

Third Party Evaluation Report 2019
Ministry of Foreign Affairs of Japan

Evaluation of the SATREPS Program (Science and Technology Research Partnership for Sustainable Development)

March 2020

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Preface

This report is an Evaluation of the SATREPS (Science and Technology Research Partnership for Sustainable Development) program, and was commissioned to Oriental Consultants Global Co., Ltd. by the Ministry of Foreign Affairs of Japan (MOFA) in fiscal year 2019.

Since its commencement in 1954, Japan's Official Development Assistance (ODA) has contributed to the development of partner countries while tackling global issues. Today, the international community acknowledges the necessity to improve the effectiveness and efficiency of ODA. MOFA regularly conducts ODA evaluations, of which most are conducted at the policy-level with two main objectives: to improve the management of ODA, and to ensure its accountability. These evaluations are commissioned to external third parties to enhance transparency and objectivity.

The objective of this Evaluation was to review Japan's overall SATREPS policies and implementation from 2008 to 2018, and to produce recommendations based on the review to improve policy planning for the effective and efficient implementation of future assistance by the Government of Japan. For accountability purposes, the results in their entirety are available to the general public.

The Evaluation Team in charge of this study consisted of a chief evaluator (Dr. Jin Sato, Professor, Institute of Advanced Studies on Asia, The University of Tokyo), and an advisor (Dr. Yu Oliver Maemura, Lecturer, Graduate School of Engineering, The University of Tokyo). Professor Sato supervised the entire evaluation process and Dr. Maemura provided advice and input on analytical and evaluation processes. In addition, to complete this study, we have received support from MOFA, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, the Japan International Cooperation Agency (JICA), the Japan Science and Technology Agency (JST), the Japan Agency for Medical Research and Development (AMED), Japanese research institutes and local ODA Task Forces, as well as government agencies, project implementation agencies, and researchers in the Kingdom of Thailand and South Africa. We would like to take this opportunity to express our sincere gratitude to all those who supported this study.

Finally, the Evaluation Team wishes to note that the opinions expressed in this report do not necessarily reflect the views or positions of the Government of Japan.

March 2020
(Oriental Consultants Global Co., Ltd.)

Note: This English version is a translation of the official Japanese Evaluation Report of SATREPS (地球規模課題対応国際科学技術協力プログラム) の評価

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Chapter 1 Background, Objectives and Evaluation Framework

Overview of Evaluation Study

Evaluation Team

Chief Evaluator	Dr. Jin Sato	Professor, Institute of Advanced Studies on Asia, The University of Tokyo
Advisor	Dr. Yu Oliver Maemura	Lecturer, Graduate School of Engineering, The University of Tokyo
Chief Consultant	Mr. Masashi Takano	Oriental Consultants Global Co., Ltd.
Consultant (1)	Ms. Miki Imai	Ditto
Consultant (2)	Mr. Hiroki Okita	Ditto
Consultant (3)	Ms. Nao Yamagata	Ditto

Target Period of SATREPS: FY 2008~2018

Survey Period: September, 2019~March, 2020

Field Survey Country: The Kingdom of Thailand, The Republic of South Africa

Evaluation Background and Objectives

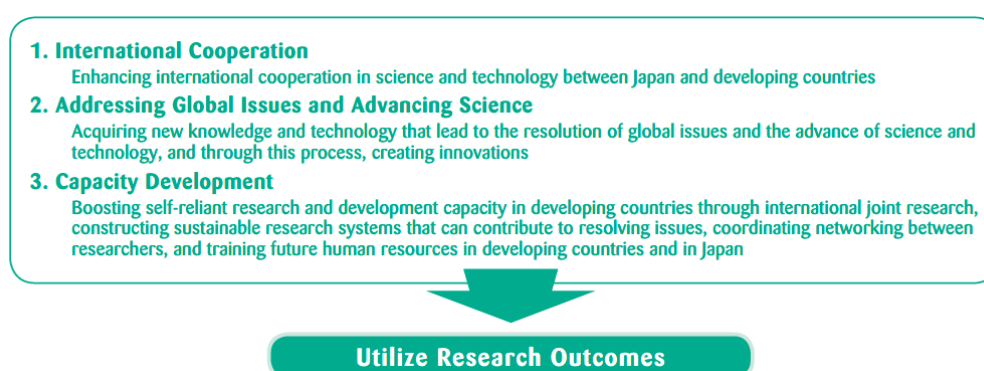
SATREPS is a Japanese government program established in 2008 that promotes international joint research. The program is structured as a collaboration between the Japan International Cooperation Agency (JICA), the Japan Science and Technology Agency (JST), and the Japan Agency for Medical Research and Development (AMED) under the supervision of MOFA, and the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Based on the needs of developing countries, the program aims to address global issues and produce research outcomes of practical benefit to both local and global society by combining competitive research funds for science and technology projects and development assistance (ODA). This evaluation study was conducted not only focusing on the research results of SATREPS and its implementation, but also considers the impact on ODA and Japanese diplomacy with the objective utilizing the evaluation results to produce recommendations for future policy planning in the field of ODA and international science and technology cooperation.

1-1 Evaluation Background and Objectives

The Science and Technology Research Partnership for Sustainable Development (hereinafter SATREPS) was established in 2008 and is a Japanese government program that promotes international joint research. The program is structured as a collaboration between the Japan International Cooperation Agency (hereinafter JICA), the Japan Science and Technology Agency (hereinafter JST) and the Japan Agency

for Medical Research and Development (hereinafter AMED) under the supervision of the Ministry of Foreign Affairs (hereinafter MOFA) and the Ministry of Education, Culture, Sports, Science and Technology (hereinafter MEXT). The program aims to address global issues¹ and produce research outcomes of practical benefit to both local and global society² based on the needs of recipient countries by combining competitive research funds for science and technology projects, and development assistance (hereinafter ODA).

The three stated objectives of SATREPS are 1) International Cooperation, 2) Addressing Global Issues and Advancing Science, and 3) Capacity Development. The “Utilization of Research Outcomes” is positioned as the ultimate goal above these 3 objectives (see Figure 1.1).



Source) JST, AMED, JICA (2019), SATREPS Brochure

Figure 1.1 Objectives of SATREPS

As of 2018, SATREPS has launched a total of 133 projects in 50 countries which are categorized into Environment and Energy (Global-scale Environmental Issues and Low Carbon Society/Energy), Bioresources, Disaster Prevention and Mitigation, and Infectious Diseases Control. Each project is provided with approximately 100 million yen in funding and implemented in partner countries as an ODA Technical Cooperation project.

This evaluation study was conducted not only focusing on the research results of SATREPS and its implementation, but also considers the impact on ODA and Japanese diplomacy with the objective utilizing the evaluation results to produce recommendations for future policy planning in the field of ODA and international science and technology cooperation.

¹ Global issues: Issues that affect more than a single country or region, and cannot be resolved without international collaboration. Examples include energy/environment issues, disaster risk reduction, infectious disease control, and food security.

² Research outcomes of practical benefit to both local and global society: This term is equivalent to “Utilization of research outcomes” addressed in SATREPS Brochure, meaning the research projects should lead to future social and economic benefits, achieved by using newly obtained knowledge and technology to enhance government services or to develop products that can be deployed in the market. Either “Research outcomes of practical benefit to both local and global society” or “Utilization of research outcomes” is used on this document in accordance with context.

1-2 Scope of Evaluation

The scope of this evaluation study is the SATREPS program implemented from FY 2008 to 2018. During this period, a total 133 projects were selected, in which 8 focused on Climate Change, 27 projects on the Environment, 23 projects on Disaster Prevention and Mitigation, 31 projects on Bioresources, and 25 projects on Infectious Diseases Control. This evaluation study also examined case studies within two countries: the Kingdom of Thailand (hereinafter Thailand) and the Republic of South Africa (hereinafter South Africa). Both countries are upper-middle-income countries in which Japan operates ODA activities. The case study projects in each country are explained in detail in Chapter 3 and Chapter 4.

In addition, this evaluation study has conducted interview surveys with researchers and students involved in the “Integrated Study Project on Hydro-Meteorological Prediction and Adaptation to Climate Change in Thailand (IMPAC-T)” selected in 2008, and “The Project for Advancing co-design of integrated strategies with adaptation to climate change in Thailand (ADAP-T)” selected in 2015 for a broad picture understanding of SATREPS. Those 2 projects are referred as “Reference Projects” in this report.

1-3 Implementation Policy of the Evaluation and Evaluation Framework

1-3-1 Evaluation Framework

In accordance with “the ODA Evaluation Guidelines (12th Edition)” by MOFA, this study evaluates the developmental and diplomatic outcomes of SATREPS with the criteria of “Relevance of Policies”, “Effectiveness of Results” and “Appropriateness of Processes”. Evaluation criteria, verification items, and content of verification are shown in Table 1.1.

Table 1.1 Evaluation Framework

Verification Items		Contents of verification
Development Viewpoints		
I. Relevance of Policies		
1. Relevance to Japan's high level policies	(1)	How relevant is SATREPS to Japan's high level policy?
2. Relevance to development needs of partner countries	(2)	How relevant is SATREPS to partner country needs?
3. Relevance to international priorities	(3)	How relevant is SATREPS to international priority issues?
4. Relevance to other donors' assistance	(4)	How aligned is SATREPS with other donors' policies? How outstanding is Japan's ODA among other donors?
II. Effectiveness of Results		
1. Effectiveness of input on policy goal	(1)	Has SATREPS input effectively helped achieve policy goals? (a) Commissioned Research Expenses (b) Dispatching Japanese researchers (c) Training of counterpart trainees in Japan (d) Provision of research equipment
2. Effectiveness of output and outcome on input	(2)	What results and output have the input produced? (a) Summary of evaluation results of effectiveness in terminal evaluation of each research project (b) Personnel exchanges and strengthening relationships with counterpart research institutions (c) Quality and diffusion of capacity development (d) Effort toward research outcomes of practical benefit to both local and global society
3. Research outcomes of practical benefit to both local and global society (Social Impact)	(3)	Has SATREPS promoted utilization of research outcomes? How has SATREPS promoted it?
III. Appropriateness of Processes		
1. Appropriateness of SATREPS implementation structure	(1)	How is the implementation structure of SATREPS?
2. Appropriateness of process from application to Termination	(2)	How appropriate is the process from application to termination of SATREPS project? (a) Application and selection process for research projects (b) Research implantation process in partner countries (c) Project monitoring / evaluation process
IV. Diplomatic Viewpoints		
1. Diplomatic importance	(1)	Diplomatic Importance of SATREPS in Japanese science and technology diplomacy and National Security Strategy.
2. Diplomatic impact	(2)	Impact on Japan's presence in the international community and influence on bilateral and regional relations

The evaluation from Development Viewpoints employs ratings based on “the ODA Evaluation Guidelines (12th Edition)”, which explains that each evaluation item should be rated as either A. Highly Satisfactory, B. Satisfactory, C. Partially Unsatisfactory, or D. Unsatisfactory.

The ratings are used only for evaluating the Development outcomes, and not from Diplomatic or general perspectives that integrate the 3 development criteria.

1-3-2 Process of Evaluation

This evaluation study was conducted from September 2019 to March 2020, combining electronic, domestic, and international field surveys. In addition, meetings for setting the direction of this evaluation were held with SATREPS related agencies such as MOFA, MEXT, JST, AMED and JICA. As for the timing of the meetings, the first meeting was held after the evaluation framework was drafted, and the second meeting was held after the domestic survey and field survey were completed.

1-3-3 Evaluation Implementation Structure

The evaluation was conducted by an evaluation team composed of a chief evaluator, advisor, and four consultants from Oriental Consultants Global CO., Ltd., as shown in Table 1.2.

Table 1.2 The Member of Evaluation Team

Title	Name	Affiliation
Chief Evaluator	Dr. Jin Sato	Professor, Institute of Advanced Studies on Asia, The University of Tokyo
Advisor	Dr. Yu Oliver Maemura	Lecturer, Graduate School of Engineering, The University of Tokyo
Chief Consultant	Mr. Masashi Takano	Oriental Consultants Global Co., Ltd.
Consultant (1)	Ms. Miki Imai	Ditto
Consultant (2)	Mr. Hiroki Okita	Ditto
Consultant (3)	Ms. Nao Yamagata	Ditto

Kazuya Akagi, Researcher of Development Administration Division, International Cooperation Bureau, MOFA, accompanied the field survey conducted from November 24 to December 8, 2019, as an observer.

Chapter 2 Overview of Evaluation Target

2-1 Position of SATREPS in Japan's Science and Technology Policy

SATREPS is a scheme designed to achieve one of the basic policies of the “3rd Science and Technology Basic Plan”, revised by the Cabinet Office in 2007. The relevant policy is to support “Science and Technology Supported by Society and People and Return its Outcomes into Society”, and is an example of how the country aims to strengthen “Strategic Development of Science and Technology Diplomacy” in 2009. SATREPS was born out of Japan's policy commitments to science and technology, and human resource development that were developed together with campaigns and initiatives within the international community.

In April 2007, the Council for Science, Technology and Innovation³ (hereinafter CSTI) decided to promote “Science and Technology Diplomacy” to support international science and technology cooperation, by linking the research capabilities of Japan's scientific and technological community, with the technical cooperation capabilities of the development community.

Subsequently, in May 2008, CSTI announced "Proposals for Strengthening Science and Technology Diplomacy (draft)", and pointed out the need for linking science and technology with diplomacy. In the Okinawa G8 Science and Technology Ministers' Meeting held in 2008, the importance of promoting science and technology cooperation was reaffirmed to create a low-carbon society and next-generation biofuels. The Japan-Africa Science and Technology Ministers' Meeting also confirmed that implementation would take place for human resource development and policy dialogues for sustainable development in developing countries with a focus on the Africa region. On the basis of the series of meetings, “Strategic Development of Science and Technology Diplomacy” were implemented in 2009.

Since then, Japan made steady and regular progress, by establishing “The Task Force on Science and Technology Diplomacy” in 2011, the “Strategy on Science and Technology innovation” in 2013, the “Council for Science, Technology and Innovation” in 2014, and the “Advisory Board for the Promotion of Science and Technology Diplomacy” in 2015, all as measures to integrate science and technology and diplomacy.

In order for science, technology and innovation to contribute to the achievement of the Sustainable Development Goals (SDGs) adopted in United Nation (UN), it is necessary to cooperate among various stakeholders including governments, universities, research institutions, NGOs, and the private sector. SATREPS is the sole development scheme that contributes to socio-economic development in developing countries by solving global issues through the promotion of research and

³ The Council for Science and Technology Policy was set up in the Cabinet Office as one of the policy councils on key policy fields at the reorganization of government ministries and agencies in January 2001.

development, industry-academia collaboration, human resource development, and scientific communication. Accordingly, it could be stated that SATREPS is one of the initiatives that plays a leading role in science and technology diplomacy in Japan.

2-2 Overview of SATREPS

2-2-1 History of SATREPS

Science and technology diplomacy is relatively new in the history of Japanese ODA, and SATREPS has taken root in the last ten years. Promotion of science and technology is one of Japan's important national diplomatic strategies that the country aims to be competitive in internationally, as a country poor in natural and energy resources.

Before the establishment of SATREPS, Japan attempted to utilize science and technology as diplomatic tools, as opposed to using diplomacy as a means of developing science and technology. However, the role of science and technology in diplomacy was not clear, and sufficient diplomacy was not implemented to promote science and technology cooperation in Japan.

On the other hand, the threat of global issues that cannot be solved without science and technology innovation such as global warming and infectious diseases, has increased. With borderless issues increasing risks globally, it became necessary to support global science and technology collaboration, and continual progress in science and technology became essential.

