innovative Program of Climate Change Projection for the 21st Century, process studies focusing on the ecosystem on land and the mixed layers in the atmosphere or in the ocean are under way, with research results reflected in the development of climate models.

7.2.3.2 Climate Change Projection Modeling and Projection Studies

Climate change projection studies in the areas of sophistication of projection models, quantification of uncertainties, and impact assessment in natural disasters have been conducted under the “*KAKUSHIN Program*” using the Earth Simulator. The studies fall under the following five themes: (1) Projection of long-term climate change (up to 2300); (2) projection for the near future (20 to 30 years); (3) projection of extreme events (typhoons, torrential rains, etc.); (4) sophistication of the cloud resolution model; and (5) parameterization of marine microphysics.

Research carried out through the Global Environment Research Fund includes the following: integrated research on climate change scenarios to increase public awareness and contribute to the policy process; investigation of physical and chemical properties of aerosol by advance technologies for improvement of prediction of climate change.

7.2.3.3 Studies on Climate Change Impact

Research has been carried out on the following themes: comprehensive assessment of climate change impacts to determine the dangerous level of global warming and appropriate stabilization target of atmospheric GHG concentration; experimental study of ocean acidification impact on benthic calcifiers; current situation of biodiversity crisis in the forest-alpine ecotone and its mechanism under global change; and impact assessment of global warming on the circulation and ecosystem of large lakes.

7.2.3.4 Socioeconomic Analysis, Including Analysis of both Climate Change Impact and its Anticipated Reaction

Research has been carried out on the following themes: research project on establishing of methodology to evaluate middle to long term environmental policy options toward asian low-carbon society; research on development of integrated scenarios on climate change and

assessment of climate policies using Asia-Pacific Integrated Model; and analysis of climate change policies.

7.2.3.5 Research and Development on Reduction and Adaptive Technology

Research has been carried out on the following themes: adaptive measures to changes in geomorphology and water resources on atoll island countries; assessment of combined effects of rising temperature and ozone concentration on rice production and quality, and its application for mitigation of food supply risk in Asian countries; biofuel use strategies for sustainable development; scenarios and policies proposal for energy saving in residential/non-residential buildings toward creating a low-carbon society.

Furthermore, for the promotion of international research, at the G8 Environment Ministers' Meeting in Kobe in May 2008, the Government of Japan proposed the International Research Network for Low Carbon Societies (LCS-RNet) as one of the Kobe Initiatives, and its establishment was approved at the G8 Environment Ministers' Meeting held in Syracuse, Italy, in April 2009. Currently, a total of 10 organizations from six countries, including Japan, are participating in LCS-RNet. Research institutes of participating countries are expected to share information on research about low-carbon societies, promote research cooperation, and contribute to international policy-making processes on climate change, including the G8, by communicating research outcomes and recommendations..

7.3 Systematic Observations

7.3.1 Basic Principles

- Observation and monitoring of climate change should be implemented in accordance with the Science and Technology Basic Plan (decided by the Government of Japan in March 2001) and the Earth Observation Promotion Strategy (proposed by the CSTP in December 2004), and promoted comprehensively based on the annual Earth Observation Implementation Policy and the Comprehensive Monitoring Program for Global Warming included in the Global Warming Research Initiative. Bearing in mind Japan's contribution to the development of GEOSS based on the 10-Year Implementation Plan, organizations that carry out such observations and monitoring should adopt methods consistent with international observation and monitoring projects. In addition, the results of their activities should be available to ensure that the data is utilized effectively.

- Again bearing in mind the contribution to the development of GEOSS, the Government of

Japan participates and cooperates in international observation and monitoring programs conducted under the Global Environmental Monitoring System (GEMS), the Global Atmosphere Watch (GAW) Program, the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the Joint World Meteorological Organization (WMO)/UNESCO Intergovernmental Oceanographic Commission (IOC) Technical Commission for Oceanography and Marine Meteorology (JCOMM). It also conducts wide-area observations and monitoring based on the appropriate sharing of international tasks. In addition, the government is also working to promote the Asia-Pacific Network for Global Change Research (APN) and to facilitate the implementation of observations and monitoring throughout the Asia-Pacific region.

