Internal Ex-Post Evaluation for Technical Cooperation Project (SATREPS[1])

conducted by Sri Lanka Office: August, 2021

Country Name	**The project for development of pollution control and environmental restoration technologies of waste landfill sites taking into account geographical characteristics in Sri Lanka**
Democratic Socialist Republic of Sri Lanka	

I. Project Outline

Background	In Sri Lanka, due to rapid urbanization and population growth, the quantity of municipal solid waste generation was increasing and unregulated waste dumping caused serious social and environmental problems. In order to solve the problems, not only strengthening of solid waste management system at each local authority but also development of new sustainable engineering techniques based on site-specific, low cost, low maintenance, and low environmental impact were needed for pollution control and restoration at final disposal landfill sites. In addition, it was often the case that researchers in Sri Lanka left the country after graduation to continue their research due to the shortage of equipment and materials as well as research funds. It was required for Sri Lankan research institutions to improve their capacity of research and development as well as to improve the research environment to attract researchers.
Objectives of the Project	Through (i) identifying policy framework of solid waste management in Sri Lanka and recognizing and assessing components of social capacity, (ii) defining methodology of appropriate site selection for new waste landfills, (iii) monitoring existing waste landfill sites and those surroundings to grasp environmental situations, (iv) developing pollution control and environmental restoration technologies for waste landfill sites, and (v) finalizing the Guide for sustainable planning, management, and pollution control of waste landfills in Sri Lanka, the project aimed at strengthening research and development capacities on pollution control and environmental restoration technologies of waste landfill sites, thereby contributing to the sustainable solid waste management in Sri Lanka. 1. Expected Overall Goal: N/A 2. Project Purpose: Strengthen research and development capacities on pollution control and environmental restoration technologies of waste landfill sites, thereby contributing to the sustainable solid waste management in Sri Lanka. *The English expression of the project purpose is slightly modified from that described in R/D.
Activities of the Project	1. Project Site: Sri Lanka 2. Main Activities: (i) Finding of social and economic conditions for appropriate new waste landfill site selection, Formulation of draft of action plan, etc., (ii) Preparation of hazard maps for site selection, Preparation of procedures for new waste landfill site selection, etc., (iii) Planning and establishing of monitoring system, Implementation of quality assurance/quality control (QAQC), Prediction of transport of pollution plumes and implementation of risk assessment, etc., (iv) Examination of materials and methods related to pollution control and environmental restoration technologies, Planning and implementation of a field scale study and reflection of the results to techniques developed, etc., (v) Formulation of the guideline for sustainable pollution control of waste landfills in Sri Lanka, Holding of workshops to share knowledge and experience and reflection of the comments to finalize the guideline, etc. 3. Inputs (to carry out above activities) Japanese Side 1) Experts: 23 persons 2) Trainees Received: 18 persons 3) Equipment: Spectrophotometer, liquid chromatograph, gas chromatograph, computers, etc. 4) Local expense: Sri Lankan Side 1) Staff Allocated: 19 persons 2) Land and facility: Project office at the University of Peradeniya (UOP), laboratories, sites for the field scale study 3) Local expense:
Project Period	April 2011 – March 2016 / Project Cost: (ex-ante) 365 million yen, (actual) 376 million yen	
Implementing Agency	University of Peradeniya (UOP) National Solid Waste Management Support Center (NSWMSC) University of Ruhuna (UOR) Institute of Fundamental Studies, Kandy (IFS) Central Environment Authority (CEA)
Cooperation Agency in Japan	Saitama University, Center for Environmental Science in Saitama (CESS), National Advanced Industrial Science and Technology (AIST), Waseda University

II. Result of the Evaluation

<Constraints on Evaluation>

- In this Ex-Post Evaluation, an evaluation judgment was made primarily by analyzing information acquired by sending and collecting questionnaires, and through telephone and e-mail interviews, however, due to the impact of COVID-19, a part of information that was initially planned to be collected was not obtained, that is, the information in all the questions listed in the questionnaire was not obtained, including the details of current organizational structure of the implementing agencies.

< Special Perspectives Considered in the Ex-Post Evaluation>

- Overall Goal is not specified in the framework of this SATREPS project. However, it can be assumed that contribution to sustainable solid waste management (described as a part of the Project Purpose) is what was expected by the outputs of the project, and considered as "Expected Overall

[1] SATREPS: Science and Technology Research Partnership for Sustainable Development

Goal". As an indicator to verify the contribution to sustainable solid waste management, utilization of research outcomes is applied.

1 Relevance

<Consistency with the Development Policy of Sri Lanka at the Time of Ex-Ante Evaluation>

In the Ten-Year Horizon Development Framework (2006–2016), appropriate and sustainable solid waste management was one of the priority issues. In 2009, the Sri Lankan government formulated "the National Action Plan for Haritha Lanka Programme (2009-2016)", in which solid waste management was listed as priority and presented the strategy to improve the infrastructure for solid waste management or to develop appropriate alternative method at each municipality.

