Greetings

Japan Science and Technology Agency (JST)
President Michinari Hamaguchi

SATREPS is a program for promoting joint research between Japan and developing countries to address issues of global scale, such as global warming, natural disasters, and infectious diseases. Global issues have become increasingly complex and particularly severe in developing countries. They are now at a stage where they cannot be solved by any single country alone. Solutions will require scientific and technological innovations that transcend borders, as well as efforts to develop the necessary human resources.

In September 2015, the United Nations Sustainable Development Summit was held at U.N. headquarters. This Summit culminated in the adoption of the Sustainable Development Goals (SDGs), a collection of goals for the international community to work together to achieve by 2030. The intention of SATREPS is to contribute to the international community as it aims to achieve sustainable development through the SDGs, by having researchers from Japan and developing countries work together on issues, creating new knowledge and technologies based on local needs, which can be put to use in the actual community.
About SATREPS

The SATREPS program is a collaboration among Japanese government agencies: JST, AMED and JICA. Based on the needs of partner countries, JST/AMED and JICA cooperate to promote international joint research targeting global issues with an objective of future utilization of research outcomes. Implemented through collaboration with Official Development Assistance (ODA), the aim of the program is to acquire new knowledge and technology that lead to the resolution of global issues and the advance of science and technology, and through this process, to create innovations. International joint research under this program also aims to enhance the research and development capabilities of partner countries, and helps create sustainable research systems able to address and resolve issues.

3 Goals of SATREPS

1. International Cooperation
2. Addressing Global Issues and Advancing Science
3. Capacity Development

Utilize Research Outcomes

Overall research and development management of the international joint research is handled jointly by JST and AMED, which has expertise in funding research projects at research institutions in Japan, and JICA, which has expertise in technical cooperation in developing countries. JST and AMED will provide financial support to the Japanese research institutions for the project activities in Japan and JICA will provide financial support to the research institutions in the ODA recipient countries within the framework of technical cooperation projects.
SATREPS and Science & Technology Diplomacy
Contributing to SDGs

SATREPS is an entirely new type of program that combines official development assistance (ODA) with competitive research funding in the fields of science and technology. Since its inception in 2008, over 100 projects in 40-odd countries around the world have been carried out under the program. Joint research activities between Japan and developing countries that address global challenges through science and technology contribute greatly to capacity development and scientific and technological advancement in both Japan and developing countries. They also facilitate research outcomes with the potential of finding wide applicability in society.

In view of the foregoing, the program is anticipated to play an important role in Japan’s efforts to actively address the Sustainable Development Goals (SDGs) adopted by the United Nations.

Recent years have seen an increase in threats that have a global impact, including global warming, major natural disasters, and food problems. SATREPS is working to address such global issues by raising the overall ability of developing countries to handle such challenges, and by enhancing their science and technology research capacity. In addition to conventional methods of applying and transferring science and technology from Japan, SATREPS promotes international joint research so that universities and research institutions in Japan and in developing countries can become partners in the development and application of new technology, and in the acquisition of new knowledge. This program is successfully strengthening science and technology diplomacy policy by using Japan’s science and technology as a resource for diplomacy.

SATREPS Program Director
Dr. Taizo Yashikai
Professor emeritus of Keio University, previously member of the Council for Science and Technology Policy, specialist in international politics and science and technology policy

SATREPS projects around the world

Countries Eligible for the Program

<table>
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<tr>
<th>Research Areas and Fields</th>
<th>2011</th>
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Total (115)
Project Outcomes

Thailand
Development of an Integrated System to Reduce Flood Risk, Help Combat Climate Change

South Africa
Uncovering the Mechanisms of Climate Change Phenomena—for the First Time in the World

Malaysia
Development of a Scenario for Creating a Low-Carbon Society by 2050 and Working toward an Ideal Future

Vietnam
Energy Revolution in Vietnam: Creating Biodiesel Fuel from Diverse Materials

Panama
Taking on the Challenge of Total Aquaculture of Yellowfin Tuna Contributing to the Sustainable Use of Resources

Vietnam
Using Japan’s State-of-the-Art Rice Breeding Technology to Solve Food Problems

Chile
The Power of Science to Create Tsunami-resilient Communities and Save People from Major Earthquakes

Cameroon
Contribution to Investigation of Causes of Limnic Eruptions Receives Award from Cameroon Government

Environment and Energy
(Global-scale environmental issues)

(Vietnam)

Multi-benefit measure for Mitigation of Climate Change in Vietnam and Indochina Countries by Development of Biomass Energy

