

J-PRISM Waste Audit in Waste Management Planning and Policy Making

- Objectives, Approaches and Methodology -

Executive Summary

SPREP and JICA have been working on the improvement of waste management in Pacific Island Countries (PICs) for more than 20 years. J-PRISM has been implemented as Japan's Technical Cooperation aimed at developing the capacity of organizations and personnel in each country.

Surveys on waste quality and quantity are essential for subsequent activities such as collection and landfill improvement, planning and policy making. At the same time, the survey activity leads to the improvement of the capacity of the government staff in charge.

In any policy and/or program development, it is essential to carry out the analysis of the current situation and develop an improvement plan. In the field of waste management, there are several baseline surveys essential for the situation analysis, including Waste Audit¹ Survey, Final Disposal Amount survey, Time and Motion Survey, Recycling Survey, etc. Particularly, the Waste Audit Survey is the starting point for strategic planning, which is necessary to create a Waste Flow chart, and the accurate Waste Flow cannot be drawn without data on both the amount of generation and of disposal.

However, in the PICs, due to the lack of institutional capacity, it is a challenge to continuously conduct the national waste audit survey using a consistent methodology to make policy decisions while analyzing the changes. To consider whether these PICs can solve the structural challenges and how their survey results can be monitored at the regional level, this document studies the 20-year history of JICA and JPRISM's technical support for waste audit surveys including other baseline surveys.

Here J-PRISM II Project Office found that the data collection capacity of PICs counterparts was strengthened through more than 10 waste audit surveys and survey methods suitable locally was studied with reference to the World Health Organization Guide published in 1996. Moreover, the baseline surveys practiced by these countries led to the development of the Solid Waste Management Practical Guide, which was published by J-PRISM I in collaboration with SPREP in 2018, and whose main authors were the PIC's counterparts themselves. Their ability to conduct baseline surveys including waste audits by themselves is remarkable among other developing countries that JICA supports. These results provided new insight into our understanding of the appropriate methods for collecting waste management data as well as the capacity development required for Pacific Island Country counterparts.

JICA and J-PRISM believe that it is important for each country to collect the official waste management data of its own national or local government, and it is desirable to develop data collection and survey methodologies in line with its own goals and policy making. Based on this, JICA and J-PRISM will continue to support the creation of waste management baseline data together with the Pacific Island Countries partners.

1. Introduction - Before Starting J-PRISM -

1.1 Beginning of JICA Technical Cooperation on Solid Waste Management

The beginnings of the JPRISM project can be traced back to the year 2000. Dr. Kunitoshi Sakurai visited SPREP at the time and discussed how Japan would be able to assist the Pacific island countries with municipal solid waste

¹ The "Waste Audit" shown in this paper is referred to as "solid waste generation survey" in the WHO guide and is explained as "waste generation and composition survey (WGCS)" in the SWM Practical guide. Apart from the names of these surveys, JICA also conducts the survey under the name of "waste amount and composition survey (WACS)", and there is no internationally unified survey name on it. Since waste audit is a more common name in the PIC, this paper uses the term "waste audit" as a generic term for those surveys.

management. Dr. Sakurai was an internationally recognized expert in the field of environmental management and had worked at various organizations such as WHO, the University of the South Pacific and the University of Tokyo.

As a result, JICA's three priority themes set for support were "Improvement of the management of municipal solid waste", "Promotion of waste generation control", and "Appropriate final disposal (landfill site management)", which were strengthened by regional workshops and training.

JICA has been focusing on developing each country's waste management capacities since that time. This is due to the fact that technical improvements cannot be sustained unless each country's capabilities are improved.

Based on the above history of the project design, JICA dispatched waste management experts in the region in response to requests from SPREP from 2000 to 2010, and has been implementing J-PRISM (Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management) since 2011 up until now.