- It is important to promote Earth observation by satellites effectively with coordination on a worldwide scale in accordance with Japan's Plan for Satellite Development for Global Observation and Means for Advancing Data Usage compiled in June 2005 by the Space Activities Commission. Accordingly, the Government of Japan is actively participating in the activities of the Committee on Earth Observation Satellites (CEOS) and other international forums and is promoting the development, launch, and operation of satellites in conformity with these activities. Furthermore, the Government of Japan promotes integrated global observations combining satellite, aircraft, ship and ground-based observations in cooperation with international organizations and research projects through GEOSS.

7.3.2 Priority Fields

The Government of Japan places special priority on promoting the observations and monitoring necessary to identify the causes, status and impacts of global warming and climate changes.

Observations and monitoring related to climate changes and global warming cover a wide area (and can include the entire globe), so Japan has actively been promoting the development of effective methods such as the utilization of various satellite sensors, as well as operating geostationary meteorological satellites.

7.3.3 Main Systematic Observations

7.3.3.1 Atmospheric Climate Observing Systems Including Atmospheric Constituent Measurement Systems

Homogeneous and high quality climate observations have been implemented over 150

meteorological stations in Japan for more than several decades. CLIMAT reports (the reporting format of monthly values from a land station set by the WMO) from some of these stations are exchanged internationally on a monthly basis. Japan, in a joint effort with Germany, has been monitoring the reception rates and data quality of CLIMAT reports from all over the world under the framework of the WMO. Japan has also been providing climate change-related information, based on climate data collected and analyzed through the above activities, in quasi-real time both within and outside Japan. Data from geostationary meteorological satellites, such as cloud amount, are used to monitor long-term changes in global radiation, and associated climate change. The Precipitation Radar (PR) aboard the Tropical Rainfall Measuring Mission (TRMM) satellite provides data for rainfall distribution in tropical and subtropical zones. In order to contribute to the further promotion of measures against global warming, including the grasping of the region-by-region status of greenhouse gas absorption and emissions, Japan launched the Greenhouse Gases Observing Satellite (GOSAT) in January 2009 and will start publishing observation data in the future. Furthermore, Japan has been promoting the following activities: research and development of a Dual-Frequency Precipitation Radar (DPR) for the Global Precipitation Measurement (GPM) project in order to internationally contribute in the field of global observations; research on the Global Climate Observation Mission (GCOM), which makes continuous global observations of climate changes and the circulation of water using microwave and multi-band optical radiometers; research on satellite-mounted sensors for observations of greenhouse gasses with higher accuracy; development of a comprehensive system to trace, analyze and forecast the changes in the Sun as well as Earth's upper atmosphere; international joint research for the development of comprehensive observation systems for the middle atmosphere; joint research into global environmental measurement technologies in Asia; and research and development of a stratospheric platform for directly observing the atmosphere at various altitudes ranging from the troposphere to stratosphere.

Table 7.1 Participation in the Global Atmospheric Observing System

	GSN	GUAN	GAW	Others
Number of stations	14	7	7	
Number of operating stations	14	7	7	
Number of stations operating to GCOS standards	14	1	7	
Number of stations expected to be operational in 2010	14	7	7	
Number of stations providing data to International Data Center	14	7	7	

*As of January 1, 2009, including the Showa Station in the Antarctica

**Table 7.2 Atmospheric Observing Systems for Climate at Land Surface
(Land Surface Meteorological Observations)**

System	Climate parameters	Total stations	Appropriate for characterizing national/regional climates?			Time Series Stations [digitized]			Adequate Quality Control Procedures?			Meta data available Total stations [digitized (%)]	Continuity Stations expected to be operational in 2010
			Fully	Partly	No	30-50 years	50-100 years	More than 100 years	Fully	Partly	No		
Stations useful for national climate monitoring purposes	Atmospheric pressure	157	○			18 [18]	79 [79]	60 [60]	○			157 [100]	157
	Cloud	77	○			4 [4]	23 [73]	50 [0]	○			77 [100]	77
	Weather	155	○			19 [155]	76 [0]	60 [0]	○			155 [100]	155
	Humidity	157	○			20 [20]	77 [77]	60 [60]	○			157 [100]	157
	Precipitation	155	○			19 [19]	76 [76]	60 [60]	○			155 [100]	155
	global solar radiation	59	○			59 [59]	0 [0]	0 [0]	○			59 [100]	59
	Sunshine duration	156	○			20 [20]	79 [79]	57 [57]	○			156 [100]	156
	Temperature	157	○			20 [20]	77 [77]	60 [60]	○			157 [100]	157
	Visibility	155	○			19 [155]	76 [0]	60 [0]	○			155 [100]	155
	Wind	156	○			19 [19]	77 [137]	60 [0]	○			156 [100]	156
Stations reporting internationally		53											
CLIMAT reporting Stations		53											