Panama
Taking on the Challenge of Total Aquaculture of Yellowfin Tuna Contributing to the Sustainable Use of Resources

Bioresources

Disaster Prevention and Mitigation
South Africa

Uncovering the Mechanisms of Climate Change Phenomena
—For the First Time in the World

The southern Africa region is vulnerable to abnormal weather conditions owing to its high reliance on nature-based farming methods. The project analyzed accumulated observational data and numerical simulations to understand how climate change phenomena in the mid-latitude regions of the southern hemisphere occur, increase and decline. It also used the Earth Simulator supercomputer to run a model that reproduces interactions between the atmosphere and oceans. Through these activities, the project succeeded in correctly predicting climate change phenomena for the first time in the world.

As described above, the project was able to satisfy South African expectations for accurate weather forecasts that are necessary for farming and water resource management. It also concentrated on creating an international network of researchers composed mostly of young Japanese and South African researchers. The project was completed, and the impact were exchanged with the South African Weather Service for imparting and expanding the project outcomes, thereby continuing to contribute greatly to the creation of sustainable societies.

Environment and Energy (Global-scale environmental issues)

SDGs Addressed by the Project

Thailand

Development of an Integrated System to Reduce Flood Risk, Help Combat Climate Change

The Chao Phraya River, which has a drainage basin equivalent to roughly 40% of Japan’s land area, is a valuable source of water for Thailand’s farms, factories, and homes. Climate change has increased the risk of droughts, floods and other natural disasters in recent years. The project started in 2008, concurrently with the establishment of SATREPS. Its purpose was to observe on an ongoing basis the effects of climate change on Thailand’s water resources and to conduct research for the development of a model-based forecast system. In the Project’s third year (2011), severe flooding occurred in the Chao Phraya River basin, where many Japanese firms had established branches offices. The floods caused massive damages to Japanese automakers and electronic components producers in the area. The project team actively supported the Thai government’s rescue operations by making flexible use of the network of observation stations and forecast models that it had developed by then to identify the effects of flooding. It thereby succeeded in proving the system’s practical effectiveness.

The project’s contributions to Thailand through its future-minded research activities and policy responses to the unexpected occurrence of a natural disaster were recognized firmly by the Thai government.

Countries around the world are focused on reducing carbon dioxide and other greenhouse gas emissions and slowing the pace of climate change, but change continues unabated. The implementation of measures proposed by the project to improve disaster preparedness and strengthen society’s resistance to climate change constitutes concrete action to combat climate change (SDG 13).

Floods is an issue that is expected to worsen as global warming progresses. In this connection, initiatives for minimizing damages through appropriate land use and early warning and for realizing stable water supply through more flexible changes in water reservoir management regulations all help supply safe water (SDG 6) and make cities safe and sustainable (SDG 11).

Disaster in Thailand

Enabling the Future: Forecasting temperature and rainfall fluctuations helps prepare for droughts, floods and other natural disasters. However, the project made an effective way of predicting impacts on agricultural products such as wheat, corn, and wine, as well as the health of people in the area. The project’s outcomes provided a major step forward toward the development of a practically effective means of seasonal predictions for mid-latitude regions. In fact, one could say that a door has opened for further understanding into industry and society can obtain much-needed knowledge of upcoming events much in the manner of a weather forecast.

Many Thai researchers expressed their confidence in Japan’s science and technology when they started developing our climate change and hydrological cycle monitoring system. We were able to show that their confidence in us was not misplaced when we helped deal with floods that actually occurred. At the same time, discussions with local residents concerning early warning systems for slope disasters and interviews held during the flood investigation allowed the project research team to understand from first hand the importance of utilizing science and technology to help improve social conditions.

Enabling the Future:

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Environment and Energy (Global-scale environmental issues)

SDGs Addressed by the Project

Of the mapped development projects, 30 are ongoing with active results. In 2011, a flooding in Thailand was forecasted three days in advance, and the Thai government implemented this forecast by building flood barriers in Pathum Thani near Bangkok in October 2011.

A workshop held jointly with the Thai government in December 2011, after the devastating floods. The event was attended by many members of local Japanese-affiliated firms.

Floodwaters in Pathum Thani near Bangkok in October 2011
Malaysia

Development of a Scenario for Creating a Low-Carbon Society by 2025 and Working toward an Ideal Future

The Iskandar special economic zone in Malaysia is currently seeing a rush of housing, office and factory construction, and there are concerns about increases in carbon dioxide emissions. In the past, town development focused only on towns, industrial development focused only on factories, environmental plans focused only on the environment and so forth, without any thought to coordinating all these activities. The project developed a method for planning and carrying out such activities in a quantitative and integrated manner (the “Low-Carbon Society Scenario Preparation Method”) and proved that it can be applied to regions with only a limited amount of data, such as Malaysia.