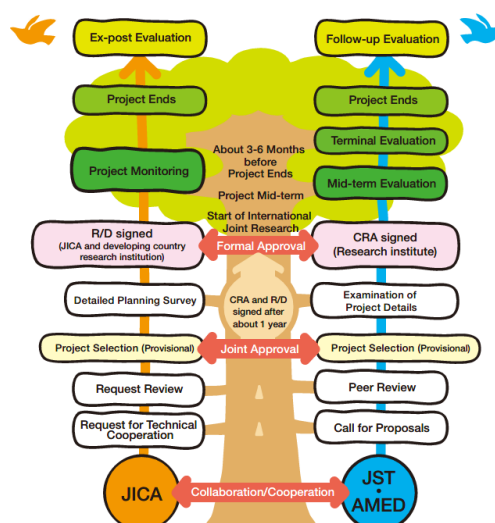
SATREPS is an important program in science and technology diplomacy promoted by the Japanese government. It is not merely promoting for pure research and applied research, but for utilization of research outcomes to match needs of the partner country's issue, and to solve that. This program aims to strengthen diplomatic relations between Japan and partner countries and contribute to Japan's national interests.

2-2-2 SATREPS Process

As mentioned above, SATREPS is a framework in which JICA works with either JST or AMED to collaborate and promote international joint research with developing countries. Figure 2.1 shows timeline of a SATREPS project, from application to completion.

(1) Application and Selection

Around September of each year, JST and AMED release a call for research proposals for

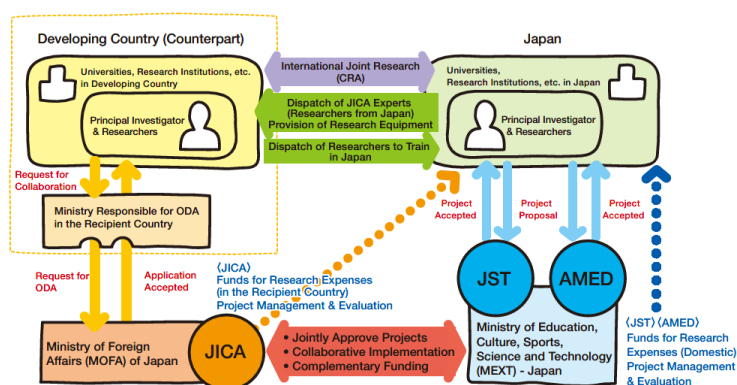


Source) JST, AMED, JICA (2019) "SATREPS Brochure"

Figure 2.1 Project Progress

researchers belonging to universities and research institutions in Japan. The research topics have not changed since 2014, and include 4 fields that cover 5 areas. Since SATREPS is a collaboration between ODA and science and technology support, support is provided to research institution in countries listed by the Organization for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC).

Various other organizations are also involved in the process from application to selection. Figure 2.2 shows the cooperation structure and Table 2.1 summarizes the process from application to selection.



Source) JST, AMED, JICA (2019) "SATREPS Brochure"

Figure 2.2 Cooperation Structure of SATREPS

Table 2.1 Process from Application to Selection

Process	Abstract
(1) Applications of Research Proposals/ Request of ODA Technical Cooperation	Research institutes in Japan: Submission of research proposals to JST/AMED Research institutes in partner country: Submission of request of ODA Technical Cooperation to MOFA Japan.
(2) Matching	Matching between Proposal to JST/AMED and ODA request
(3) Adjustment of Research area	Adjustment of research area of each project
(4) Document screening	Comprehensive screening by the screening committee (JST) or the evaluation committee (AMED) referring to JICA and MOFA priorities.
(5) Interviewing for selection	Interviews by the screening committee (JST) or the evaluation committee (AMED) with JICA and MOFA.
(6) Adjustment of Research area within selected project (only JST)	Committee Chairs in each research area and Program Directors adjust selected projects considering the number of projects in each research area and regional balance across target countries.

	Provisional selection of research projects are finalized by the SATREPS Promotion Committee.
(7) Provisional selection and notification	The provisional period is the period before the Record of Discussions (R/D) and Collaborative Research Agreement (CRA) are signed by the end of the fiscal year.
(8) Formal selection	When a R/D, CRA, or MOU (Memorandum of Understanding) is completed between JICA and the counterpart after JICA conducts an interim Detailed Design Study, the research project will be formally approved for awarding, and international joint research will begin.

Source) The evaluation team based on information from various agencies and "SATREPS Public Invitation Guideline for Fiscal Year 2020 (Provisional Translation)" by JST

Regarding the application process, research institutes in Japan apply in cooperation with research institutes in partner countries. Therefore, when applying to JST/AMED, the Japanese Principal Investigators & Researchers must explain not only the process of selection but also content of the joint research project and the coverage of the SATREPS budget. In contrast, it is essential for the principal investigator in the partner country to submit official requests for ODA technical cooperation specified as SATREPS to MOFA. The request must reach Japan through the ministry or agency in the recipient country responsible for ODA and the Japanese embassy in the recipient country. The condition to be included in the selection process in Japan is to complete the (2) Matching between applications of research proposals in Japan and request of ODA technical cooperation in the partner country. Provisional projects are selected by (4) Document screening and (5) Interviews conducted by the screening committee (JST) or the evaluation committee (AMED), together with JICA and MOFA. During the provisional period, research institutes in Japan and research institutes in partner countries confirm SATREPS project plans (schedule, budget and activities) and build trustworthy relationship. Formal selection is finalized after confirming a R/D, CRA, or MOU between research institutes in Japan and research institutes in the partner country.

The screening committee (JST) is composed of about 11 external experts such as researchers at domestic universities, researchers belonging to research institutions (including retired researchers), and JICA staff (1~2 persons⁴) recommended by JICA. Individuals with potential conflicts of interest and JST staff are excluded from this committee. Evaluation criteria of selection include the quality of the plan and feasibility of the utilization of research outcomes for social impact, relevance to ODA policy, relevance as an ODA project, scientific and technological value, alignment with

⁴ The number of JICA staffs included in this committee has increased from 1 to 2 since 2019.

Japan's national interests, implementation structure of both countries, and qualification of research representatives.

The evaluation committee (AMED) is composed of external experts such as a PS (Project Supervisor) and PO (Project Organizer). Evaluation criteria for selection include relevance to the project purpose, scientific and technical significance, implementation structure, required expenses, feasibility of the plan and potential for the utilization of research outcomes for social impact, relevance to ODA policy, and project sustainability.

In parallel with the selection by JST/AMED, JICA and MOFA primarily screen applications from an ODA viewpoint. As SATREPS is implemented as an ODA project, the research needs to take the form of cooperation, contributing to addressing or resolving issues faced by the partner country, fitting in with the Country Assistance Policy, and create a practical and social impact.

(2) Implementation and Evaluation

The period of international joint research (period to conduct the technical cooperation project set out in the R/D) is three to five years. JICA bears the expenses necessary for the implementation of ODA technical cooperation including the dispatch of experts from Japan, acceptance of foreign researchers, and provision of machinery and equipment in the partner country, which is the recipient country under the ODA technical cooperation framework.

JST, AMED and JICA cooperate in the monitoring, midterm evaluation, and terminal evaluation of research projects. JST and AMED conduct Mid-term Evaluations (after the third year of a five-year project), Terminal Evaluations (slightly before the end of the research period), and Follow-up Evaluations (a certain period after the research period has ended⁵). Each project is required to submit annual reports to JST and AMED on which the PS, PO and RS (Research Supervisor) review the research progress. Progress management by JST and AMED are conducted following a standardized Target Outcomes Sheet.

JICA performs periodical monitoring on both JST and AMED projects as part of JICA's project management processes for ODA technical cooperation based on the documents submitted semi-annually by the project coordinator⁶. In principle, Follow-up Evaluations are conducted 3 years after the research period has ended. JICA monitors projects based on the R/D and its attachments: Project Design Matrix (PDM) and Plan of Operation (PO).

⁵ It is accordance with basic policy of managing competitive funds stipulated in "General guidelines for national research and development evaluation" by Cabinet Decisions on 2016

⁶ Periodical monitoring are performed on the SATREPS projects since 2014

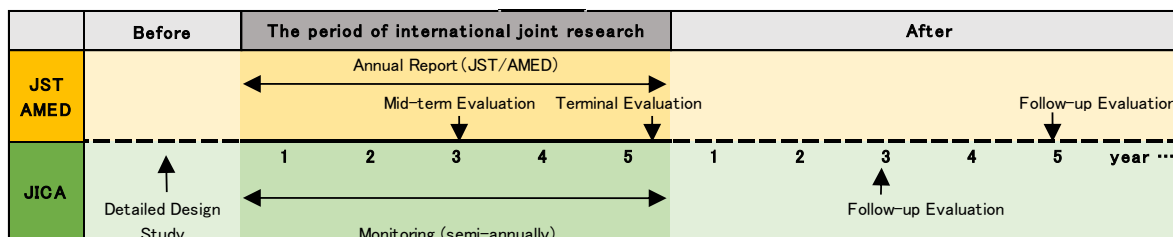
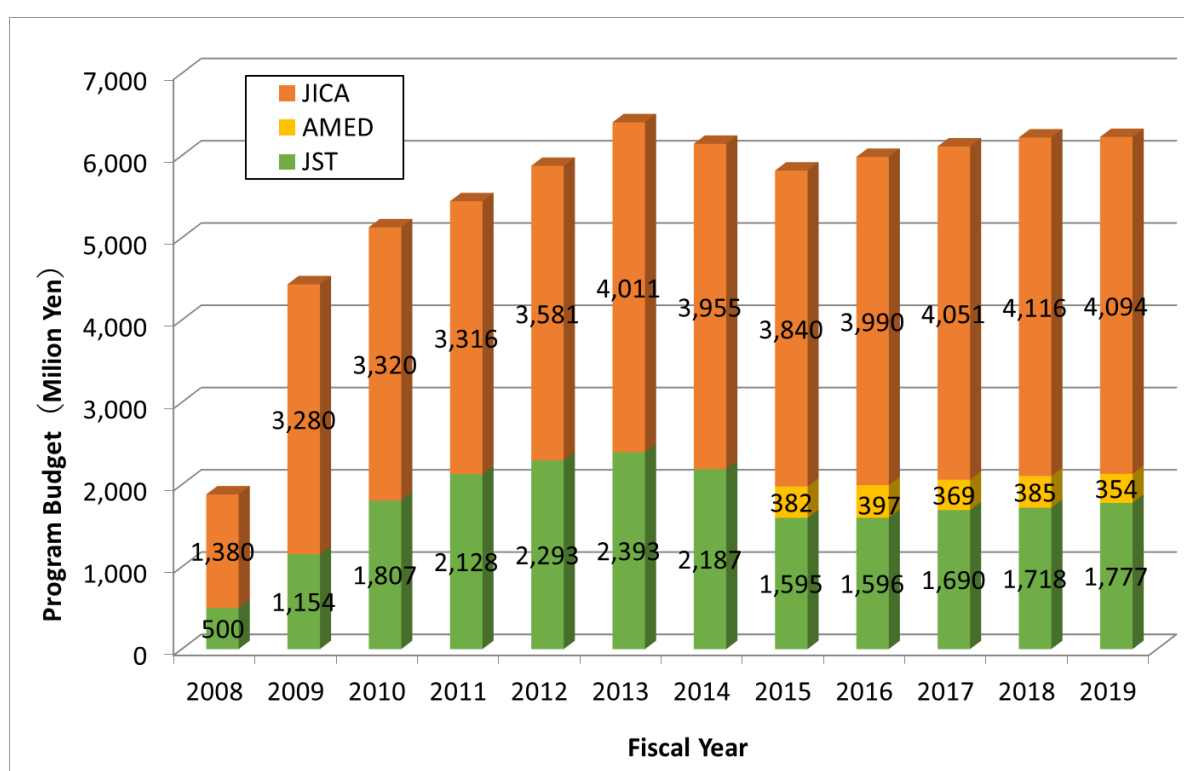


Figure 2.3 Evaluation and Monitoring Schedule

2-2-3 Trend and Performance of SATREPS

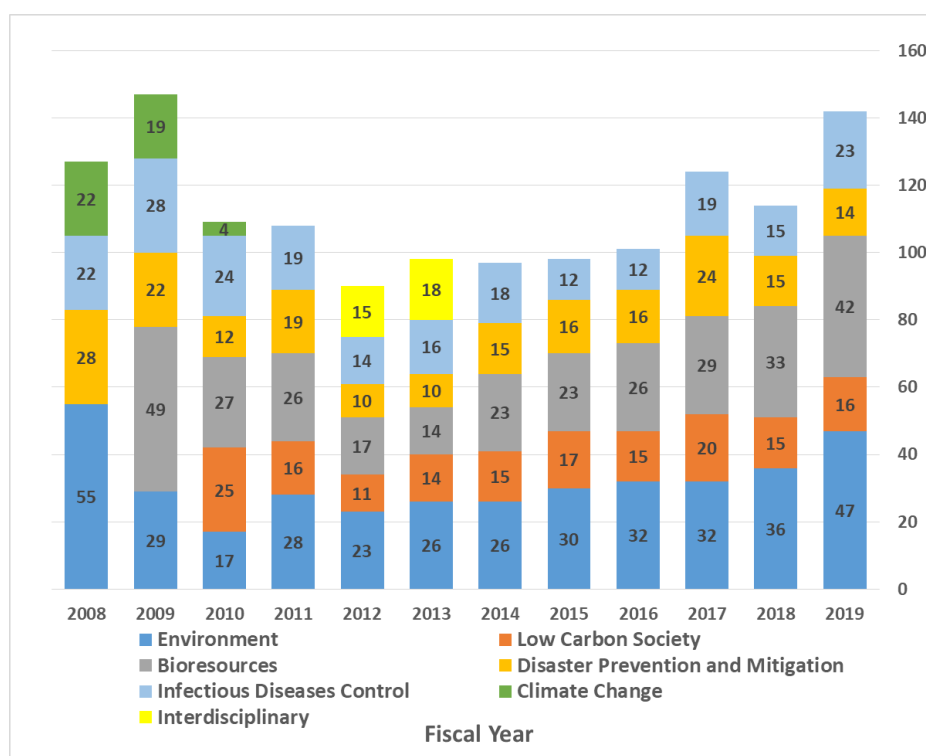
Figure 2.4 shows the transition of the SATREPS budget from FY 2008 to 2019. Since FY 2015, the budget has seen a slight increased every year.



Source) The Evaluation Team based on the data from JST

Figure 2.4 Transition of SATREPS Budget

Figure 2.5 shows the number of application projects, presenting that its number has increased since FY 2012.



Source) The Evaluation Team based on the data from JST

Figure 2.5 Data of Application Project

2-2-4 Publicity and Raising Awareness of SATREPS

Since SATREPS is an ODA funded scheme, the people involved are ultimately accountable to the Japanese citizens. One method of enforcing this accountability is to consider how general citizens in Japan recognize and perceive the value of SATREPS. It is indeed difficult to accurately grasp the awareness of SATREPS in Japan as no previous studies or polls on SATREPS in Japan have been published so far. However, it could be suggested that the recognition of SATREPS is not high in Japan, where the interest in science and technology, trust in scientists, and science and technology affirmation among general citizens has declined⁷. According to domestic surveys and interviews with experts and stakeholders in Japan, we obtain the following factors that could infer relatively low recognition of SATREPS:

- Since SATREPS is mainly taken on by research institutions and its outcomes are utilized overseas, general citizens have very few opportunities to be exposed to SATREPS
- Even if the research results of SATREPS are highly evaluated, only the name of the research project or the invented technology are publicized. In contrast, the name of the scheme tends only to be partially or not widely publicized.