*As of January 1, 2009, including the Showa Station in the Antarctica

Table 7.3 Available Homogenous Data Sets for Land Surface Meteorological Observations

Data set name	Climate Parameters	Stations and Region covered	Time period	Contact
Surface meteorological observation monthly and 10-day mean/total data file	Atmospheric pressure, clouds, weather, humidity, precipitation, global solar radiation, sunshine duration, temperature, wind	156 stations in Japan	1961-2008	Japan Meteorological Agency
Surface meteorological observation daily mean/total data file	As above	As above	1880s-2008	Japan Meteorological Agency
Surface meteorological observation monthly mean/total data file	As above	As above	1880s-2008	Japan Meteorological Agency

*As of January 1, 2009,

Table 7.4 Atmospheric Observing System (Upper Air Meteorological Observations)

System	Total stations	Appropriate for characterizing national/regional climates?			Times Series Stations [digitized]				Adequate Quality Control produces?			Meta data available Total stations [digitized (%)]	Continuity Stations expected to be operational in 2010
		Fully	Partly	No	5-10 years	10-30 years	30-50 years	More than 50 years	Fully	Partly	No		
Radiosonde Stations	17	○			0	0	8 [8]	9 [9]	○			17 [100]	17
Stations reporting internationally	17												
CLIMAT TEMP Reporting Stations	17												
Wind profiler stations	31			0	0	0	0	○				31 [100]	31

*As of January 1, 2009, including the Showa Station in the Antarctica

Table 7.5 Available Homogenous Data Sets for Upper Air Meteorological Observations

Data set name	Climate Parameters	Stations and Area covered	Time series	Contact
Upper air meteorological observation daily mean/total data file	Humidity, temperature, wind, altitude	16 stations in Japan Data at standard atmospheric pressure levels	1981-2008	Japan Meteorological Agency
Upper air meteorological observation monthly mean/total data file	As above	As above	1951-2008	Japan Meteorological Agency

*As of January 1, 2009

Table 7.6 Atmospheric Constituent Observing Systems for Climate

System	Total stations	Appropriate for characterizing national climate?			Times Series Stations [digitized]				Adequate Quality Control Procedures?			Meta data available Total stations [digitized (%)]	Continuity Stations expected to be operational in 2010
		Fully	Partly	No	10-20 years	20-30 years	30-50 years	More than 50 years	Fully	Partly	No		
CO ₂	5	○			4 [4]	1[1]	0	0	○			5 [100]	5
Vertical CO ₂ distribution	4	○			4 [4]				○			4 [100]	4
Surface ozone	7	○			5 [5]	0	0	0	○			8[100]	8
Total ozone	6	○			2 [2]	2[2]	2 [2]	0	○			6 [100]	6
Vertical ozone distribution	6	○			2 [2]	0	2 [2]	2[2]	○			6[100]	6
Other greenhouse gases	7	○			6 [4]	0	0	0	○			7[100]	7
Aerosols	8	○			4 [4]	2[2]	0	0	○			8[100]	8
Vertical aerosols distribution	21	○			0	0	0	0	○			21 [100]	21

*As of January 1, 2009

Total of the Meteorological Agency's observation stations (including the Showa Station in the Antarctica) and the National Institute for Environmental Studies' observation stations

7.3.3.2 Ocean Observing System for Climate

Japan has been promoting the development of the Global Ocean Observing System (GOOS), and also contributing actively to its regional pilot project, the North-East Asian Regional Global

Ocean Observing System (NEAR-GOOS).

