

# Matsuoka Zemi

## Introduction of SATREPS Project

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# What is SATREPS?

- SATREPS (Science and Technology Research Partnership for Sustainable Development) is a Japanese government program that promotes international joint research targeting global issues. Global challenges cannot be met by a single country or region acting on its own, so engagement by the international community is essential. To address these issues, SATREPS works through three- to five-year projects involving partnerships between researchers in Japan and researchers in developing countries. SATREPS projects are expected to lead to outcomes with potential for practical utilization, and to enhance research capacity in the developing country.
- The program is collaboration between two Japanese government agencies: the Japan Science and Technology Agency (JST) and the Japan International Cooperation Agency (JICA).





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# SATREPS Project in Sri Lanka

Ken Kawamoto, Saitama University: Principal Investigator in Japan

**SATREPS** = The Project for Development of Pollution Control and Environmental Restoration Technologies of Waste Landfill Sites Taking into Account Geographical Characteristics in Sri Lanka

## Environmental-Friendly Solid Waste Management

Development of site-specific pollution control and remediation techniques for waste disposal sites utilizing locally-available materials

Unregulated waste dumping is a crucial contributor to social and environmental problems in developing countries. The project aims are 1) to carry out monitoring of soil and groundwater pollution, and perform environmental risk assessment at waste dumping sites and surrounding areas, 2) to develop site-specific pollution control and remediation techniques for waste dumping sites utilizing locally available geo-geo-materials, and to evaluate the developed techniques through small-scale pilot experiments, and 3) to propose a guideline for sustainable design and construction of waste dumping sites that is specifically linked and applicable to the waste management system in Sri Lanka.

Development of sustainable techniques to prevent contamination, with verification based on small-scale field experiment

Solid waste management at local municipalities and soil and groundwater monitoring at selected disposal sites are being investigated. Utilizing locally-available materials, low-cost and site-specific pollution control and remediation techniques for waste dumping sites are developed. A small-scale field experiment including these techniques will also be carried out. Integrating the results from these studies, applicable guidelines for the design and maintenance of solid waste disposal sites will be proposed to the Sri Lankan government.

Cooperation Institutions: University of Peradeniya (UoP), Institute of Fundamental Studies (IFS), National Solid Waste Management Support Center (NSWMS), Central Environmental Authority (CEA), Center for Environmental Science in Saitama University, National Advanced Industrial Science and Technology (AIST), Waseda University

Cooperation Period: 9 Years (Adoptive fiscal year: FY 2010)

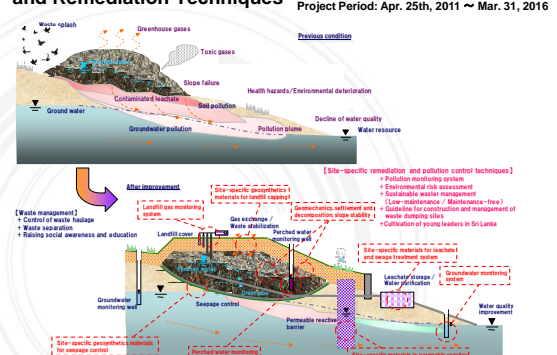
Cooperation research of local areas. The research data provided is with information in local waste characteristics

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# SATREPS: Site-Specific Pollution Control and Remediation Techniques

Project Period: Apr. 25th, 2011 ~ Mar. 31, 2016



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# Implementing Agencies

**[Sri Lankan institutes]**

- Univ of Peradeniya (UoP): Primary Institute
- National Solid Waste Management Support Center (NSWMS)
- Univ of Ruhuna (UoR)
- Institute of Fundamental Studies (IFS)
- Central Environmental Authority (CEA)

**[Japanese Institutes]**

International Institute for Resilient Society, Saitama University (SU)

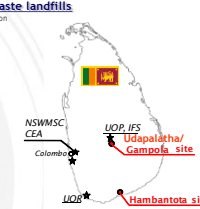
- Center for Environmental Science in Saitama (CESS)
- National Advanced Industrial Science and Technology (AIST)
- Waseda University (WU)

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# SATREPS: Research Activities and Outputs

- Formulate concept of guideline for planning, managements and maintenances for waste landfills
  - Derived on solid waste management (SWM) policies in Sri Lanka
  - Survey on organization, human resources, budget, technical capacities related on SWM at local authorities (Gampola site and Hambantota site)
  - Define items and contents of the guideline
- Define methodology of appropriate site selection for new waste landfills
  - Technical, social, and economical conditions for appropriate new waste landfill site selection
  - Procedures for new waste landfill site selection
- Monitor existing landfills and its surroundings
  - Monitoring plan, quality assurance and quality control (QA/QC)
  - Monitoring system and manuals, improvement of monitoring laboratories and staff capacity
  - Transport of pollution plumes and risk assessments
- Develop pollution control and environmental restoration techniques for waste landfill sites
  - Site-specific pollution control and remediation techniques
    - Leachate treatment
    - Geomembrane, slope stability
    - Permeable reactive barrier
    - Landfill capping
  - Field scale study for examining developed techniques
- Finalize the guideline for sustainable and applicable planning, maintenances and operations for waste landfills
  - Combined methods using outputs 1 to 4 with low-cost, low maintenance and low environmental impacts
  - Potential maps for new waste landfills in the area of Gampola and Hambantota sites
  - A standard monitoring method for new landfill sites
  - Finalization of the guideline for sustainable and applicable landfill planning, operations and maintenances in Sri Lanka