⁷ HOSOTSUBO, Moritaka, KANO, Kei, OKAMURA, Asako, MIKI, Kiyoka, "Public Attitudes to Science and Technology: Society 5.0", NISTEP RESEARCH MATERIAL, No.282, National Institute of Science and Technology Policy, Japan

- Since SATREPS is a science and technology project, technical terms are frequently used and its research outcomes often do not directly benefit the general citizens.
- The name of "Science and Technology Research Partnership for Sustainable Development" is too long to understand and it is difficult for the general public to understand what kind of program it is – it is also very unclear from a Japanese language perspective.

SATREPS related agencies have carried out various public awareness activities. For example, MOFA has presented SATREPS projects in an ODA e-mail magazine⁸ as well as the White Paper on Development Cooperation⁹. JICA has introduced SATREPS on their ODA visualization website, a science and technology cooperation website, and a public relations magazine named “mundi”¹⁰. AMED posts SATREPS research projects at its building, distributes SATREPS pamphlets, and posts brochures and information on its website.

JST publicizes SATREPS on its website and runs a Facebook and Twitter¹¹ account introducing SATREPS projects through “REPS-kun”, a SATREPS mascot-character. Research results are simplified and presented to the public (see Figure 2.6) on their social media as well as through an annual report. Results are also presented annually at the Science AGORA¹² conference, held annually in November, as well as the JST Fair and Innovation Japan for Industry and Academia.

In order to raise the recognition of SATREPS among the general citizens, it is necessary for related agencies to carry out public awareness campaigns and activities continuously. Research projects could be obligated to participate in such activities, and also be required to visualize the utilization of research outcomes and social impact to the public. Public awareness activities should aim to close the gap between the “overseas” and “advanced science and technology” elements of SATREPS activities and the Japanese public.



Figure 2.6 REPS-kun in Twitter

⁸ https://www.mofa.go.jp/mofaj/gaiko/oda/mail/bn_260.html, https://www.mofa.go.jp/mofaj/gaiko/oda/mail/bn_382.html

⁹ White Paper on Development Cooperation 2018 introduces SATREPS project in p.24 and p.47

¹⁰ Mundi version of December 2018 introduces SATREPS project

¹¹ As of 15th February 2020 twitter hold 560 followers and facebook hold 2,078 followers

¹² Science Agora is a generic term for a place connecting science and society, which is open to everyone. It is held annually by JST since 2006.

Chapter 3 Case Study I: The Kingdom of Thailand

3-1 Overview of the Project

Case Study I is a project in Thailand entitled "Basic Technology for Transporting Non-food Biomass into Fuel", implemented during 2010-2015. Table 3.1 shows the overview of Case Study I.

Table 3.1 Overview of Case Study I

Project Title	Innovation on Production and Automotive Utilization of Biofuels from Non-food Biomass
Description	The purpose of this project was to contribute to the reduction of CO ₂ emissions that cause global warming by developing fundamental technologies for fuel production using JETROFA, a genus low-growing plant in the spurge family, Euphorbiaceae, which does not compete with food crops for biofuels in the transportation sector. With a lack of prospects for the supply of the raw materials, it did not lead to the practical use of transport fuel production using JETROFA. However, by applying the high-quality biodiesel (H-FAME) production technology ¹³ developed in this project, a real-vehicle driving test using palm oil bio-fuels (food-based biomass), a product with steady supply in Thailand, was demonstrated in collaboration with the local branch of a Japanese automobile manufacturer. The achievement was positioned as a guideline in Thailand's Oil Alternative Energy Development Plan ¹⁴ , and led to the practical use of biomass fuel using the H-FAME technology from FY2018 in Thailand.
Research Institution (Japan)	(1) Principal Institution : National Institute of Advanced Industrial Science and Technology (AIST) ¹⁵ (2) Waseda University
Research Institution (Thailand)	(1) National Science and Technology Development Agency (NSTDA) (2) Thailand Institute of Scientific and Technological Research (TISTR) (3) King Mongkut's University of Technology North Bangkok (KMUTNB)

¹³ H-FAME (fatty acid methyl ester-FAME-partial hydrogenation) technology. The main component (FAME) of Jetropha, which is increasingly needed as a non-food biofuel, is partially hydrogenated under mild reaction conditions to remove toxin components and significantly improve oxidation and thermal stability (H- FAME).

¹⁴ In September 2015, H-FAME was specified as a biodiesel fuel to support the achievement of targets in the "Revised and Alternative Energy Plan (2015-2036)" by the Ministry of Energy of Thailand.

¹⁵ At present, the Japanese Principal Researcher belongs to the Research Center for Metals and Materials Technology (MTEC) in Thailand, and continues to conduct research related to this research theme.

3-2 Relevance of Policies

(1) Consistency with Japan's Assistance Program for the Kingdom of Thailand

The SATREPS scheme and Case Study I for Thailand are consistent with Japan's Development Cooperation Charter and "Japan's Country Assistance Policy for the Kingdom of Thailand". Priority areas stated in this policy include the need for Japan and Thailand to promote international collaborative research "by improving research capacity and strengthening the network", which can be considered to be highly consistent with Japan's Assistance Program for Thailand.

(2) Consistency with Development Needs in Thailand

The SATREPS scheme and Case Study I for Thailand are consistent with and linked to Thailand's "20-Year National Strategy (2017-2037)" and the detailed plan "Thailand 4.0" issued by national government. SATREPS also conforms to the "National Research Policy Strategy" and the "20-Year National Science, Technology and Innovation Basic Plan 2012-2021", and is also consistent with regional policies such as the AEC Blueprint 2025, which is a specific action item of ASEAN's "ASEAN Community Vision 2025".

In the context of Case Study I, the Thai government has formulated the "National Energy Plan (2015-2036)" based on the Paris Agreement's commitment to reduce greenhouse gases. One of the detailed plans, the "Alternative Energy Development Plan: AEDP2015", has set a target to increase the ratio of biofuels in Thailand to 30% by 2036. In addition, the "Cebu Declaration on Energy Security in East Asia" released at the 2007 East Asia Summit, stated goals to promote the use of biofuels as a regional issue. Therefore, consistency with regional and global development needs can be observed in Thailand through Case Study I.

In recent years, air pollution from PM 2.5 (fine particulate matter) has become a significant problem in Thailand due to the increase in automobile exhaust gas emissions. The Thai government has tightened regulations on diesel vehicles, which are the most significant cause of PM 2.5. Regarding trucks, a request to control movement into Bangkok and an improvement of inspection methods for vehicle inspections have been implemented. Public buses in Bangkok are being encouraged to switch to the biodiesel blended fuel called "B20", which is a fuel produced with a ratio of 20% biodiesel and 80% petroleum diesel that emits fewer pollutants. Thai automakers are being asked to apply the European emission standards "Euro 5" for all vehicle production by 2021, and have been informed that regulations will become mandatory in 2024. Diesel oil refiners have been instructed to use B20 as the standard for manufacturing and sales from early 2020, and gas oil dealers and gas stations have been asked to sell B20 from March 2020 nationwide.

The production of biofuels using the H-FAME technology developed in this case study has been put into practical use while providing relief to dependence on crude oil

imports as well as air pollution – both of which have long been priority national issues. This project has reached a preliminary stage from which significant practical and social impacts can be expected. The project was thus evaluated highly in terms of the timing of implementing SATREPS as well as the development needs of Thailand.

3-3 Effectiveness of Results

The following results concerning the effectiveness of the project results were obtained through domestic and field surveys.

- Development of H-FAME and proven demonstrability and applicability to consumer automobiles
- Transition and application of the H-FAME technology to palm oil leading to the formulation of policies to support the introduction of biomass fuel in Thailand.
- Contribution to the formulation of Asian standards for biodiesel fuel in cooperation with the East Asia-ASEAN Economic Research Center (ERIA) and ASEAN countries

For this project, the strength and quality of relationships within the established network of relevant organizations contributed to the effectiveness of the results. In a large-scale research project with significant funds and an expansive and diverse network of collaborators, coordination and information sharing becomes a key challenge. However, in Case Study I, various effective initiatives were taken, such as establishing a joint coordination committee consisting of local ministries, research institutes and private companies, and the organization of an external evaluation committee from the initial stage of the project. Through these activities, collaboration between industrial, academic, and government organizations beyond the participating research institutes was strengthened. This led not only to the research goal of developing fundamental technology for fueling non-food biomass transport, but also catalyzed the planning of related policies in Thailand and the development of new fuels in the ASEAN region.

The research results spread not only throughout Thailand but also to the ASEAN region through the construction and strengthening of a network of industry, academia, and government, as well as the participating Japanese and Thai's research institutions. As a new research field for the scientific community in Thailand, it also greatly contributed to human capacity development in the country. Students and researchers who participated in the project reported that case studies contributed to the advancement of their research through the use of equipment provided through SATREPS, training received from Japanese researchers, and further training in Japan. Moreover, the field survey clarified that the study results of Case Study I were shared with Indonesia and Malaysian researchers through a third-country training program

designed, organized, and implemented by the local stakeholders after conclusion of the project period. Capacity development impacts can thus be said to have been observed beyond the bilateral relationship between Japan and Thailand, and into the ASEAN region.

In comparison with the scientific and technical cooperation provided by other representative donors, SATREPS was often compared with the Newton Fund from the UK¹⁶, and Horizon 2020 from the EU¹⁷. The features of other support schemes include research fields related to the social sciences, such as gender and governance, in addition to areas covered by SATREPS. Furthermore, various projects such as scholarships, exchange programs, and research grants are provided within the scheme, as well as joint research.

On the other hand, it was pointed out that SATREPS had a complex scope and adoption process in comparison with other donors. Among the advantages of SATREPS are the provision of state-of-the-art research equipment that is difficult to procure on the Thai side, the dispatch of highly specialized researchers (or experts), and the capacity development of research participants in Thailand. These were perceived to be the positive and distinct features of SATREPS in comparison to schemes provided by other donors.

3-4 Appropriateness of Processes

Field surveys revealed that no organizations had an overall understanding of SATREPS in Thailand. There are some issues, such as the difficulty of coordinating ministries and agencies within Thailand, where it remains unreasonable to expect improvements from initiatives from relevant departments and implementing agencies on the Japanese side. However, it was recognized that the division of labor and implementation processes between Japan and Thailand could be improved. The role of the Thai International Cooperation and Development Agency (TICA), which is the coordinating agency in charge of ODA in Thailand, is point of contact for accepting applications in Thailand, and for supporting the dispatch of technicians and personnel exchanges. However, all other substantive issues and processes are conducted on the Japanese side (by JST and JICA), resulting in TICA only receiving the end results of decisions made to accept or reject applications via the embassy. Therefore, it makes it difficult for TICA to participate in SATREPS independently, and there is no detailed feedback from the Japanese side on the details or rationale behind rejected proposals. From an interview in the field, evaluators received comments that it is also difficult for TICA to provide advice to applicants for the next call for applications (See

¹⁶ Founded in 2014 as part of UK ODA, it aims to develop science and innovation partnerships that promote economic development and well-being in developing countries. £1 million in one year per project is paid. It covers 17 countries (only low and middle income countries) in the DAC List.

¹⁷ Founded in 2014 by the EU to promote research and innovative development. A total of € 80 billion has been invested between 2014 and 2020. It is implemented in both developing and developed countries.

the separate volume for details on the cooperation system between Japan and Thailand).

In order to participate in SATREPS, research institutions in the partner country also need to raise additional research funds. Through field surveys, however, it became clear that generally, the partner institution in Thailand needs to undergo a lengthy and competitive process to procure such funding, by reaching out and scheduling interviews with the relevant government organizations and agencies, coordinating within their own institutions, and preparing documents for research funding sometimes even two years in advance. In order to ensure the necessary and sufficient input from Thai collaborators, it is also essential for the Japanese side to understand the systems of securing research funds that structure processes at Thai research institutes, and to be familiar with the budgets and priorities of relevant government agencies in the research field.

After completion of the SATREPS implementation period, partner research institutions will be required to maintain the research facilities and equipment provided through the initial funding. In such cases, both Japan and Thailand must consider how to structure and finance the continued maintenance and operation of the equipment. In order to guarantee the long-term sustainable effectiveness of SATREPS input, it is necessary to foster a strong sense of ownership within the partner research institute.

In addition, relevant ministries and agencies that distribute research funds to each project keep track of the progress and results of the research projects under their control. However, it was confirmed that they did not have any information on research projects that were administered or funded by other ministries or agencies. To resolve such issues, it is desirable to improve the implementation process and information sharing. For instance, TICA could proactively share information and strengthen cooperation among related ministries and agencies, and synthesize discussions between relevant ministries and agencies to coordinate science and technology cooperation schemes with other donors. It will not only enable smoother information sharing with related organizations but also lead to an increase in the recognition and reputation of SATREPS within the Thai government.

3-5 Evaluation from Diplomatic Viewpoints

3-5-1 Diplomatic Importance

In terms of science and technology diplomacy between Japan and Thailand, the “Japan-Thailand Economic Partnership Agreement” of 2007 mentions the promotion of bilateral cooperation in the fields of “science, technology and energy and the environment”. Under this agreement, interactive human resource development and technology transfer have been carried out. For instance, research and development

institutions such as JST¹⁸, AMED, and JSPS¹⁹ and universities are conducting bilateral joint research, R&D projects, and science and technology cooperation utilizing ODA schemes. Summit-level or foreign minister-level talks are also held annually between Japan and Thailand. The Thai government regularly expresses its appreciation for Japan's human resource development support and science and technology cooperation during such talks. Thailand has implemented SATREPS projects since the beginning of the scheme, and can be said to play an important part in Japan-Thailand diplomacy.

3-5-2 Diplomatic Impact

According to the terminal evaluation report conducted by JICA in 2015 and the final report by JST in 2016, Case Study I resulted in the establishment and a strengthened network of researchers and research institutions in the field of environment and energy have been realized within Thailand, between Japan and Thailand, and among ASEAN countries.

In their efforts to produce additional social impacts, Case Study I worked with the East Asia-ASEAN Economic Research Center (ERIA) and ASEAN countries to formulate Asian standards for biodiesel fuel. This helped promote fuel standards not only in Thailand but also throughout the ASEAN region, and can be expected to contribute to solving environmental and energy issues on a global scale.

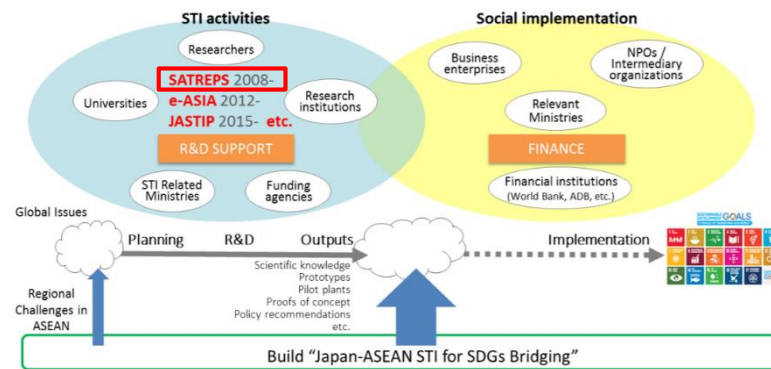
Moreover, as a mechanism to further support the promotion of the utilization of research outcomes for social impact in the ASEAN region, the “ASEAN-Japan STI for SDGs Bridging Initiative” at the 9th Japan-ASEAN Science and Technology Cooperation Committee in 2018 was established (Figure 3.1). In the “1st: Japan-ASEAN Multi-Stakeholder Strategic Consultancy Forum” held in Bangkok 2019, the results of three SATREPS research projects in ASEAN countries was introduced. Opportunities for parallel development of research in ASEAN countries among multi-stakeholder groups of ASEAN and Japan were discussed. The initiative and the forum were also mentioned in the Chairman's Statement of the 21st ASEAN-Japan Summit which was held in November 2018. The statement suggests that the network and outcomes of joint research cultivated through SATREPS are expected to produce impacts in society from the viewpoint of science and technology diplomacy. In summary, the diplomatic impacts of Case Study are as follows.