Based on the research outcomes and their corroboration, the project team held active discussions with the Iskandar Development Agency on multiple occasions since the start of the project. In 2013 it completed the Low-Carbon Society Blueprint 2025, an official document designed to serve as the foundation of development activities. Already more than 10 of the policies cited in the Blueprint have been put into motion. It is hoped that the achievements will be handed down to the next generation and expanded to other parts of Asia as well.

Enabling the Future

The Low-Carbon Society Blueprint 2025 contains 12 action plans for achieving a green economy, green community, and green environment, as well as 281 initiatives focused on specific challenges. One of these is the Iskandar EcoLife Challenge scheme, modeled after Kyoto’s Children’s EcoLife Challenge but adapted to local conditions. In December 2015, the EcoLife Challenge Summit 2015 was held in Kyoto, and Iskandar grade-school children and teachers gathered in Kyoto to visit local elementary schools and meet the mayor. Interspersed between Kyoto and Iskandar in the area of low-carbon education continues to expand and advance today.

Environment and Energy (Low Carbon Society / Energy)

Vietnam

Energy Revolution in Vietnam: Creating Biodiesel Fuel from Diverse Materials

Vietnam has 9 million hectares of wastelands caused by slash-and-burn farming and Agent Orange. It also faces a variety of challenges brought about by rapid economic development, such as poverty and urban air pollution. The objective of the project was to develop the ruined lands to plant jatropha and other trees for production into clean fuel, which could then be used in urban areas.

The project succeeded in developing a comprehensive biomass energy production and utilization system. It simultaneously helped renew devastated lands, mitigate air pollution, and create employment. The project also took readings of air pollutants in Hanoi and Ho Chi Minh to clarify the extent of pollution in these major cities. It developed a way of producing 3,000 liters of biodiesel fuel (BDF) daily. The fuel is currently supplied to 10 cruise ships plying the Halong Bay area, a World Heritage site.

Enabling the Future

The project tested the production of jatropha oil, BDF from palm oil, catfish oil and animal fat (tallow). It succeeded in obtaining high-quality (soybean pure) BDF from all materials tested. At present, BDF developed by the project is used in Halong Bay cruise ships, and great efforts are being made to inform tourists of the importance of research collaboration between Japan and Vietnam. One of the biggest outcomes of the project has produced 12 Ph.D holders and 3 Masters Degrees through Japanese scholarship programs (SAT REPS section) and also established a Biomass Center at the Vietnam National University for the both countries’ future.

SDGs Addressed by the Project


Environment and Energy (Low Carbon Society / Energy)

Project Outcomes

The overall aim of the project is to help realize a low-carbon society. One way is to plant more trees, which absorb carbon dioxide. Another way is to manufacture carbon neutral, renewable BDF, and use it as clean energy. The goal is to reduce carbon dioxide emissions by 7.6 tons for every ton of BDF. At present, a decrease of 3,800 tons has been achieved. In the future, it should be possible to realize reductions by 100,000 tons annually with afforestation and BDF production equivalent to 10,000 tons. Such research outcomes not only create access to sustainable and modern energy (SDG 7), but they are also likely to help improve air pollution in urban areas and reduce poverty among ethnic minorities in mountainous areas through afforestation and seed gathering.

Jatropha and other trees were planted in abandoned mines along Halong Bay. This experience already disaster prevention benefits in addition to enabling BDF production and carbon dioxide reduction.


Prime Minister Yayaki Manda, the ministry’s investigator, invited many graduate students from Vietnam to join the project and helped them obtain doctorates. For this and other achievements, he was awarded the Medal of the Vietnam National University (VNU) in September 2016.

Researchers in Japan & Malaysia

The much-visited Pacific Biosphere Center at the Vietnam National University (VNU) opens.

Prime Minister and the vice president of VNU present BDF to Vietnamese President Nguyen Van Cu on August 11, 2011. Prime Minister and the vice general secretary of the Communist Party of Vietnam (January 2017).
Taking on the Challenge of Total Aquaculture of Yellowfin Tuna!