Furthermore, Japan has been making efforts to enhance the observation and monitoring systems, and other measurements, to determine time-and-space-related distributions of CO₂ in the ocean, while continuous observation has been implemented at nationwide observation points to monitor the change in the sea levels. Oceanographic observations have also been carried out to monitor oceanic changes associated with climate changes in the western North Pacific. With the aim of sophisticating climate change projection models, Japan has been improving the marine observation system by deploying Triton buoys in the tropical Western Pacific since 1998, and deploying ARGO floats since 2000 under the Advanced Ocean Observing System (ARGO Project). Moreover, Japan has been promoting the following activities: preparation of the foundation for monitoring the marine environment in accordance with the Northwest Pacific Action Plan (NOWPAP); operation of the Advanced Microwave Scanning Radiometer-E (AMSR-E) for marine environmental observations; research on the Global Climate Observation Mission (GCOM), which makes continuous global observations, including the ocean, using microwave and multi-band optical radiometers; provision of data on the rainfall distribution in tropical and subtropical zones using the Precipitation Radar (PR) aboard the Tropical Rainfall Measuring Mission (TRMM) satellite; research and development of a Dual-Frequency Precipitation Radar (DPR) to be mounted on the main satellite for the Global Precipitation Measuring (GPM) project; research on the Global Climate Observation Mission (GCOM), which makes continuous global observations of climate changes and the circulation of water using microwave and multi-band optical radiometers; and research into remote sensing technologies.

Table 7.7 Participation in the Global Ocean Observing System

	VOS	SOOP	Tide gauges	SFC drifters	Sub-SFC floats	Moored buoy	ASAP
Number of stations	485	37 ^{*3}	15 ^{*2}	27 ^{*1}	355 ^{*3}	18 ^{*1}	5
Number of stations providing data to International Data Center	59 ^{*4}	37 ^{*3}	15 ^{*2}	27 ^{*1}	355 ^{*3}	18 ^{*1}	5
Number of stations expected to be operational in 2010	The same as at present or more	37 ^{*3}	15 ^{*2}	27	355 ^{*3}	18	5

*1: As of July 16, 2009

*2: Tide gauges registered with the Global Sea Level Observing System (GLOSS), including the Showa Station in the Antarctica

*3: As of July 15, 2009

*4: The number of ships that sent observation table data to the GCC in fiscal 2008

7.3.3.3 Terrestrial Observing System for Climate

Japan is continuously strengthening its observation and monitoring systems and other measures to scrutinize the temporal and spatial distribution of greenhouse gases such as CO₂, CH₄, N₂O, CFCs, and tropospheric ozone, and has also been carrying out the following: monitoring of greenhouse gas flux in northern forests; observation of CO₂ and CH₄ by the Greenhouse Gases Observing Satellite (GOSAT); launch and operation of the Advanced Land Observing Satellite (ALOS); provision of data on the rainfall distribution in tropical and subtropical zones using the Precipitation Radar (PR) aboard the Tropical Rainfall Measuring Mission (TRMM) satellite; operation of the Advanced Microwave Scanning Radiometer-E (AMSR-E) for marine environmental observations; research and development of a Dual-Frequency Precipitation Radar (DPR) to be mounted on the main satellite for the Global Precipitation Measuring (GPM) project; research on the Global Climate Observation Mission (GCOM), which makes continuous global observations of climate changes and the circulation of water using microwave and multi-band optical radiometers; research into satellite-mounted sensors for enhancement of the accuracy of observation of greenhouse gases; research on the Global Climate Observation Mission (GCOM), which makes continuous global observations, including the land surface, using multi-band optical radiometers; and research into remote exploration technologies that carry out terrestrial environmental observations of vegetation amounts (biomass), land use, changes in land coverage, ground moisture, snow and ice.

7.3.3.4 Support for Developing Countries to Establish and Maintain Observation Systems, Relevant Data and Monitoring Systems

Japan has been conducting joint research on global environmental observations and promoting technical transfers in order to build observation networks in areas lacking such facilities in Asia. Japan has also been promoting “science and technology diplomacy,” such as the establishment of strategic environmental monitoring systems using satellites in the Asia-Pacific region, pilot projects concerning the utilization of satellite data through the Asia-Pacific Earth Observation Pilot Project, and capacity development.