- Strengthened presence and reliability of Japan in science and technology research in Thailand

¹⁸ JST has been promoting top-down strategic international science and technology cooperation since FY2003 to support international research exchange in partner countries, regions, and fields based on intergovernmental agreements and agreements at ministerial meetings.

¹⁹ Japan Society for the Promotion of Science

- Promotion of intercommunication in science and technology in the ASEAN region
- Utilization of research outcomes for with direct social impacts and application within the consumer economy



Source: MEXT (2018) Japan-ASEAN STI for SDGs Bridging Initiative

Figure 3.1 Outline of the Japan-ASEAN STI for SDGs Bridging Initiative

Chapter 4 Case Study II: The Republic of South Africa

4-1 Overview of Case Study Project

This section provides an in-depth discussion on the “Project for Establishment of an Early-warning System for Infectious Diseases in Southern Africa Incorporating Climate Predictions” implemented from 2014-2019, as Case Study-2. Table 4.1 shows the overview of Case Study II.

Table 4.1 Overview of Case Study II

Project Title	Project for Establishment of an Early-warning System for Infectious Diseases in Southern Africa Incorporating Climate Predictions
Description	This objective of this project is to develop an infectious disease outbreak prediction model that incorporates the influences of a variety of environmental factors into climate change models in order to predict the outbreaks of malaria, pneumonia, and diarrheal diseases such as cholera that are predominantly affected by climate conditions. The ultimate aim of the research is to build an early warning system (infectious Diseases Early-Warning System; iDEWS) that can be applied in implementing effective countermeasures for infectious disease.
Research Institutions (Japan)	(1) Principal Institution: Nagasaki University (NU) (2) Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Research Institutions (South Africa)	(1) Principal Institution: Alliance for Collaboration on Climate & Earth Systems Science (ACCESS) (2) Council for Scientific and Industrial Research (CSIR) (3) South African Medical Research Council (MRC) (4) Limpopo Department of Health (DOHL , Malaria Institute included) (5) National Institute for Communicable Diseases (NICD) (6) South African Weather Service (SAWS) (7) University of Limpopo (UL) (8) University of Pretoria (UP) (9) University of Cape Town (UCT) (10) University of the Western Cape (UWC) (11) University of Venda (UV)

4-2 Relevance of Policies

Regarding the consistency of Case Study II with South Africa's development needs, the project is found to be consistent with South Africa's “National Development Plan

2030,” “2014-2019 Medium-Term Strategy Framework (MTSF), formulated by the Government of South Africa; “The 2030 Agenda” by African Union (AU); and “Regional Indicator Strategic Development Plan (RISDP)” by the Southern African Development Community (SADC). In addition, the SATREPS scheme and Case Study II are also consistent with “Japan’s Country Development Cooperation Policy for the Republic of South Africa” and “TICAD7: Japan’s Contributions for Africa” set by the Government of Japan.

Regarding the suitability of malaria control as a research topic, the Government of South Africa also emphasizes the importance of malaria control and the need to develop measures against infectious diseases for an aging society in the “National Department of Health Strategic Plan 2010/11-2012/13”. In addition, the World Health Organization (WHO) states the importance of measures against infectious diseases caused by climate change in Sub-Saharan Africa in their “WHO Guidance to Protect Health from Climate Change through Health Adaptation Planning 2012-2016”. The Government of South Africa also formulated the “National Action Plan on Adaptation of Climate Change to the Health Sector 2012-2016” based on the WHO’s recommendations. As a result, we observe high consistency with regional and global development needs in the SATREPS scheme in South Africa through Case Study II.

4-3 Effectiveness of Results

The following results were obtained through field surveys in Japan and South Africa. This research project is a successor to the “Application of Climate Change Prediction and Application in Southern Africa (2009)”, implemented by Director Yamagata from the JAMSTEC Application Laboratory. Case Study II was able to produce a variety of highly effective results by utilizing existing networks and research results. These include:

- The development of a climate-based infectious disease epidemic prediction model for malaria, pneumonia, and diarrhea.
- The formulation of an operational guideline for iDEWS using the infectious disease epidemic prediction model for Limpopo Province.
- The demonstration of predictive performance and operability of iDEWS.

In particular, significant outcomes have been observed for capacity development. Students and researchers who participated in Case Study II report that SATREPS contributed to improved international recognition of the research institutions. This was achieved through actions such as learning how to use the equipment provided through SATREPS; receiving training from Japanese researchers; and participating in training activities in Japan. Figure 4.1 shows the system and effects in capacity development observed in Case Study II.

It was confirmed that the capacity development effect spread not only to research institutes in urban areas, but also to researchers in rural areas, representatives of local governments at the municipal level, and general residents of each municipal area. This project aimed to disseminate results of the malaria outbreak prediction model to the general public and to promote malaria prevention measures. Dissemination was taken on mainly by the Malaria Control Center in Limpopo²⁰. The center employs several representatives of local governments every spring for eight months, and uses a picture-story show to train the general public about malaria prevention measures.

Although researchers in rural areas have obtained degrees from universities, they tend to have limited research capacity in comparison to researchers in urban areas and Japanese researchers. Experienced researchers regularly visited these rural areas to provide intensive support, which contributed to enhanced research skills and abilities in rural areas. Respondents claimed that the quality of training from researchers in rural areas to local government workers improved, and activities for enlightening malaria prevention measures were properly implemented. In other words, In Case Study II, the effects of capacity development spread to local governments and the general public through research support from Japanese researchers to other urban research institutions and local researchers.

Regarding comparisons with other donors in the field of science and technology for South Africa, no other donors were confirmed to be providing assistance similar to SATREPS. Many donors mainly provide scholarships to students and researchers in South Africa to support degree acquisition at overseas universities. SATREPS, which focuses on capacity building and implementation of science and technology, creates and provides joint research opportunities. In addition, SATREPS aims to achieve SDGs through the development of science and technology as one of its objectives, and it has been confirmed that this makes it distinct from the support of other donors.

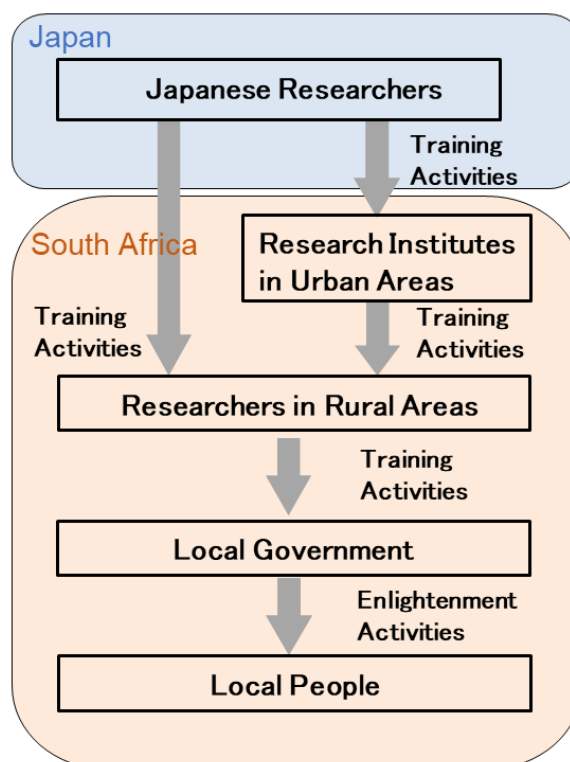


Figure 4.1 Impact of Capacity Development in Case Study II

²⁰ Limpopo is a malaria-prone area located approximately 300 km northeast of South Africa's capital, Johannesburg.

4-4 Appropriateness of Processes

South Africa is a relatively privileged environment for researchers while many African countries tend to devote less budget and resources to conducting research. In terms of budget, the Government of South Africa believes that it could be more transparent to use SATREPS than to allocate budgets to local governments. In terms of human resources, South African researchers are able to conduct high-level research with a strong higher-education system in place.

On the other hand, from the viewpoint of public relations and the expansion of SATREPS, there are no institutions in South Africa that coordinate opportunities for the exchange of opinions among donors, international organizations, and aid agencies. There are few opportunities for contact between stakeholders. It is therefore essential 1) to build a network (a personal network) at the stage of SATREPS project formation, and 2) to build a cooperative team (a team network) and environment at the stage of SATREPS research continuation. In Case Study II, the existing network of ACCESS and South Africa's principal investigators, the interpersonal relationships between supervisors, and advanced teamwork were significant factors leading to success.

4-5 Evaluation from Diplomatic Viewpoints

4-5-1 Diplomatic Importance

In terms of science and technology diplomacy between Japan and South Africa, the Japan-South Africa Science and Technology Cooperation Agreement was signed in August 2003. Based on this Agreement, interactive human resource development and technology transfer has been carried out. Between Japan and South Africa, summit-level or foreign minister-level talks are held annually, and through those opportunities, South Africa expresses its appreciation for Japan's human resource development support and cooperation in advanced science and technology. SATREPS for South Africa is an ODA scheme that plays a part in Japan-South Africa diplomacy, and is a collaborative project that contributes to deepening trust and friendship between the two countries.

4-5-2 Diplomatic Impact

According to the terminal evaluation report conducted by JICA in 2012, Case Study II produced a network of researchers and research institutions related to seasonal climate forecasting and variability, and strengthened collaboration at the following three levels:

- Exchange and collaboration between Japan and South Africa
- Exchange and collaboration among seasonal climate forecasting researchers and institutions in South Africa

- Collaboration between Southern Africa and SADC countries

A new model of seasonal climate forecasting introduced by Case Study II in South Africa has been put into operation in the seasonal climate forecasting system of SADC countries, and the forecast information is made publicly available online. It is expected that the information obtained from the forecast system, such as precipitation, temperature changes, and sunshine hours, will be applied in the fields of agriculture, health and sanitation, and water resources management to contribute to mitigating risks from the natural environmental and climate change. In addition, researchers involved in the project currently coordinate joint research activities with neighboring countries (Mozambique, Malawi, Zambia, etc.) that have a large number of malaria patients under a collaboration with E8 (The Elimination 8 Initiative)²¹. Based on these observations, Case Study II has produced diplomatic effects through the following initiatives:

- Japan's strengthened presence and reliability in science and technology research in Southern Africa
- Enhanced intercommunication among science and technology research institutions in neighboring countries
- Utilization of the research outcome for economic society and its wide application

²¹ An eight-nation coalition is established by SADC to work for eradicating malaria in southern Africa by 2030.

Chapter 5 Evaluation of the SATREPS Scheme

5-1 Relevance of Policies

(1) Relevance to Japan's High Level Policies

Japan's science and technology policy has been implemented under the "Science and Technology Basic Plan", which is revised every five years since its establishment in 1996. The current Fifth Science and Technology Basic Plan (FY 2016-2020) is the first iteration of the basic plan to be reorganized into the Comprehensive Science, Technology and Innovation Conference (CSTI of 2014). The plan states that the international activities of science, technology, and innovation should be integrated with "science and technology diplomacy", and that policies should be implemented and reformed based on objective evidence. To implement the plan, CSTI is aiming for a combined total of 26 trillion yen in public and private R&D investment and government development investment.

The "Development Cooperation Charter," which was approved by the Cabinet together with the Fifth Science and Technology Basic Plan, states that a priority policy is to build a sustainable and resilient international community through efforts to address global issues. The Charter states that human resources cooperation, utilization of advanced technologies, and collaboration with universities and research institutes are required to promote effective and efficient development cooperation – all of which align consistently with the SATREPS guidelines.

(2) Relevance to Development Needs of Partner Countries

When SATREPS announces a call for proposals, applicants generally need to confirm the consistency between the development needs of the partner country and the content of the proposed research project. As shown in 1-1, SATREPS is a joint research project between the two countries, as well as one of Japan's ODA schemes. For this reason, in the project selection process, evaluations are being conducted with an emphasis on how research projects that utilize ODA funds can contribute to solving development issues in partner countries. In other words, if the principal investigator does not fully understand the development needs of the partner country from the proposal development phase, the project will not be accepted. Selected projects are required to contain research content that is consistent with the development needs of the partner country. As described earlier in Chapters 3 and 4, high consistency with the development needs of the partner countries of both projects has been confirmed in Case Studies I and II.

(3) Relevance to International Priorities

As in (2) above, results from SATREPS should also respond or contribute to global issues and align with the Sustainable Development Goals (SDGs) at the formulation

stage. Regional goals should also be considered through consistency with the issues within the target country's regional community, as well as development goals shared through the Regional Economic and Social Development Council. The case studies discussed here are consistent with international and regional priorities through their response to SDGs and regional priorities, particularly in Case Study I with its impact on ASEAN policies. Case Study II revealed consistency through its resolution with TICAD (see the separate volume for details).

(4) Relevance to Other Donors' Assistance

Through the field survey, it was confirmed that the governments of the case studies were properly using SATREPS by Japan and R & D support provided by other donors. Thus, SATREPS is appropriate in terms of cooperative support for solving development issues in the partner country. Besides, from the viewpoint of Japan's comparative advantage in the science and technology field of the partner country, both the Thai and South African governments are provided state-of-the-art research equipment that is difficult to prepare by their related organizations and have highly specialized researchers (experts). The fact that they mentioned the provision of equipment and dispatch of researchers as the benefit of SATREPS indicates these consist a comparative advantage of this scheme.

As for science and technology cooperation by other donors, the field survey mainly mentioned research support by Newton Fund in the UK and Horizon 2020 in the EU. The main feature of such support is that it covers social science research areas such as gender and governance, in addition to the four fields and five areas covered by SATREPS. Moreover, other donors hold multiple workshops and symposiums before announcing the implementation of science and technology support in order to obtain many proposals (Unsolicited Proposals) from general researchers. External public relations have been carried out jointly with partner government agencies. Efforts are being made to attract the attention of the target countries. In addition, the support includes not only collaborative research but also options such as scholarship programs, exchange student programs, and research grants. It has also been evaluated as a simple procedure that allows applications to be made to multiple projects through one scheme.

5-2 Effectiveness of Results

This section evaluates the effectiveness of SATREPS by analyzing 1) inputs allocated towards achieving policy objectives, 2) outputs and outcomes produced as the result of the inputs, and 3) social impacts produced utilizing research outputs/outcomes. The scope of the evaluation covers SATREPS as a whole. In the evaluation process, the above-mentioned case studies and Reference Projects are used as reference.

(1) Effectiveness of the Input on Policy Goal

The budget for a single SATREPS project is approximately 100 million yen/year, out of which approximately 35 million yen/year is allocated to JST's and AMED's commissioned research development, and another 60 million yen/year is allocated to JICA's technical assistance. The overall SATREPS budget is seeing a slight increase over time as shown in Figure 2.4.

When implementing a SATREPS project, JST/AMED supports the necessary domestic research expenses, or "Commissioned research expenses"²², while JICA bears the expenses necessary for the enforcement of technical cooperation. This includes dispatching Japanese researchers, training of counterparts in Japan, and procuring machine/equipment. A notable feature of JICA's expenses as a general rule says that a series of expenses including; "personnel expenses of counterparts", "office rent in the counterpart's country", "consumables spent by counterpart researchers", "personnel expenses of researcher belonging to the counterpart research organization", "operation and maintenance costs of grant machine and equipment", "allowance for day-to-day meeting", and "local travel expenses of counterpart researcher" etc., are to be shouldered by the counterpart research organization using other financial sources. These restrictions are put in place to adhere to a basic Japanese ODA principle of self-help, which aims to contribute to sustainable and self-reliant development of the partner government after the completion of the project.