**Enabling the Future**

In countries known as coastal developing economies, which include small island nations in tropical and sub-tropical regions, fishing is a key industry for the production of food for the domestic population and as an export industry. In recent years, however, the over-fishing and global climate change are affecting stock levels, threatening the foundations of the industry. This project established as its target the research of tuna species, a marine resource that is exploited in many countries around the world. The project is contributing to the development of resource management testing concepts and total aquaculture technology that is not dependent on natural resources, to achieve the goals of the yellowfin tuna and sustainable use of natural resources (SDG 14) and management of natural resources (SDG 12). It also aims to become a model for global partnerships between industrial nations that possess these technologies and developing countries who need them.

*Artificially hatched juvenile yellowfin tuna kept existing in the line-box nets*

**Project Outcomes**

This project built a coherent system for the establishment of efficient rice breeding techniques, development of promising lines, and the dissemination of new varieties, targeted at Northern Vietnam, with its diverse range of social and natural environments, it was conducted in line with SDG 2, achieving food security and promoting sustainable agriculture.

In just five years, the project has completed the registration of several promising lines as new varieties, in particular, new varieties with short growing periods are making a major contribution to the improvement of food supply efficiency in farming communities in Northern Vietnam.

**Vietnam**

Using Japan’s State-of-the-Art Rice Breeding Technology to Solve Food Problems

The Vietnamese economy has shown remarkable growth in recent years, but the nation’s northern region and other rural areas still face problems such as food shortages and income disparity. In particular, food self-sufficiency is low in the mountainous regions of the north, and people living in these regions have been suffering from chronic food shortages for many years.

Applying efficient breeding technologies that leverage rice genomics, an area in which Japan excels, the project has succeeded in developing new promising lines of rice that have short growing periods and high yields, and are resistance to disease and insect pests. In addition to its aim to establish cultivation methods in these regions using the newly developed varieties, the project has engaged in efforts to introduce the new varieties, with the major goal of raising food self-sufficiency. In the pursuit of its research, the project team has also contributed to the development of efficient rice breeding programs with the potential for future spin-off effects in the region. The promising lines developed in the world-first, they have already been registered as new varieties in Vietnam, and they are steadily being introduced to rice cultivation in these regions. It is hoped that additional efforts to improve food self-sufficiency and contributing to agricultural policy in Vietnam, these technologies will be extended to the nations of ASEAN in the future.

**Selection process in the field**

**Teaching local farmers about the new varieties**

**Centers in Thai Nguyen province**
The Power of Science to Create Tsunami-resilient Communities and Save People from Major Earthquakes

Chile in South America is known as a particularly earthquake-prone country. The massive, M8.8 earthquake of 2010 brought the nation's problems with tsunami warnings and evacuation to the fore. Japan, also, was struck by the Great East Japan Earthquake in 2011. Higher tsunami than envisaged caused devastating damage, bringing renewed awareness of the destructive power of tsunami and the dangers of tsunami-induced debris. This joint research project between Japan and Chile engaged in the development of highly precise early tsunami warning systems for the prevention and mitigation of tsunami damage, the estimation of damage at the pilot site, and the development of guidelines and resident education programs for the creation of tsunami-resilient communities. One of the major outcomes of the project has been the development of the guidelines, whose use can be extended to the whole of Chile. The tsunami-related programs have been incorporated into JICA’s Disaster Risk Reduction Training Program for Latin America and the Caribbean, and are contributing to the training of personnel in Latin American countries.

Enabling the Future
The new methods for estimating the size of earthquakes developed in the course of this project and the methods for real-time tsunami source estimates using offshore tsunami observation data are already being put into use by Japan’s Meteorological Agency. In March 2014, Peru and Chile jointly hosted the International Symposium on Earthquake and Tsunami Disaster Mitigation in Latin America with the aim of extending the project’s outcomes. It is hoped that tsunami-resilient communities and people will be created in Chile and Japan and, ultimately, on a global scale.

SDGs Addressed by the Project
The creation of sustainable communities (SDG 11) requires not only the development of infrastructure, but also approaches towards disaster mitigation. The programs for the creation of tsunami-resilient communities and resident development programs developed in this joint research project with Chile can be adapted to countries other than Chile. Chile’s tsunami disaster mitigation infrastructure cannot yet be described as sufficient, but taking lessons from the Great East Japan Earthquake, awareness in Chile of the importance of disaster mitigation infrastructure is growing day by day. With the engagement during the project in the development of management methods for the continuation of port and harbor operations, the resilience of logistics operations to disasters has increased dramatically.