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Surveys of SATREPS Activity 1 (A1)		
Survey	Survey Period	Survey Contents
Baseline Survey	Sep. 2011 ~ Dec. 2011	General Solid Waste Management Situation of Central and Southern Province
Local Budget Survey	Mar. 2012 ~ Aug. 2013	Detailed evaluation and breakdown of all the costs and revenues of a SWM project
Environmental Business Survey	Oct. 2012 ~ Jul. 2013	Business Activities on Environmental Monitoring, Consultancy, Recycling, Composting and Final Disposal Works on Solid Waste Management in Sri Lanka
Waste Amount & Composition Survey (WACS)	May 2012 ~ Feb. 2014	Quantitative Survey of total waste stream, generation, collection, composition, etc.
Public Awareness Survey	Dec. 2013 ~ June. 2014	Identify the citizen's general idea, action and policy acceptance with regard to solid waste management in their region

Support to make SWM Action Plan for 3 LAs  
(Kandy MC, Gampola UC, Udapalatha PS) applying the SATREPS A1 surveys

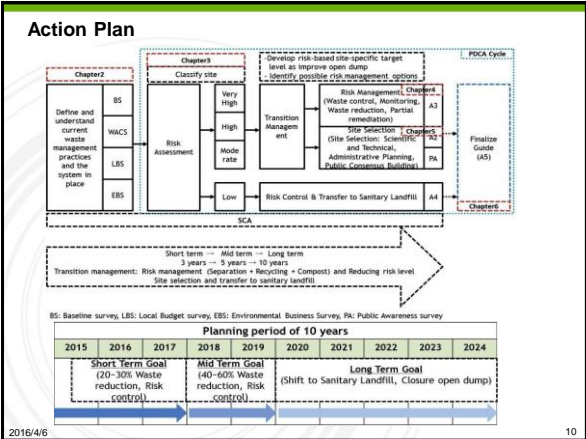
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Download Site of Research Outcome

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Research Outcome		
学術論文		
出版状況	査読有無	詳細情報
掲載	査読あり	李洸昊, 松本礼史, 松岡俊二 (2015)「途上国の都市における『ごみの流れ』の構造分析—スリランカ・キャンディ市を事例に」『国際開発研究』国際開発学会, 24巻, 1号, 2015年
掲載予定	査読あり	李洸昊 (2015)「スリランカ・キャンディ市のごみ問題と廃棄物行政に対する住民意識の構造分析」『環境情報科学学術研究論文集29』環境情報科学学会
口頭発表		
発表形式	審査有無	詳細情報
口頭発表	審査あり	松岡俊二 (2014)「開発途上国の廃棄物問題と国際環境協力: 制度はどのように変わるのか?」『国際開発学会第25回全国大会報告論文集』(2014年11月30日, 千葉大学)
口頭発表	審査あり	李洸昊, 松本礼史, 松岡俊二 (2014)「スリランカにおけるごみの流れの構造分析と廃棄物政策: WACS調査を踏まえて」『国際開発学会第25回全国大会報告論文集』(2014年11月30日, 千葉大学)
口頭発表	審査あり	石渡まりな, 飯島聡 (2014)「住民の廃棄物行政に対する信頼の規定要因は何か? スリランカにおける住民意識アンケート調査から」『国際開発学会第25回全国大会報告論文集』(2014年11月30日, 千葉大学)

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Contents of Action Plan	
1. Introduction: Background and Scope of Plan	4.2.2 Separation
1.1 Background	4.2.3 Recycle and Compost
1.2. Scope of Action Plan	4.3 Partial Remediation (Support from A4)
2. Present Situation of SWM in Kandy	4.3.1 Soil cover
2.1 Waste Flow (SATREPS Survey in Nov. 2012)	4.3.2 Fencing
2.1.1 Generation	4.3.3 Surface water control
2.1.2 Collection / Transportation	4.3.4 Site zoning
2.1.3 Recycle and Compost	4.4 Environmental Monitoring
2.1.4 Final Disposal	4.4.1 Main elements of environmental monitoring
2.2 Institutional Framework	4.4.2 Design and Implementation
2.3 Local Community and SWM	5. Site Selection
3. Risk Assessment of Open Dumping Site	5.1 Main elements of Site Selection
3.1 Methodology	5.2 Technical Assessment Methodology
3.2 Result	5.3 Social Consensus
3.3 Evaluation	5.4 Joint Solid Waste Management (JSWM)
4. Risk Management	5.5 Join with cluster landfill – Gonadikawatha
4.1 Estimation of Waste Generation Amount	6. PDCA Cycle
4.2 Waste Reduction	
4.2.1 Various options	