To evaluate the effectiveness of SATREPS input, "Commissioned Research Funds" allocated to JST/AMED, "Dispatching of Japanese researchers", "Training of counterparts in Japan", and "Granting of machine/equipment" managed by JICA are considered and analyzed separately.

(a) Commissioned Research Expenses

JST and AMED provide funding for direct and indirect expenses for research projects. Table 5.1 shows the composition of expenses.

Table 5.1 The Composition of Commissioned Research Expenses

Type of Expense	Large Category	Definition
Direct expenses	Goods expenses	Procurement expense of facilities, equipment, and consumables for research
	Travel expenses	Travel expenses for research representative (research representative, main co-researcher etc.), participant of

²² AMED refers to these items as "Commissioned Research and Development Expenses", but for simplicity, "commissioned research expenses" is used in this report.

		research and invited person whose name is written in the research plan
	Labor expenses/honorarium	Manpower expense/honorarium for participants of research (except research representative, etc.)
	Other expenses	Other expenses necessary for conducting research e.g.) Expense for research result dissemination, meeting and apparatus lease, etc.
Indirect expenses	In principle, 30% of direct expenses is allocated	

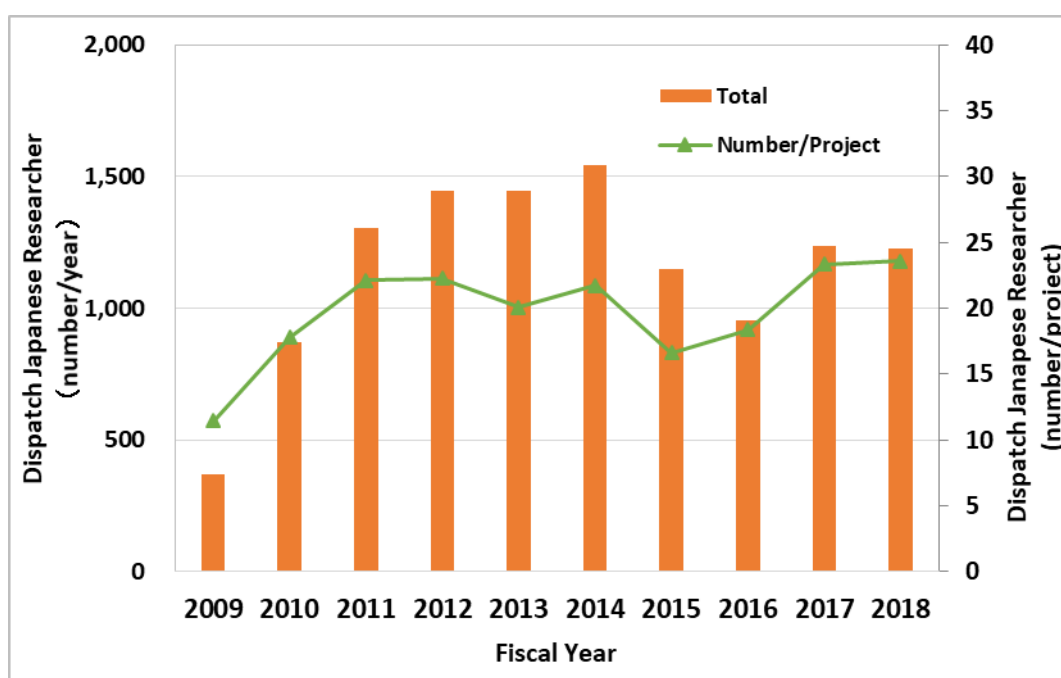
Source) Recreated by the evaluation team based on the "Application requirement of SATREPS 2020" (JST) and the "Application for open call, SATREPS" (AMED).

(b) Dispatching Japanese Researchers

Dispatching Japanese researchers under the framework of SATREPS is conducted in the same manner as a technical cooperation project in Japan, which aims to transfer technology, or provide skills on policy making and project management for officers and counterparts in charge of technical cooperation in partner countries. Under the SATREPS scheme, Japanese researchers conducting research in the partner country are referred to as "Overseas researchers", that fall under the category of "Long term overseas researcher" (a dispatch period of over 1 year), or "Short term overseas researcher" (a dispatch period of less than 1 year). Long-term dispatching procedures are administered by research institutions to which the representative belongs, while short-term dispatching procedures are managed directly by JICA.

Interviews with early-career and experienced researchers based in Japan revealed perceived difficulties in securing long term overseas research positions. Many researchers have been dispatched through the SATREPS scheme, and the scheme provides ample opportunities for Japan based researchers to accumulate international research experiences. The figures of dispatched Japanese researchers under the SATREPS scheme is shown in Figure 5.1, indicating an average dispatch of approximately about 20 persons/project.

It should be noted that the numbers for the "Effectiveness of result" do not include data on the field of Infectious Diseases Control after 2016. This is due to institutional restructuring that took place in 2015 that transferred these projects to AMED's jurisdiction. This fact was taken into consideration in evaluating the scope of activities from FY 2016 onwards.



Note 1.) The field of infectious disease control is not included after 2016

Note 2.) Added to total value in case the same researcher dispatched within the same year

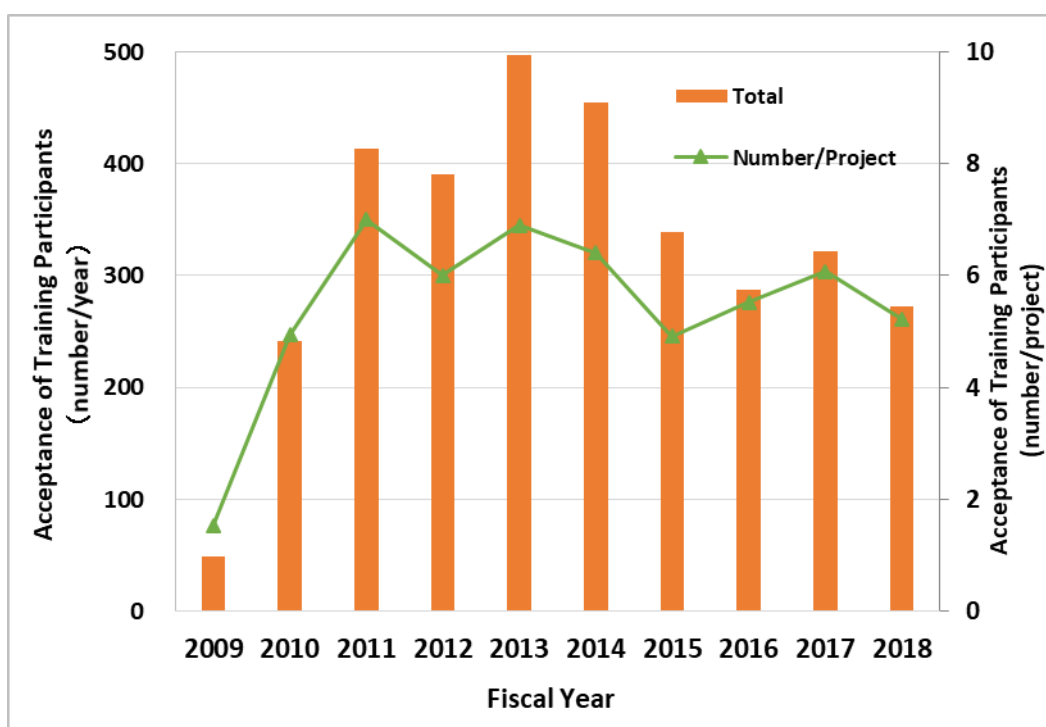
Source) Evaluation team based on information provided from JST

Figure 5.1 The Number of Researchers Dispatched from Japan

(c) Training of Counterpart Trainees in Japan

The acceptance of foreign researchers in a SATREPS scheme is carried as a technical cooperation Training Program. The system entails that a researcher from the collaborating research institution in a partner country can be invited to Japan to receive advanced training. It is expected that invited researchers will play a leading role in advancing science, technology, or bilateral collaboration. Invited researchers are expected to play a key role in the successful completion of the research project. Training programs can be classified as long-term (over one year) or short-term (less than one year) and include travel and accommodation costs, daily allowances, and other training expenses.

Figures of the foreign researcher training program funded by SATREPS are depicted in Figure 5.2. Approximately 5-6 trainees per project have been accepted on average. According to field interviews, researchers in partner countries are highly motivated to receive training in Japan, and this represents one of the primary incentives for researchers overseas to participate in SATREPS.



Note 1.) The field of infectious disease control is not included after 2016

Note 2.) Added to total value in case the same researcher arrived within the same year

Source) Evaluation team based on information provided from JST

Figure 5.2 The Number of Research Trainees Accepted from Partner Countries

(d) Provision of Research Equipment

The provision of equipment in SATREPS follows the same procedure as that of a technical cooperation project. JICA shoulders the costs of procurement, transportation, and installation/adjustment of goods, and conducts all processes in consistency with security export control restrictions. Exported equipment is immediately transferred to the government of a recipient country and used for collaborative research activities. Both case studies introduced in this report received research equipment and the evaluation team has confirmed that the equipment was properly maintained and continues to be utilized by counterpart research institutions even after the completion of the project.

(2) Effectiveness of Output and Outcome in Input

The following two methods are adopted to evaluate the effectiveness of output and outcome: i) a summary evaluation of the project evaluations conducted by JST and JICA, and ii) an examination of personnel exchanges and strengthening relationships with counterpart research institutions.

(a) Summary of Evaluation Results of Effectiveness in Terminal Evaluation of Each Research Project

According to the "ODA Evaluation Guideline 12th edition (June 2019)", the "effectiveness of results" is composed of an evaluation of the "effectiveness" and "impact" of a project in consistency with the DAC Evaluation Criteria. These evaluation results provided by JICA²³ are examined in combination with the comprehensive evaluation rating provided by JST's terminal evaluation.

Although JICA's ratings of "effectiveness" and "impact" in terminal evaluations have no unified definition, expressions such as "very high", "high", "slightly high", "medium degree" are used in to order their evaluative judgments. JST's uses letter scores in their rating system, such as S, A+, A, A-, B, C (listed here in descending order of quality). Table 5.2 depicts the summary of comprehensive evaluation results, effectiveness scores, and impact scores. The figures are extracted from 66 terminal reports from JST, and 43 from JICA.

Table 5.2 The Evaluation Result of SATREPS Projects by JST and JICA

Implementing Agency	The number of evaluated projects	The number of projects with "High" value of comprehensive evaluation (%)	
JST	66	49 (74%)	
Implementing Agency	The number of evaluated projects	The number of projects with "High" effectiveness (%)	The number of projects with "High" impact (%)
JICA	43	39 (90%)	37 (86%)

Note) In JST evaluation result, "S", "A+", "A" are classified in "High". In JICA evaluation on effectiveness, "Very high", "Rather high", "Comparatively high", "Expected to be high", "Extremely big", "Plus impact" and "Positive impact" fold into same category.

Source) Evaluation team

JST and JICA can be seen to evaluate the effectiveness of the majority of completed SATREPS projects as "high". Very few research projects are evaluated by JST as a "C", or by JICA as a "D: Low".

However, the few projects that are evaluated poorly are for various reasons, such as project relevance being adversely effected due to changes in government policies in the partner country, or a delay of progress in a project due to conflicting opinions between participating researchers. Relative to a conventional domestic research project, SATREPS researchers in general must perform under greater constraints and higher risks associated with collaborations in developing countries. Despite such constraints and risks, JST and JICA evaluation results appear to be quite positive.

²³ Since this evaluation deals with adopted project before 2014, some JICA terminal evaluation report were available. Having mentioned, JICA prepare post-project evaluation but not terminal evaluation at present (refer to JICA's "Project Implementation Guideline on Science and Technology Research Partnership for Sustainable Development (SATREPS)")

Therefore, it is reasonable to state that the effectiveness of results within SATREPS projects overall appears rather high, although there is room for improvement with a few poorly performing projects.

(b) Personnel Exchanges and Strengthening Relationships with Counterpart Research Institutions

As mentioned above, the effectiveness of the results appears generally high within existing evaluation results of individual SATREPS projects. Next, the effectiveness of results specifically towards the three objectives of SATREPS is evaluated progressively throughout the project stages. Figure 5.3 shows the relationship of indices indicating “the depth of collaboration”, “the effect of output”, and “the effect of the effectiveness”, respectively. In this figure, a hypothesis is set; viz. "Research outcomes of practical benefit to both local and global society" is produced through deep collaboration. In line with this hypothesis, the following sub-sections (b) to (d) examine whether a reasonable level of output/outcome was produced through the inputs utilized in the SATREPS scheme.

Depth of Co-research (Shallow→Deep)	Start of SATREPS	Personnel Exchange/ Strengthening of Relationship with Counterpart Research Institution	Capacity Development of Researcher and Research Institution of Counterpart Country and Dissemination	Effort to practical benefit of research outcomes
Generated Effect	-	Increase of the number of participants to research and their attribution Implementation of co-research Participation of student and master Regular sharing of research results	Capacity Development of Researcher and Research Institution Accumulation of Research Results Capacity Development of the Recipient of Research Benefit Improvement of Research Result/ Evaluation	Dissemination of research result to broader area
Example of Index to Measure Effect	-	The number of travels between counterpart country and Japan	The number of patents and academic publishing	The number of workshops/ symposia held The number of related patents approved

Source) Evaluation team

Figure 5.3 Relations between Depth of Research and Research Outcomes of Practical Benefit

When a SATREPS research project is adopted, research institutions begin coordinating the personnel exchanges. Interviews with participants in Japan and overseas revealed that researchers in Japan were able to gain exposure and develop interests in counterpart countries through such exchange programs. SATREPS programs were able to help popularize overseas training programs between Japan and counterpart countries. Researchers received training abroad through the "SATREPS frame"²⁴ which is also supported through a MEXT Scholarship to enable researchers to also consider receiving higher specialized education in Japan. The

²⁴ SATREPS frame is established in 2010. It is a special frame which adopt 10 doctoral course students at the max from SATREPS-adopted university with signed in Record of Discussion (R/D).

indicators of "(1) Effectiveness of input toward policy objective", can thus be represented with figures such as "Figure 5.1" and "Figure 5.2".