Evacuation roads at Arica, Arica province, Chile

Cameron Contribution to Investigation of Causes of Limnic Eruptions Receives Award from Cameron Government
Cameron, in central western Africa, has a volcanic zone stretching 1,600 kilometers, and there are many volcanoes and crater lakes throughout the country. In the 1980s, large quantities of CO2 that had collected at the bottom of Lake Nyos and Lake Monoun suddenly erupted in what are known as “limnic eruptions,” causing the deaths of about 1,800 residents in the vicinity. Until this project, the causes and detailed mechanisms of limnic eruptions have been unknown. The research team set up automatic observation buoys to gauge changes in water level in real time. Using computer simulations to elucidate the conditions for limnic eruptions and investigating the shape of the lake bottom using ultra-sound, the team succeeded in identifying locations where water containing CO2 would erupt. The scientific findings have opened up pathways to the mitigation of disasters caused by limnic eruptions. For their contribution that the scientific outcomes of this project have made to the development of comprehensive disaster prevention measures and to the training of personnel, the research team was highly commended by the government of Cameroon and awarded the Ordre de la Valeure in March 2016.

Enabling the Future
Under this project, six young researchers from Cameroon came to Japan to study at a Japanese university, where they obtained their doctorates under the guidance of a Japanese researcher who was a member of the project team. Their doctors will enable them to take high-status positions back in their home country. It is hoped that these young researchers will become a bridge between Japan and Cameroon in the academic field in years to come.

Landslides & administrative offices from Cameroonian area affected by the Great East Japan Earthquake

Sampling of deep layer lake water

The government of Cameroon confirmed the death of one of the members of the project team, D.D. Rukawa, with researchers of the project on March 2016.
Comments from Project Participants

SATREPS carried out a questionnaire survey of principal investigators (Japan or partner country) in August 2016.

From Researchers in Japan

Q. What made you decide to apply for SATREPS?

Devastating damages caused by the great earthquake and tsunami in Maure, Chile, in 2010 and the Great East Japan Earthquake in 2011 spurred me to propose the joint study. (Japan-Chile joint research)

Genetic materials of local Afghan wheat varieties, collected by Hitoshi Kihara, a world-famous wheat geneticist, are still preserved. I wanted to make, through SATREPS, a contribution of Japanese science and technology to the world and the future. (Japan-Afghanistan joint research)

Q. What did you gain in the area of research members’ capacity development?

During the project, three people with Japanese government scholarships granted through SATREPS obtained doctorates in Mexico and Japan. (Japan-Mexico joint research)

On the Japan side, two doctoral dissertations were completed. On the Malaysian side, one member was hired as an expert by a government agency overseeing low-carbon society planning, another held lectures and workshops at universities, and another enrolled in a postgraduate program in Japan. (Japan-Malaysia joint research)

Q. What were some of the difficulties you faced in conducting joint research?

Immediately after starting the project, several labor unions at the partner-country university went on strike, and all administrative tasks stopped. We couldn’t get the paperwork done for obtaining equipment and supplies, and we couldn’t carry out any activities in the laboratory. (Japan-Sri Lanka joint research)

Chile, in South America, was very far, just as I’d feared. In addition to the fact that air fare cost much higher than flying to Asian countries, the amount of time and physical stamina required was much greater than expected. (Japan-Chile joint research)

Q. Please comment on SATREPS projects.

The program has a strong focus on applying research outcomes to real-life situations and on supporting capacity development. In this respect it goes beyond the limits of traditional international joint-research projects. Our project was well aligned to the basic goals of SATREPS in that its theme, namely the conservation and adaptive management of coastal ecosystems, addressed issues of strong social significance in a highly solutions-oriented manner. (Japan-Philippines joint venture)

From Researchers in Partner Countries

Q. How was the communication or interaction in conducting an international joint research taken with Japanese researchers?

Although the distance between Brazil-Japan and cultural differences, the communication and interaction was very good. (Japan-Brazil joint research)

In our project we had meetings using skype and also we were connected by social networks, so fluent communication was important for the success of our project. (Japan-Peru joint research)

Q. Please let us know about the outcomes of the SATREPS project.

The achievements of SATREPS in Gabon were excellent. For example, we got a new research station building close a national park, as well as two new labs for genetic (DNA and RNA) and microbiology analyses. (Japan-Gabon joint research)

Low Carbon Society Blueprint for Iskandar Malaysia is approved by highest authorities – Prime Minister/Chief Minister Johor as board chairman of Iskandar Malaysia, Putrajaya Green city plan 2025 was approved and is used in implementation of low carbon measures in Putrajaya development. (Japan-Malaysia joint research)