<Consistency with the Development Needs of Sri Lanka at the Time of Ex-Ante Evaluation>

In order to solve solid waste management problems, development of new sustainable engineering techniques based on site-specific, low cost, low maintenance, and low environmental impact were needed. It was required for Sri Lankan research institutions to improve their capacity of research and development as well as to improve the research environment to attract researchers.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The priority areas in the Japanese assistance toward Sri Lanka were i) assistance toward peace building and reconstruction and ii) assistance in mid- and long-term view. In the area of the assistance in mid- and long-term view, one of the three priority issues was improvement of economic infrastructure, including improvement of urban environment[2].

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved at the time of project completion. The appointed authors finished writing most chapters of the "Guide for sustainable planning, management and pollution control of waste landfills in Sri Lanka" ("Guide") at the time of the terminal evaluation and the draft final of the Guide was presented to stakeholders at the end of the project. Although there was some delay in completion of the Guide due to some coordination issues among the relevant organizations, the Guide was completed in 2016[3].

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects continued to the time of the ex-post evaluation. First the key research outputs produced by the project have been utilized. The Guide was published and has been available and utilized at Waste Management Authority (WMA), NSWMSC and CEA. The Guide is followed in any case of construction of new landfill by private or public sector as per the CEA's recommendation, although the Guide has not become a legal document. The Action Plans formulated by the project were used to develop their own solid waste management plan at Kandy Municipal Council (MC), Gampola Urban Council and Matale MC. The Manuals for waste landfill site selection have been also used for actual site selection at UOP, and the procedures and reports on QAQC have been used at UOP laboratories. The pollution control and environmental restoration technologies for waste landfill sites have been also utilized, for example, at UOP for designing the leachate treatment at Gahagoda for Kandy MC. Second, research projects have been continuously conducted based on the research outputs by the project. At UOP, using the output of the project, seminars/presentations were conducted and articles and post-graduate thesis on related topics were presented. At UOR, a new research project on landfill leachate treatment has been launched. Third, the key research facilities/equipment provided by the project have been continuously utilized. The majority of the facilities/equipment have been well utilized for research studies at UOP and UOR, although at IFS, they are not currently very much used as no research has been designed for the use. Some of the equipment at UOR are out of order at the time of the ex-post evaluation and need services but other equipment is functioning.

<Status of Achievement for Expected Overall Goal at the time of Ex-post Evaluation>

The Expected Overall Goal is achieved. The research outcomes by the project have been utilized to contribute to sustainable solid waste management in Sri Lanka. For example, the findings of project were utilized at UOR to design and construct the landfill site at Kataragama PS (Pradeshiya Saba: the third-level administrative unit, next to municipality and urban.)[4]. In the design, locally available expansive soil and coir fibers were used for landfill liner construction and coir brushes were used for leachate treatment. CEA and UOR, in collaboration with the National Building Research Organization, used shear strength parameters of solid waste obtained from the project for analysis and the restoration work of failed Meethitamulla dumping site. CEA and a few local government authorities are applying the project outcomes on site selection for landfills to a certain extent.

<Other Impacts at the time of Ex-post Evaluation>

According to the questionnaire to each implementing agency, positive impacts have been reported. At IFS, knowledge was enhanced with regard to landfill site selection and management, analytical instrumentation and dealing with the local authorities. At UOP, UOR and CEA, research capacity has been improved in terms of undergraduate and postgraduate students research, facilities to industries, service to industries/society, and research publications. Scientific literacy at CEA and local governments has been improved as they make decisions based on the investigations and proposals by universities. In addition, collaboration between the universities and CEA as well as local governments were strengthened in terms of landfill management. No negative impacts were observed.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results
(Project Purpose)	Indicator 1	Status of the Achievement: achieved (continued)

[2] Ministry of Foreign Affairs, "ODA Country Data Book in 2010"

[3] Although the Guide was completed in 2016 after project completion, the draft was almost completed at project completion. Therefore, the Project Purpose was considered to be achieved at the time of the project completion.

[4] The design of landfill at Kataragama PS was supported by JICA's technical cooperation "Pollution Control and Reduction of Environmental Burden in Solid Waste Management" (2016-2019).