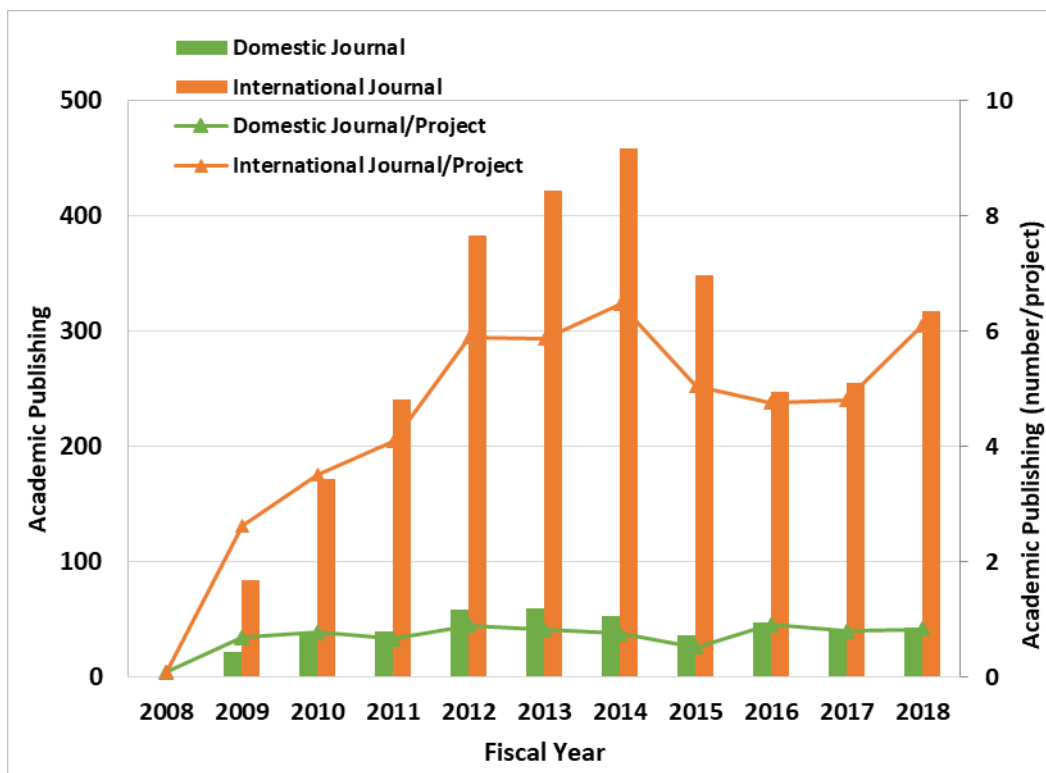
Interviews with Reference Projects also revealed that projects were highly evaluated due to their ability to co-ordinate with various administrative agencies within the counterpart country, and not just the partner research institutions. Relationships were formed with administrative agencies which also provided opportunities to develop sectorial linkages. In addition, through personnel exchanges, links between research systems in Japan and the counterpart country were formed to enable supplementary sharing agreements, such as students and equipment. Various examples were observed where personnel exchanges represented the first steps to research teams and collaborative mechanisms gaining momentum within the project. The evaluation team attempted to measure these outputs objectively by gathering information on the number of meetings and/or policy discussions that took place between research institutions, but such information could not be compiled, generated, or analyzed.

(c) Quality and Diffusion of Capacity Development

Through the strengthening of mutual relations using personnel exchanges, both researchers and research institutions benefited from capacity development. One of the indexes to measure capacity development is the number of original theses (Figure 5.4) and presentations at the academic conferences (Figure 5.5). One of the incentives for researchers to participate in SATREPS was to receive support to build a strong track record of research results by producing and presenting research results within the academic community.

Interviews with Reference Projects revealed that a counterpart researcher was highly incentivized to write a superior thesis using SATREPS data and considered it an essential condition to build a research career in Thailand.

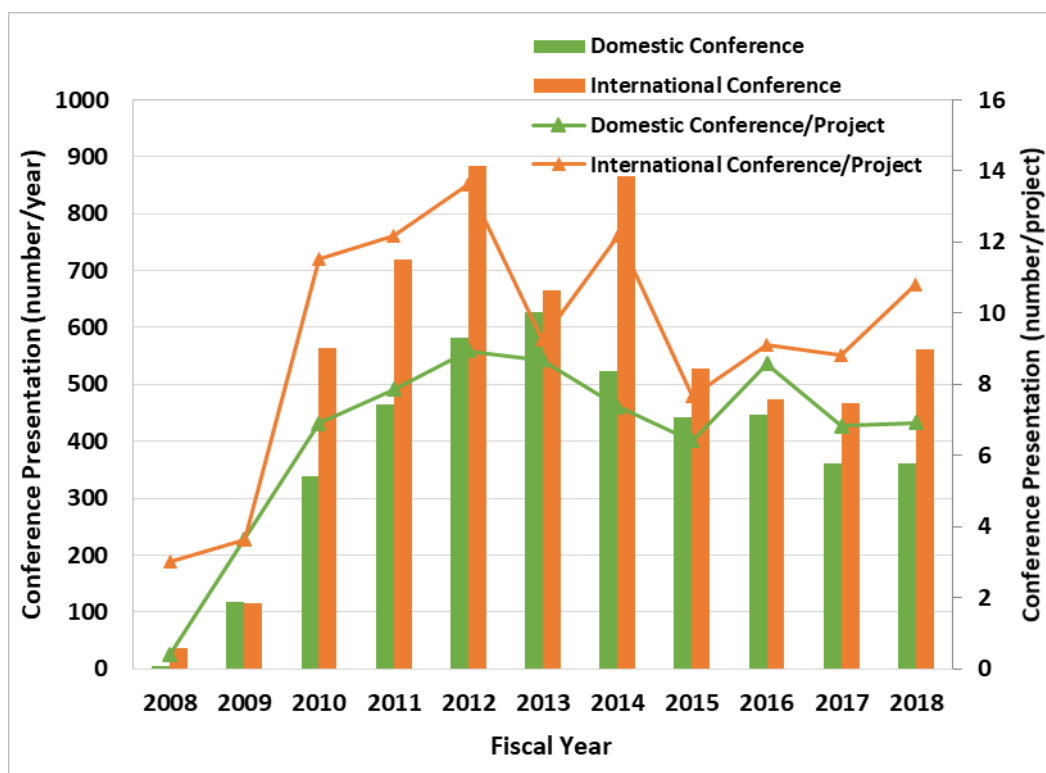
When examining Figure 5.4 and Figure 5.5, it is difficult to normalize the numbers, as SATREPS does not set target indexes for the categories and the distribution of figures is rather large. Recent trends reveal, however, that SATREPS projects appear to produce more than 4 times the amount of international publications compared to domestic journal articles, and an average of 6 international conference presentations per year. Such figures do indicate a consistent level of capacity development by the counterpart researcher and research institutions. Research results and theses are published overseas rather than in Japan because of the global nature of SATREPS research projects.



Note) The field of infectious disease control is not included after 2016

Source) Evaluation team based on information provided from JST

Figure 5.4 The Number of Academic Publishing (All fields) Released under SATREPS



Note) The field of infectious disease control is not included after 2016

Source) Evaluation team based on information provided from JST

Figure 5.5 The Number of Conference Presentations (All fields) Hosted under SATREPS

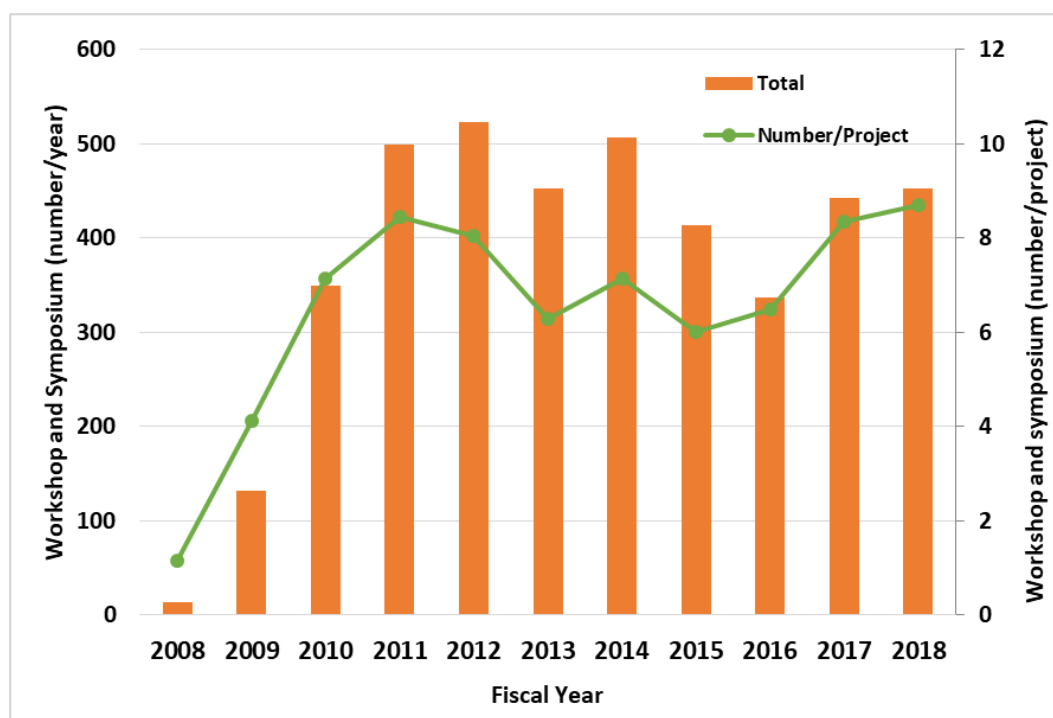
The benefits of capacity development observed within SATREPS may not be limited only to the researcher and research institutions, but also to the citizens of a counterpart country, as described in section "4-3 Effectiveness of Results", regarding the case study of South Africa²⁵. Such symbolic SATREPS projects have various lessons to share regarding how research projects or administration agencies in the counterpart country can reach out to other concerned stakeholders to maximize the social impact.

As mentioned in Chapter 3 and Chapter 4, SATREPS has promoted capacity development of researchers, research institutions and local people in partner countries by means of frequent exchanges of researchers between Japanese institutions and partner countries. The scheme is unique in comparison to science and technology cooperation programs implemented by other donors, and has been recognized as a Japan-specific scheme by partner countries.

(d) Effort toward Research Outcomes of Practical Benefit to both Local and Global Society

Through the realization of capacity development, research capacity of counterpart research institutes can be enhanced. Skills and knowledge of new science technologies also gradually accumulate. In addition to the activities of spreading and disseminating research results, workshops and symposium are increasingly hosted at this stage to promote the practical benefits of research outcomes to both local and global society, which is the goal of SATREPS. As shown in Figure 5.6, an average of 6 international academic symposiums are organized a year, a rate which has increased significantly in the past 3 years. Such publicity events increase the exposure and awareness of SATREPS and creates opportunities to collaborate with other sectors to produce research outcomes of practical benefit to both local and global society.

²⁵ Even for an internationally famous research institute like "ACCESS" introduced in Case Study 2, SATREPS project targeting a wide geographical distribution are rare. Thus, SATREPS is thought to be equipped with the possibility to provide new capacity development to any research institution in the world.



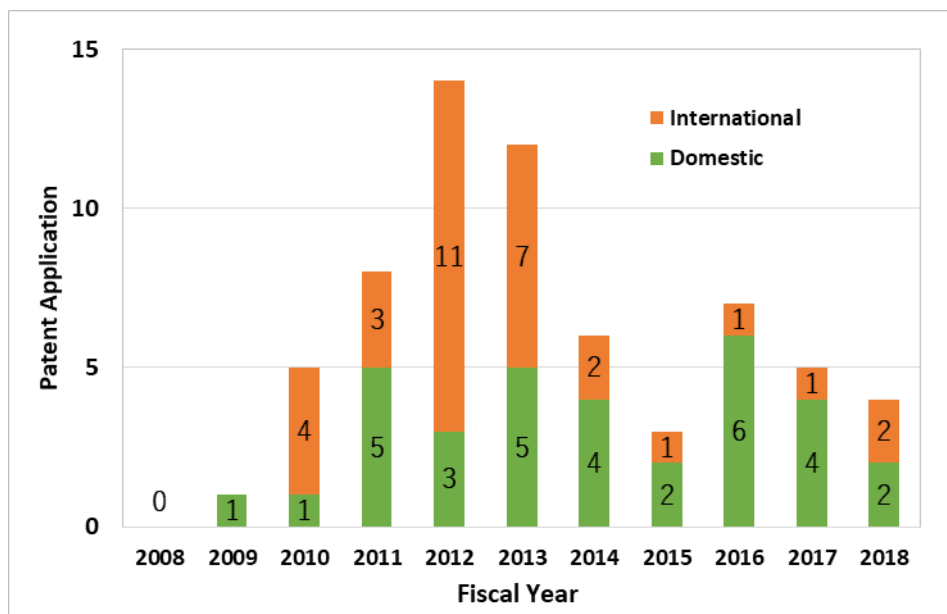
Note) The field of infectious disease control is not included after 2016

Source) Evaluation team based on information provided from JST

Figure 5.6 The Number of Workshops /Symposia Held under SATREPS

Various indices can be considered to measure the level of research outcomes of practical benefit to both local and global society. For example, the number of technical patents, and the evidence of influence on policies for the approval from regulatory and international agencies (the field of infectious disease control in particular) fall into this category.

However, it is generally difficult to express such indices numerically. E.g., How *useful* is a patent, before it impacts the market? How *important* was a policy change, that will affect the future? Even for observable figures such as the “number of patent applications”, research institutions are very sensitive to the cost-effectiveness of technologies described within patents (e.g. maintenance cost of the patent, possibility of licensing to commercial entity and its income etc.) and careful as to choosing which results should be worthy of a patent application. As can be seen in Figure 5.7, the number of patent applications fluctuate and do not provide clear evidence of “practical outputs” from this perspective.



Note) The field of infectious disease control is not included after 2015

Source) Evaluation team based on information provided from JST

Figure 5.7 The Number of Patents Approved under SATREPS

(3) Research Outcomes of Practical Benefit to both Local and Global Society (Social Impact)

As discussed in 1-1, SATREPS sets a goal of “Research outcomes of practical benefit to both local and global society” as the goal of its three objectives. Thus, each SATREPS project is expected to take a solid step toward this target during the project period. The SATREPS's goal of "Research outcomes of practical benefit to both local and global society" can be categorized into two types, i) the outcome is commercialized and prevails in the market, and ii) the outcome is reflected in public services or impact public policy. All administrative organizations and implementing agencies of SATREPS agreed to these two types. In other words, "Research outcomes of practical benefit to both local and global society" is a direct or indirect long-term effect that can be observed after the implementation period of a SATREPS project, and it is thought that this can be evaluated as an impact in "the effectiveness of the result".

Additional details of how such “benefits” can be defined can be found in the "Approach of Ministry of Education, Culture, Sports, Science and Technology for the STI for SDGs Promotion²⁶", "For the earth, for the future, SATREPS" and "For the earth, for the future, SATREPS Vol.2 ". In Case studies 1 and 2, projects of this sort were deemed not to be able to achieve its goals without the support of Japan's technology and co-research activities with counterpart research institutions in question. It is thought that the competitive characteristics of SATREPS such as the scale of its budget, policies to promote personnel training and cooperation, and public

²⁶ Presentation material on “4th Multi-stakeholder Forum on Science, Technology and Innovation for the Sustainable Development Goals”, prepared July 26, 2018.

awareness promotion with the counterpart country have contributed greatly to achieving the goals of SATREPS.

However, it should be noted that "Research outcomes of practical benefit to both local and global society" can be both positively and negatively influenced by external factors such as political shifts and changes to a partner country's development priorities, as well as change to the ODA landscape produced by strategic actions by other agencies or donors.

For example, in Case Study 1, implementation of the research results was promoted by the enforcement of a new biomass policy in Thailand as well as the support of private enterprises. Therefore, it is desirable to make preliminary arrangements during the project period that considers and makes attempts to predict external factors leading up to the end of each project. Although there is commonly accepted definition of the "Research outcomes of practical benefit to both local and global society" among concerned agencies of SATREPS, a common understanding of how it can be measured, compared, or what constitutes a reasonable target to be achieved within one project cycle remains undefined. It is thus firstly necessary to build a common recognition among related agencies concerning "Research outcomes of practical benefit to both local and global society".

5-3 Appropriateness of Processes

This section provides an assessment of SATREPS processes by reviewing implementation structures and practices within each of the relevant institutions. The overall implementation and management process of SATREPS is evaluated with a particular focus on three points: the process of applying for and accepting research projects, the process of conducting research in partner countries, and the process of monitoring and evaluating projects.