ACTION PLAN IMPLEMENTATION SCHEDULE  
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Implementation Schedule (Kandy MC)											
Activities	Period	Short Term Goal			Mid term Goal			Long Term Goal			
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
01. Public awareness											
(a) Introduce "3R" concept											
(b) Citizens, Government Organizations, non-Government Organization, school children awareness Programmes											
02. Introduce waste separation											
03. Introduce Bio Gas plants for Hotels, housing complex etc.											
04. Introduce bio gas plants for vegetable markets											
05. Introduce "Garbage fee" system for the commercial corners.											
06. Introduce "Free market" for reusable items.											
07. Introduce "Home Composting" for citizens											
08. Introduce Recycle waste buying centers.											
09. Constructing bio reactor for dumping garbage											
10. Generate 500 KVA, power supply for the national grid with the help of gas.											
11. Waste segregation plant at the final dumping site.											
- separation organic & inorganic waste and separate plastic, polythene manually, separate steel, Al with the help of magnetic separator and after that papers, plastic, cardboard bailed by bailing machine.											
14. Introduce RCF manufacturing plant & power plant											
15. Ash will be dumped in to the sanitary Landfill site.											
<b>-Institutional, Financial considerations-</b> Activity 1, 2 & 4 & 7 & 9 provided money from the Municipal Council budget and activity 3 provided money from private sector themselves. Activity 6, 10 provide money from the Ecoch Lanka Pvt Limited. 11. Waste separation plant at the final dumping site. Financial support expected from Korean government grant. 12. Manufacturing bio gas and bio gas will be funded by Ecoch Lanka Private Ltd. 13. Plastic/ Polythene crushing & manufacturing Plants funded by central Environment Authority. Garbage/papers bailing plants will be funded by the Municipal Council. 14. RCF manufacturing plants & power plant financial support expected from Korean company and Ecoch Lanka Pvt Ltd joint ventures. 15. The Korean Company & Ecoch Lanka Pvt Ltd will be provided financial support.											

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### Implementation of "Action Plan (Kandy MC)"

#### Curbside Collection

#### Waste Separation

Collect organic waste only three days/week  
Weekend only inorganic waste

#### Recycling Centers

#### Awareness Programs

### Implementation of "Action Plan (Kandy MC)"

#### Home gardening program

#### TAKAKURA Compost

#### Improvement of Final Disposal Site (Soil Cover)

### "Guide for sustainable planning, management, and pollution control of waste landfills in Sri Lanka"

Preface

Abstract

1. Introduction

2. Solid Waste Management in Sri Lanka

3. Risk Assessment and Risk Management of Waste Landfills

4. Environmental Monitoring of Existing Waste Landfills

5. Landfill Site Selection

6. Pollution Control Techniques for Waste Landfills

7. Conclusive Remarks and Future Perspectives

Appendix 1 Status of Landfill Legislation in Sri Lanka

Appendix 2 Issues for improving SWM in Sri Lanka

Appendix 3 Financial stream related to SWM in Sri Lanka

Appendix 4 Action plan making for remediating SWM practices in local authorities

Appendix 5 Examples of environmental monitoring data at existing dump site

Appendix 6 Monitoring methods

Appendix 7 Quality Assurance and Quality Control (QAQC) for analytical equipment

Appendix 8 Example of quantitative risk assessment for landfill site selection

Appendix 9 Discharge Standards

Appendix 10 Case studies on leachate treatment

Appendix 11 Leachate quantification method

Appendix 12 Case studies on bottom liner

Appendix 13 Case studies on final cover

Appendix 14 Guide on lysimeter study

Appendix 15 References

### Follow Up

- Finalize the Nation Guide
- "Guide for sustainable planning, management, and pollution control of waste landfills in Sri Lanka"
- Field Research (Udawalpata and Hambantota Site)
- Implementation of Action Plan
- Making and Implementation of Action Plan for other LA in Sri Lanka (Supported by NSWMSC)

#### Udawalpata Site

#### Hambantota Site

### Project Participation of Matsuoka Zemi Student

- Environmental Research Grant in Interdisciplinary Research of Nippon Life Foundation
- Social acceptance of environmental innovation and formation of sustainable local city in Japan
- Research Assistant: Yuko Iwata (PhD Student)
- Research Project on Social Regulation and Risk Governance of Atomic Industry
- Research Project on Social Regulation and Risk Governance of Atomic Industry (MEXT)
- Research Assistant: Kohei Ohno (MA Student: Graduated on March, 2016)
- Grant-in-Aid for Scientific Research and Exploratory Research (now)
- SATREPS Project (JST and JICA)
- The project for development of pollution control and environmental restoration technologies of waste landfill sites taking into account geographical characteristics in Sri Lanka
- Research Assistant: KwangHo Lee (PhD Student)
- Marina Ishiwata (MA Student: Graduated on March, 2015)
- (Outside Project)
- Joint Research Project of Shiga University and Economic and Social Research Institute, Cabinet Office, Government of Japan
- Utilizing the richness of social capital for Regional Revitalization
- Research Assistant: Koka and Qinzhiyi (PhD Student)