Strengthen research and development capacities on pollution control and environmental restoration technologies of waste landfill sites, thereby contributing to the sustainable solid waste management in Sri Lanka.	The Guide for sustainable planning, management, and pollution control of waste landfills in Sri Lanka (2016) is formulated jointly with the Ministry of Local Government and Provincial Councils and the Ministry of Environment.	(Project Completion) - The appointed authors finished writing most chapters of the Guide by the end of the project. The draft final of the Guide was presented to stakeholders at the end of the project and the "Guide" was completed in 2016. (Ex-post Evaluation) - The Guide has been utilized by relevant organizations and is followed in any case of construction of new landfill by private or public sector as per the CEA's recommendation. - Other key research outputs produced by the project have been also utilized, i.e., the Action Plans developed by the project, Manuals for waste landfill site selection, Procedures and reports on QAQC, and pollution control and environmental restoration technologies for waste landfill sites. - Research projects have been continuously conducted based on the research outputs by the project, for example, the research on landfill leachate treatment at UOR. - The majority of key research facilities/equipment provided by the project have been continuously utilized.
(Expected Overall Goal) Contribution to sustainable solid waste management in Sri Lanka	Indicator 1 Utilization of Research Outcomes (such as implementation of policy or program based on/using the research outputs) by the SATREPS project	(Ex-post Evaluation) achieved - The research outcomes by the project have been utilized. UOR: Utilization of the findings of the project to design and construct the landfill site at Kataragama PS CEA and UOR: Utilization of shear strength parameters of solid waste for analysis and the restoration work of failed Meethitamulla dumping site CEA and a few local governments: Applying the project outcomes on site selection for landfills

Source：Terminal Evaluation Report, Questionnaire to implementing agencies (UOP, UOR, IFS, CEA)

3 Efficiency

Although the project cost exceeded the plan, the project period was within the plan (ratio against the plan: 103% and 100%, respectively). The outputs of the project were produced as planned. Therefore, the efficiency of the project is fair.

4 Sustainability

<Policy Aspect>

The Ministry of Environment developed National Policy on Waste Management (2019), which covers the period up to 2030, to facilitate solid waste management. The National Policy was designed to establish an integrated waste management system by providing more detailed focused directions. Furthermore, the Nationally Determined Contributions (NDCs) (2016), with the target period of 2021-2030, aims to track progress and achieve a collective ambition level sufficient to limit global warming in alignment with the Paris Agreement. The NDC identified waste sector as one of key issues in terms of emission reduction.

<Institutional/Organizational Aspect>

Each organization involved in the project has its own established organization structure to conduct research, and collaboration between stakeholders is observed to some extent. There are some collaborative programs after the project but not developed yet to the expected level and it seems that concrete organizational structure has not been established among stakeholders yet to fully utilize research outputs/outcomes by the project. As to the organizational arrangement for the maintenance of the facilities/equipment, at UOP, the laboratory established by the project has been managed by the support of the university. The organizational structure for the maintenance of the facilities/equipment is established in general. At UOP and UOR, maintenance is conducted by the university with additional research funding from other sources, and at IFS, maintenance is implemented through government funds and technical support.

<Technical Aspect>

According to the questionnaire to the implementing agencies, researchers sustained and improved their research capacity to continue the related research activities and start new research projects using the research outputs by the project. Government authorities such as CEA have sustained and improved scientific literacy to utilize the research outcomes by the project. At IFS, the capacity developed by the project was helpful for obtaining research grants in the field of waste management. One professor has moved from IFS to other university, but there he was able to start a new research project on landfill waste management. At UOR, the department technical staff has been already properly trained to operate the provided equipment.

<Financial Aspect>

Necessary budget has been secured at each institution and government agencies and no major financial problems have been reported, according to questionnaire to the implementing agencies.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the institutional/organizational aspect of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

The project achieved the Project Purpose of formulation of the Guide for sustainable planning, management, and pollution control of waste landfill, as the draft of the Guide was completed by the appointed authors. At the time of the ex-post evaluation, the Guide and other key research outputs, such as the Manuals as well as the pollution control and environmental restoration technologies, have been utilized at implementing agencies and relevant organizations. Therefore, the project effects have been continued. The Expected Overall Goal of utilization of research outputs for contribution to sustainable solid waste management has been achieved, as the research outcomes of the project have been utilized for designing and constructing landfill sites, for example. Regarding sustainability, although policy, technical, financial sustainability is high, some problems have been observed in the institutional/organizational aspect because concrete collaborative organizational structure has not been established among stakeholders yet. In the efficiency, the project cost exceeded the plan.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

・The Guide currently utilized by the CEA/ NSWMSC. However, this has not been legally binding yet. To further enhance the sustainable utilization of the Guide, it is effective to establish the Guide as legal-binding document, therefore, relevant officials at implementing agencies should take initiative to make the document legitimate

・It was found out that some of the equipment have gone out of order and some are needed replacements of parts, etc. Hence, the implementing agencies (UOP, UOR, IFS) should maintain them properly (financial allocation, service agreements etc.).

Lessons Learned for JICA:

・In regard to this project, the findings obtained through the project have been utilized in several projects, including JICA's technical cooperation implemented following this project, as well as actual solid waste management activities by the Government of Sri Lanka. It would be helpful that JICA assists the implementing agencies to develop guidelines, such as the Guide in this project, while obtaining agreement with the implementing agencies during the SATREPS project, , and then, facilitates the implementing agencies to utilize/follow the guidelines to enhance the sustainability of the project as well as to smoothly implement following project and/or other relevant project(s).

Discussion between experts at landfill site

Analysis of composition of waste