(1) Appropriateness of SATREPS Implementation Structure

SATREPS is operated by the Department of International Affairs (SATREPS Group) of JST, the Department of International Affairs of AMED, and the Infrastructure and Peacebuilding Department of JICA. However, since JICA has jurisdiction over SATREPS as a technical cooperation project, JICA distributes its work to relevant task departments and manages projects through their field offices in the partner countries.

One advantage of SATREPS is that it can benefit from the relative strengths of various institutions, although this leads to issues associated with the increasing complexity of a scheme that includes various institutions. For example, there are no standardized data compiling, project implementation, or evaluation methods specifically designed for SATREPS, but rather the application of existing JST and AMED practices and specifications. To evaluate and improve the SATREPS scheme, involved institutions must manage the same quality and quantity of information. As

SATREPS is funded through the ODA budget, it is also necessary to disclose information in an accessible and understandable manner, in order to gain public understanding. Each operating institution should adjust and refine their SATREPS management system and information disclosure methods to some extent, based on their respective higher level policies.

(2) Appropriateness of Process from Application to Termination

The process shown in “2-2-2 SATREPS Operation and Procedure” is recreated based on Japanese operational guidelines. This section will evaluate a series of processes related to SATREPS, focusing on the application and selection processes, the management processes of research projects in partner countries, and the monitoring and evaluating processes.

(a) Application and Selection Process for Research Projects

The application and selection processes for SATREPS projects is complicated by various factors, such as a) organizations accepting applications are located in different countries, b) multiple institutions involved in the process in Japan, and c) requirements to arrange a mutual agreement between Japan and the partner country for final approval.

Although the application process basically follows the process outlined in “2-2-2 SATREPS Operation and Procedures,” most projects are essentially built upon a foundation of trust and long-term relationships between Japanese and partner researchers, making it possible to formulate projects that benefit both parties. However, since SATREPS is basically financed by Japan’s ODA budget, Japanese research institutions tend to take ownership of projects from the application stage. For this reason, it is not clear at the project formulation stage whether or not there exists a market environment or a social system which would support or promote the utilization of potential research outcomes for practical and social impacts in the partner country.

The implementation structures of JICA, JST and AMED must also be considered to evaluate the way in which SATREPS proposals are selected and approved. JICA examines proposals and provides one of four grades, A, B, C, and D, to evaluate a proposal based on its feasibility and potential value as an ODA project, together with MOFA. JICA Headquarters finalizes comments together with input from JICA field offices and other departments to submit their evaluation to JST and AMED. JICA's evaluation focuses on country assistance policies, relevance to other development projects, and project feasibility. Within this framework, SATREPS emphasizes not just the technology transfer from Japan to a partner country, but aims to implement

international joint research projects through equal commitments and ownership between Japan and the partner country²⁷.

AMED at one point made an attempt to revise its evaluation system. In FY2019, the ODA score and AMED score were combined, but were once again separated in FY2020. On the other hand, JST has not yet conducted such a trial to modify scoring methods to directly incorporate ODA elements, and currently plan to continue only using JICA's score as a reference in the selection process.

Regarding the approval process, no major issues were brought up from relevant stakeholders within Japan, yet operating institutions in partner countries shared several challenges. A typical example that highlighted room for improvement was that operating institutions in partner countries (such as TICA in Thailand) are not clearly informed by their Japanese counterparts as to why research projects were rejected. In Japan, JST and AMED provide detailed information and notify Japanese research institutes of the results, and request that applicants notify their counterpart researchers. Applicants in Japan are thus not obligated to share such feedback with their prospective partners overseas, and researchers in partner countries are also not required to inform relevant agencies in their own country. The only way for an organization involved in administrating SATREPS projects in partner countries to obtain the results is to reach out to domestic researchers directly. If this system remains as is, it becomes difficult for partner countries to improve SATREPS schemes and proposals in the following year. Sensitive and proprietary dimensions of advanced research complicate this issue, as MOFA can share comments from JST and AMED with Embassies but are often required to adhere to strict confidentiality requirements when communicating with partner institutions.

Therefore, we observe a situation in which decision-making and ownership of the application and approval process for SATREPS projects heavily weighted towards the Japanese side. This weakens ownership within partner countries and so it is important to create a mechanism to cultivate the ownership in partner countries to improve the SATREPS system and enhance the quality of research.

(b) Research Implementation Process in Partner Countries

As mentioned above, SATREPS is a program that combines competitive funding from science and technology with ODA schemes, so the implementation process differs significantly from conventional competitive research funding. When a researcher who is not familiar with ODA projects participates in a project, he or she must experience several administrative difficulties when pushing through projects, such as submitting a request through the diplomatic process, securing additional

²⁷ When it is an international joint research, it tends to be managed mainly by people from a developed country but Reference Projects are mainly run by Thai people, and Japanese basically support them. It is important to create ownership in the recipient country.

research budgets in advance, and managing conflicts and challenges among researchers across borders. For example, multiple interview subjects in Thailand and South Africa shared stories of misunderstandings regarding the proper and differentiated use of research budgets within the technical cooperation project framework. In addition, SATREPS was perceived to have a more complicated application process, and require more time to manage financial documents, in comparison to science and technology schemes provided by other donors. Relevant authorities appear to be aware of this issue, as SATREPS has taken steps to improve and simplify the process, such as a policy to follow the university's budget application rules²⁸.

However, many SATREPS research projects are based on relationships that have built a significant foundation of trust over long-term relationships, and many cases were observed to have overcome difficulties through the diligence and determination of the research teams. For example, researchers involved in Case Study I reported the need for Japanese researchers to adopt a flexible attitude and that trust was absolutely necessary to overcome fundamental administrative challenges.

On the other hand, there appears to be room for improvement in how stakeholders cooperate and share information within a research project. JST officials described the complementary nature of various SATREPS projects in similar fields, but very few opportunities for researchers themselves to share lessons amongst one another. If information sharing among researchers participating in SATREPS can be expanded and improved, the accumulated knowledge and operational efficiency of SATREPS could be enhanced.

A significant challenge facing project members within the SATREPS scheme is that there are significant differences in operational systems in the partner countries. For example, TICA of Thailand is the organization in charge of managing SATREPS but only handles administrative procedures. As a result, TICA is not in a position to comprehensively manage SATREPS in Thailand, and other line ministries are only familiar with SATREPS research projects in which they are directly involved. On the other hand, in South Africa, it was confirmed that the signature ceremony of the original MOU was postponed in consideration of the timing of a presidential election. Thus, where political considerations may be a key factor in countries like South Africa, bureaucratic constraints are a systematic challenge for countries like Thailand.

It is not impossible to uniformly evaluate the implementation system of SATREPS to provide long-term ex-post support. Japanese stakeholders are taking various actions to promote research results and expand the possibility of utilizing research outcomes for social and practical impact. For example, JST, AMED, and JICA jointly

²⁸ For example, in the past, the original financial copies were required for accounting but today the corresponding EXCEL sheet is only required for the process.

host an annual “Bridge Workshop Connecting Science and Development²⁹” in July. The objective of the event is to allow researchers to present their research results in their final year, and to connect the researchers to private companies³⁰. In addition, as described in “2-2-4 Public Relations Contributing to Raising SATREPS's Awareness in Japan”, each organization participates in international conferences such as TICAD to communicate with private companies and create partnerships.

In addition, activities for the utilization of research outcomes in the field of infectious diseases are significantly different from other areas under the jurisdiction of JST such as the necessity of clinical experiments for drug discovery. AMED positions their definition of “utilization of research outcomes for practical and social impact” as a research results that lead to development and commercialization. AMED supports this position through a program called “Soyaku Navi”, supported by drug discovery departments within AMED which promote tie-ups with private companies using existing networks. In addition, for research projects with high potential, AMED allocates additional budget to accelerate the production based on results.

On the other hand, in partner countries, various perceptions were observed concerning the support system for promoting the utilization of research outcomes for social and practical impact. For example, in Thailand, stakeholders expected additional support from Japan, as opposed to in South Africa, where various initiatives were observed regarding the country's targets for applying and utilizing SATREPS research findings. Policies for commercial and practical development of research outcomes may differ depending on the research area, and after a SATREPS project, like any other research project, research institutes discuss the potential for continuation, expansion, and application. Systematic support mechanisms should be established to promote the utilization of research results for social and practical impacts. The realization of social impact contributes not only to the feedback of research results to society and the resolution of global issues, but also to the visualization of research results to the Japanese public and increased awareness towards SATREPS.

(c) Project Monitoring / Evaluation Process

The SATREPS monitoring and evaluation process is described in “2-2-2 SATREPS Operation and Process.” JST, AMED, and JICA share information to promote evaluations and coordinate with JICA field offices and Embassies in partner countries to gather necessary data and information. Although details of each system differ depending on the country, partner countries also implement procedures and processes to check the progress of SATREPS projects, with the support of JICA field offices and Embassies. Annual progress reports are regularly published by Japanese

²⁹ 2019/7/26 “Bridge Workshop Connecting Science and Development”
https://www.amed.go.jp/news/event/190726_bridgewws.html

³⁰ There is a comment that the timing to hold the conference is too late.

organizations, and so there are various opportunities to identify and report major problems. The mechanism can be seen to be functioning, as various research projects have received unfavorable evaluation results at the mid-term evaluation and monitoring phase.

As summarized above, SATREPS evaluation and monitoring are conducted by different institutions at different times, using different methods and standards. Current practices make it very difficult for the general public to normalize and interpret the results due to the existence of multiple interpretations. On the other hand, by referring to evaluations by multiple institutions, we can generate a more objective and complex understanding of research projects, and consider how results can be utilized for practical impacts over the long term. Unfortunately, it would be difficult to reform or overhaul current evaluation and monitoring practices for SATREPS, as they are based on JST and AMED methods that are built upon governmental guidelines for competitive funding. Similarly, JICA's monitoring and evaluation procedures are based on governmental guidelines and practices that aim to strengthen good practice within technical cooperation projects.

Regarding the potential for overall system improvements within SATREPS, MEXT organizes five-party meetings with AMED, JST, JICA and MOFA three times a year to exchange opinions, and thus have opportunities to share lessons and take actions to improve the system.

5-4 Evaluation from Diplomatic Viewpoints

5-4-1 Diplomatic Importance

According to the Japan Science Support Foundation, the relationship between science and diplomacy is classified into three categories: "diplomacy for science," "science in diplomacy," and "science for diplomacy." SATREPS plays a role in promoting effective diplomacy since it contributes to improving Japan's national interests and building relations between nations for the purpose of achieving "science for diplomacy," and developing science and technology for achieving "diplomacy for science."

In 2008, the Council for Science and Technology (at that time, the CST) issued a document to strengthen science and technology diplomacy, which triggered the creation of SATREPS, and in 2009, CST publicized their measures for promoting the strategic development of science and technology diplomacy. CST has steadily established a system for integrating science and technology with foreign policy, and SATREPS, as one of the measures, sets 1) Enhancing international cooperation in science and technology between Japan and developing countries; 2) Acquiring new knowledge and technology that lead to the resolution of global issues and the advance of science and technology and through this process, creating innovations; and 3) Boosting self-reliant research and development capacity in developing countries

through international joint research, constructing sustainable research systems that can contribute to resolving issues, coordinating networking between researchers, and training future human resources in developing countries and in Japan, as its implementation goals. Practical utilization or implementation of research outcomes for social impact is positioned as the destination of these three goals. In terms of 1) and 3) above, SATREPS can be considered “science for diplomacy.” In addition, from the viewpoint of 2) above, it can be considered “diplomacy for science.”

In addition, it is important to confirm the “National Security Strategy³¹” from the perspective of contributing to the improvement of Japan's national interests. The strategy was set in December, 2013, as a basic policy for Japan's diplomacy and defense to protect Japan's national security. As shown in Table 5.3, it defines Japan's national interests and the targets for Japan's national security, and summarizes strategic approaches and measures that Japan should take in order to achieve “Proactive Contribution to Peace.” The SATREPS scheme (see Chapter 2) is consistent with (4) Active involvement in international efforts for international peace and stability and (5) Strengthening cooperation through universal value to solve global issues as shown emphasized in Table 5.3.

Table 5.3 Overview of National Security Strategy

Japan's national interests and national security goals	Strategic approach to Japan's national security
<p><u>National Interests</u></p> <ul style="list-style-type: none"> • To maintain the peace and security of Japan and fulfill its existence • To achieve further prosperity of Japan and its people, and to further strengthen Japan's peace and security • To maintain and define an international order based on universal values and rules <p><u>Targets</u></p> <ul style="list-style-type: none"> • Strengthen deterrence and prevent threats to Japan • Improve the security environment in the region by strengthening the Japan-US alliance and strengthening trust and cooperation with partners, and 	<p>(1) Strengthening and expanding Japanese capabilities and roles</p> <p>(2) Strengthening the Japan-US alliance</p> <p>(3) Strengthening diplomatic and security cooperation with partners for peace and stability in the international community</p> <p>(4) <u>Active involvement in international efforts for international peace and stability</u></p> <p>(5) <u>Strengthening cooperation through universal value to solve global issues</u></p>

³¹ Japan Cabinet Secretariat, “National Security Strategy,” 2013

prevent and reduce the occurrence of threats • Improve the global security environment, and build a peaceful, stable and prosperous international community	(6) Strengthening the domestic base that supports national security and promoting understanding both inside and outside the country
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Based on the above reasons, SATREPS is the only development cooperation scheme that contributes to socio-economic development in developing countries, and to solving international issues with functions such as Research and Development (R&D), industry-academia collaboration, next-generation human resource development, and scientific communication. In addition, SATREPS is one of the initiatives that play a leading role in Japan's national interest, national security, and science and technology diplomacy, and thus its diplomatic importance is considered high.

5-4-2 Diplomatic Impact

The diplomatic impacts of SATREPS can be summarized as follows: a) Japan's presence in the international community and b) its influence on bilateral and regional relations.

First, from the perspective of Japan's presence in the international community, SATREPS's contribution to achieving SDGs should be confirmed. Expectations for Science, Technology and Innovation (STI) are particularly high in achieving the SDGs, which have become international norms since 2015. The achievement of SDGs and the promotion of STI are considered to be two sides of the same coin. It is important to link the results of R&D to various stakeholders, such as universities, R&D institutions, the private sector, and NGOs for solving global issues. In this regard, SATREPS can be evaluated as a guideline for international efforts to solve global issues, that is, a pioneering scheme for collaborative research through the cooperation of a wide range of stakeholders.

Second, SATREPS has contributed to the expansion of science and technology diplomacy between Japan and its partner countries and to the improvement of Japan's soft power. For example, in the case of ASEAN countries, the number of research subjects shifting from research to practical implementation through SATREPS is increasing year by year, leading to the first Japan-ASEAN Multi-Stakeholder Strategic Consultancy Forum held in Thailand, 2019. The Forum was held as a part of the "Japan-ASEAN STI for SDGs Bridging Initiative", and involves various organizations (government officials, researchers, private companies, etc.) to discuss and share information regarding 1) horizontal development of research results in other countries, 2) horizontal expansion in other countries through cooperation with international

organizations, 3) how to effectively apply government subsidies, and (4) cooperation from private companies in ASEAN with researchers.

In the case of the African region, TICAD 7 held in 2019 introduced various good practices regarding Japan-Africa STI such as SATREPS. The Advisory Board for the Promotion of Science and Technology Diplomacy in MOFA concluded recommendations to promote the utilization of research outcomes through the synergy of STI and development with the active use of ICT in R&D including SATREPS. Based on the background, the call for research proposals for SATREPS in FY2020 clearly states the policy to encourage African countries and research proposals utilizing ICT.

Therefore, the role of SATREPS, which is an initiative to solve global issues through joint research with other countries, has greatly contributed to deepening bilateral and regional friendship. In addition, from the viewpoint of responding to global issues, SATREPS contributes to the achievement of SDGs through the use of STI; and thus has contributed to the improvement of Japan's presence in the international community.

Chapter 6 Summary of the Evaluation Results and Recommendations

Summary of the Evaluation Results

(1) Relevance of Policies: A (highly satisfactory)

Verification Items: Relevance to Japan's high level policies, Relevance to development needs of partner countries, Relevance to international priorities, Relevance to other donors' assistance

Rationale: SATREPS is consistent with Japan's policies aimed at strengthening and international cooperation in the field of science and technology. Regarding the consistency with the development needs of partner countries, recipient needs are included as a requirement in SATREPS selection criteria, ensuring that selected projects contain research contents that are consistent with the development needs of the partner country. High consistency with the development needs of the partner countries has been confirmed in both Case Studies I and II. Regarding the consistency with international priorities, the case studies are also consistent with international and regional priorities.

(2) Effectiveness of Result: A (highly satisfactory)

Verification Items: Effectiveness of input towards policy goals, Effectiveness of output and outcome towards inputs, Utilization of research outcomes (Social Impact)

Rationale: SATREPS's inputs, made up of both "Commissioned Research Expenses" for domestic research and the expenses necessary for the enforcement of technical cooperation, are sufficiently implemented. The effectiveness of the results appears to be generally high within existing evaluation results of individual SATREPS projects performed by JST and JICA. It is thought that "Research outcomes of practical benefit to both local and global society" was confirmed at certain degree based on references

(3) Appropriateness of Processes: B (satisfactory)

Verification Items: Appropriateness of SATREPS implementation structure, Appropriateness of process from application to termination

Rationale: Regarding the application/approval process, the ownership of the partner country of the project may have been weakened based on our evaluation. However, in many of the research projects adopted by SATREPS, strong partnerships have already been established between researchers in the two countries, which led to successful cases built upon the existing mutual trust between researchers. However, it became clear that there is large

room for improvement in processes impacted by the complexity of the implementation system in which a diverse set of organizations are involved.

(4) Evaluation from Diplomatic Viewpoints:

Verification Items: Diplomatic Importance, Diplomatic Impact

Rationale: SATREPS represents a concrete initiative to integrate science and technology with foreign policy, and is the only development cooperation scheme that contributes to solving international issues and boosting the socio-economic development of developing countries through research and development. In addition, its diplomatic importance can be considered high due to its consistency with Japan's national and security interests, and as a specific measure used to implement science and technology diplomacy. SATREPS also contributes to the achievement of the SDGs through the use of science and technology, the enhanced presence of Japan in the international society and strengthening of bilateral and regional friendly relationships.

6-1 Summary of the Evaluation Results

Table 6.1 summarizes the ratings and evaluation results of SATREPS from the perspective of developmental goals.

Table 6.1 Rating the Evaluation Results of Development Viewpoints

Verification Items	Rating	Reference Section
I. Relevance of Policies		
1. Relevance to Japan's high level policies 2. Relevance to development needs of partner countries 3. Relevance to international priorities 4. Relevance to other donors assistance	A	5-1
II. Effectiveness of Results		
1. Effectiveness of input on policy goal 2. Effectiveness of output and outcome on input 3. Utilizing of research outcomes (Social Impact)	A	5-2
III. Appropriateness of Processes		
1. Appropriateness of SATREPS implementation structure 2. Appropriateness of process from application to termination	B	5-3

(1) Relevance of Policies: A (highly satisfactory)

SATREPS is consistent with Japan's policies aimed at strengthening the capacity of Japan's science and technology, as well as international cooperation in the field of science and technology. High consistency with the development needs of the partner countries has been confirmed in both Case Studies I and II. Regarding the consistency with international priorities, the case studies are also consistent with international and regional priorities as responses to SDGs and other policies. Although cooperative projects with other donors have yet to be implemented, there

are many similarities between SATREPS and the science and technology cooperation schemes provided by other donors. There appears to be various potential for synergy if donors were to collaborate. In addition, as other donors refer to and learn from the SATREPS scheme, there is the possibility for SATREPS to cooperate with other donor schemes while maintaining its comparative advantages. Therefore, the policy relevance is evaluated as "A: highly satisfactory".

(2) Effectiveness of Result: A (highly satisfactory)

SATREPS's inputs, such as "Commissioned Research Expense" for domestic research, and the expenses necessary for the enforcement of technical cooperation, such as "Dispatching of researchers from Japan", "Accepting of researchers from counterpart country", and the "Provision of equipment" was found to be sufficiently implemented. The effectiveness of the results appears generally high within existing evaluation results of individual SATREPS projects performed by JST and JICA, although some projects have been evaluated poorly. The model formulated by the evaluation team that operationalizes "Relations between depth of research and research outcomes of practical benefit" also found that although some minor challenges exist, overall on average the projects appear to produce effective results.

In particular, frequent exchanges of researchers between Japanese institutions and partner countries have strengthened the relationship between participating organizations, which promotes capacity development and joint research in partner countries. The scheme is unique in comparison to science and technology cooperation programs implemented by other donors, and has been recognized as a Japan-specific scheme by partner countries.

Increased capacity of research institutions in both countries could be observed and measured through the number of academic theses and conference presentations. Efforts to expand on research results to produce "practical benefit to both local and global society" were also taken by organizing and hosting workshops and symposiums.

A wealth of secondary material is available from participating organizations describing how research outcomes were utilized for the "practical benefit to both local and global society". However, a common understanding of how this can be measured, or what constitutes a reasonable set of targets or results within a project cycle, are yet to be well discussed. Future challenges notwithstanding, the effectiveness of the results are evaluated as "A: highly satisfactory".

(3) Appropriateness of Processes: B (satisfactory)

The SATREPS implementation system is jointly operated by organizations with different operational mandates, and there is no unified method to implement a

SATREPS project because it is based on the specifications of SATREPS-related materials released by each organization. As a result, it becomes difficult for any one project member, let alone a member of the general public, to comprehensively understand SATREPS schemes.

In addition, regarding the application/approval process, an issue was identified that could weaken the ownership of the partner countries, such as implementing agencies in partner countries having not received specific feedback on why proposals had been rejected. Project participants in the field pointed out that they faced various challenges in the research implementation process, mainly due to the fact that the ODA operational processes of SATREPS are fundamentally different from those of general competitive research funding.

In many of the SATREPS research projects, strong partnerships have already been established between the two countries, and multiple examples were observed in which projects succeeded based on the mutual trust between researchers. However, it became clear that the most room for improvement is located in solutions that will help project members deal with the complexity of the implementation system, which stems from the large and diverse set of participating organizations. Currently, results and processes are monitored and evaluated by multiple institutions. The advantage of the current system is that objectivity can be strengthened through the incorporation of various perspectives, and the use of existing institutional procedures enabled the system to avoid any major issues. The suitability of the process is thus evaluated as “B: Satisfactory”.

(4) Evaluation from Diplomatic Viewpoints

SATREPS represents a concrete initiative to integrate science and technology with foreign policy, and its three implementation goals satisfy higher-level policies priorities to strengthen “science for diplomacy” and “diplomacy for science.” In addition, SATREPS is the only development cooperation scheme that contributes to the resolution of global issues and socio-economic development in developing countries through research and development. SATREPS is also consistent with Japan's national and security interests and is one of the measures used by the government to implement science and technology diplomacy. Therefore, the diplomatic importance of SATREPS is high. From a global perspective, SATREPS also contributes to the achievement of SDGs through the use of science and technology, and thus has contributed to the enhanced presence of Japan in the international society bilateral and regional relationships. Diplomatic impacts have thus been observed and confirmed.

6-2 Recommendations

Recommendations based on the evaluation results

- (1) Establish a mechanism where local researchers can initiate and form project proposals to foster stronger ownership among partner countries
- (2) Facilitate information sharing among stakeholders to strengthen ownership within partner countries
- (3) Establishing long-term support mechanisms based on a common understanding of “social and practical impacts”
- (4) Understand and assess the context-dependent challenges across partner countries when implementing SATREPS projects

SATREPS aims to contribute to social and practical impacts through the utilization of research outcomes by strengthening international research partnerships; addressing global issues and advancing science & technology; and enhancing the capacity among developing countries to develop self-reliant research institutions. These aims are a combination of the goals and mandates of the two main research funding agencies of Japan, JST and AMED, as well as the agency in charge of ODA, JICA.

Within these projects that aimed to “utilize research outcomes” through problem-based research activities, the questions that are likely to be most important for the general public are:

- Can development outcomes be observed beyond the use of ODA funding for research activities?
- Are the research activities creating outcomes that are benefiting our society?

Concurrently, the ability for a research project to expand and establish practical outcomes with concrete impacts depends upon the existing capacity of institutions to negotiate with potential private sector stakeholders or policy-making bodies. In other words, research outcome utilization cannot be considered independently of the need to enhance a country’s current research capacity, and its ability to collaborate internationally. We provide recommendations below that address the three aims of the SATREPS program, in their quest to achieve social and practical impacts.

To enhance the SATREPS program overall, the following recommendations are made.

- (1) Establish a mechanism where local researchers can initiate and form project proposals to foster stronger ownership among partner countries

Currently, when applying for SATREPS funding, Japan-based researchers utilize existing networks to approach researchers in partner countries. These networks and existing connections are used to develop a proposal, apply, and collaborate on research projects. Under current practices, incentives are aligned for both researchers in Japan and partner countries to develop research proposals. However, for research results to be “utilized by society”, conditions in the partner countries become a key factor. The existence or functionality of markets or institutional mechanisms may not be in place to enable a society to receive benefits stemming from research results. As such, we recommend the establishment of a mechanism where local researchers can initiate and form project proposals through consultation with relevant government bodies. We envision a mechanism that enables project formulation to better represent governmental priorities and market trends within the partner country. Not only does this align with the Japanese government’s position that ODA should be conducted based on the needs and requests of recipient countries, such initiatives will strengthen ownership and commitment among stakeholders in partner countries, and can contribute to increased awareness and visibility of the SATREPS scheme.

For assessing the needs in recipient countries, one specific suggestion is to implement a pilot project with academic experts in the fields of area studies or the social sciences, to conduct a diagnostic study and needs analysis of research collaboration in specific countries. With a deeper grasp of policy priorities and the expectations that partner countries hold for scientific research, the relevance of the SATREPS program can be further enhanced. Such a pilot project should of course be reasonably budgeted, and would likely need to be coordinated and implemented by JST, AMED, and JICA.

- (2) Facilitate Information Sharing among Stakeholders to Strengthen Ownership within Partner Countries

A recurrent issue identified in the field by the evaluation team was that after research proposals are submitted and Japanese authorities conduct the screening phase, implementing agencies in partner countries appeared not to have received specific feedback on why proposals were rejected. This not only has a negative effect on the incentive for stakeholders to participate in SATREPS, but also prevents them from reforming and improving their practices. Current practices encourage research institutions in partner countries to request information and feedback about rejected proposals from research teams on the Japanese side. However, the process is neither

mandatory nor systematized. The current system thus does not provide systematic support for the re-submission of refined and improved proposals, and such practices can weaken ownership among partner research institutions. More information that can benefit researchers moving forward should be provided, such as specific information on what criteria led to the proposal being rejected, or what improvements could be made to increase the probability of the proposal being selected in the future.

In addition, as SATREPS is implemented in partner countries as a technical cooperation project within the ODA framework, SATREPS funding cannot be used to cover local operational costs such as basic labor or experimental materials. These running costs must be covered by the research institution in the recipient country, either internally or through the procurement of other research funds. Embassies and JICA regional offices should take special care in making sure overseas research institutions are aware of this restriction concerning the use of SATREPS funding. An institutional approach to explaining and enforcing the funding scheme is required. If researchers themselves are relied upon too much to coordinate and administer the scheme, there is a risk of inconsistent enforcement and response to restrictions across projects.

(3) Establishing Long-Term Support Mechanisms based on a Common Understanding of “Social and Practical Impacts”.

JST defines the potential “social and practical impacts” of SATREPS as one of two results: i) the outcome is commercialized and prevails in the market, and ii) the outcome is reflected public services or impact public policy. Both types of results can be interpreted very broadly, and measures that can be taken to produce such results can differ significantly depending on the field of research. Although concerned authorities and implementing agencies in Japan have agreed that “social and practical impacts” are the ultimate goal of the SATREPS scheme, even after 10 years of implementation they have yet to come to a common understanding of what constitutes a reasonable target or set of results to which a SATREPS project should aim for and achieve throughout its project cycle. A common recognition between key organizations at the least is necessary and required to generate specific reforms or strategies for improvement. One action that can be taken immediately in this respect is for relevant agencies to work towards a fundamental understanding of the differences in the operationalized concepts contained within the “Target Outcomes Sheet” submitted to JST, and the “PDM” submitted to JICA³².

After 5 years of research in a SATREPS project, many teams find that additional actions are required to actualize the social implementation of scientific research

³² JICA's PDM requires a specification of higher-level objectives that will produce long-term impacts of a country's development objectives 3-5 years after completion of a project. On the other hand, JST's Target Outcomes Sheet stipulates that higher-level objectives should be the result of outcomes that come into fruition 5-10 years after completion of a project.

results. We would also suggest that JICA create a new scheme that provides opportunities for agencies or research institutions in partner countries to apply for follow-up funding to support supplementary SATREPS-related projects. Furthermore, in comparison to traditional technical cooperation schemes, research projects generally expect concrete outcomes to materialize over a longer time horizon. Impact evaluations should also take into account this time delay in future evaluations, and consider carefully how monitoring mechanisms should be designed to encourage long-term improvements to the quality of future proposals and projects. It is important to clarify that we do not suggest that an ex-post evaluation as conducted in its current form under the framework of ODA evaluations be utilized, but that an evaluation framework must be developed that is specifically designed to measure the long-term impacts of collaborative research projects. It would be advisable not to conduct a survey of each and every SATREPS project, but rather to develop comparative criteria and produce generalizable lessons across research fields and regions.

(4) Understand and Assess the Context-Dependent Challenges Across Partner Countries When Implementing SATREPS Projects.

Although the evaluation only visited two countries, the implementation practices and organizational structure across the two countries were found to be significantly different. Research partners in Thailand had a long history of collaboration with Japanese institutions and trust between parties was well-established; challenges could be seen in the wide gaps in fundamental research capacity between Thai and Japanese research institutions. In addition, Thai researchers described difficulties in attaining domestic research funding, both in terms of the level of competition as well as in terms of the long time-frame and commitment required for application processes in Thailand. On the other hand, in South Africa the team found interviewed researchers based at highly advanced and established research institutions. South African researchers or team members did not share the same concern as Thai researchers, and did not have to locate additional funding to support SATREPS activities due in large part to central bodies in charge of coordinating and disbursing adequate research funding domestically. However, the physical distance between Japan and South Africa appears to be a factor that explains the relatively low numbers of collaborative projects between the two countries. We also learned from Case Study II that a Presidential signature was required to approve the implementation of SATREPS projects in South Africa, highlighting an area that could benefit from more streamlined approval processes.

In this manner we find that the challenges faced throughout the implementation of a SATREPS project differs significantly across countries, which requires Japan to adopt a flexible stance in addressing these context-dependent issues. JICA should

consider what actions are necessary to understand and assess the challenges faced by organizations implementing SATREPS within the partner countries, and share these lessons amongst JST, AMED, and local ODA Task Forces.