1.2. Basic Principle to Conducting Waste Audit

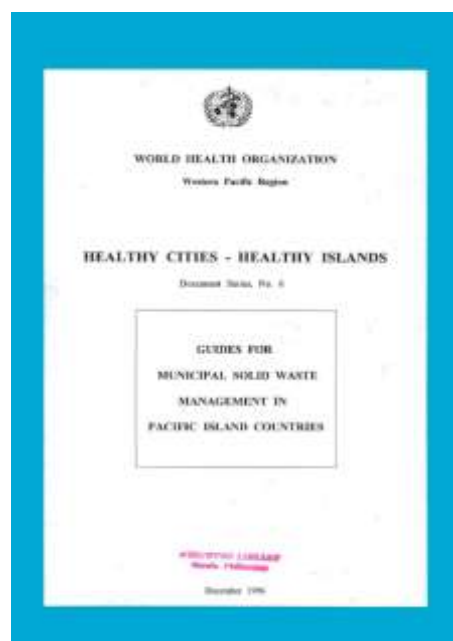
Mr. Shiro Amano (currently JICA advisor), the first JICA expert dispatched to SPREP from 2000, stated, "The results of technical cooperation should not be measured by newly established facilities, written institutions, and plans, but by the increased capacity of individual counterparts and organizations. It depends on how well the environment is set up for the counterparts and how much they have the opportunity to grow. "

Based on this basic principle, J-PRISM I and II have conducted waste audits in each country with PICs counterparts. Rather than outsourcing waste audits to private consulting firms overseas, which was common until then, JICA has supported PICs to carry out basic waste audit themselves through a series of trainings and on-site demonstrations.

1.3 Waste Management Trainings Conducted by JICA in the Early 2000s

JICA hosted the Regional Training on Solid Waste Management in Okinawa (2001, 2003, 2005) and in Samoa (2002, 2004, 2007) for counterparts from 14 PICs. Dr. Ogawa, from the WHO Western Pacific Regional Office in Manila, Philippines, served as the instructor, and counterparts from 14 countries learned how to conduct a waste audit.

The text used during these trainings was the WHO's "Guide for Municipal Solid Waste Management in Pacific Island Countries²" which was published in 1996. The WHO guide was created to help decision-makers at national and local government levels of PICs make strategic decisions for the improvement of their solid waste management services. Part 2 of this guide "Practitioner's Guide to Municipal Solid Waste Management in Pacific Island Countries" should be referred to for more technical details including the procedure for conducting a waste audit.



2. Methodology

2.1 Objectives

Based on the background above, JPRISM I and II, in principle, use the waste audit survey methodology outlined in the WHO guide, depending on the available resources and local capacity.

According to the WHO guide, a waste audit is the starting point for strategic planning. In PICs where available

² [Guides for municipal solid waste management in Pacific Island countries \(who.int\)](http://www.who.int)

resources are limited for solid waste management, cost-effective utilization of available resources is one of the most important tasks for practitioners. Solid waste generation Information (i.e. generation rate, density and composition) is essential for strategic planning in order to achieve optimal resource utilization. Therefore, every effort must be made to collect this basic data and information.

The purpose of conducting a waste audit is summarized in the following:

- 1) To determine the volume required for on-site storage, transportation, and disposal of solid waste
- 2) To identify the recycling/resource recovery potential of waste
- 3) To determine the appropriate methods of collection and disposal of waste
- 4) To estimate the expected life span of a disposal site

The outputs that can be obtained from a waste audit are defined in the following.

- 1) The daily generation rates in kg/person/day for household waste and commercial waste
- 2) The bulk density of waste generated in kg/m³
- 3) The composition of waste generated in percentage by weight

Based on the above principles, JICA and J-PRISM intends to use data collected from a waste audit to assist in the development of plans and strategies for waste collection services, or the introduction of financial mechanisms such as waste levy, user-pay, garbage bag, CDL system etc.

2.2 Selection of Sample

The WHO Guide recommends the following methods for taking samples when conducting waste audits. The following specific numbers are recommended to PICs for sample size, but the Guide does not provide a specific explanation on how the sample size was set. Therefore, when JICA implemented the waste audit in PICs, the selection of a sample and its size shown in 1) to 6) below, vary depending on the population of the target area, and the outcomes of discussions with our counterparts and relevant stakeholders.

However, in terms of the survey period, to obtain the accurate information on the amount of daily waste generation as much as possible, 8 successive days are recommended to allow the variation in waste generation over a week shown in 6) below.

- 1) Define several residential areas which represent different socioeconomic population groups (e.g., according to ethnic groups and/or income levels: low-, middle- and high-income groups)
- 2) Select 10-20 households for each of the residential area defined in 1) above (totaling 50-100 households for Pacific Island countries)
- 3) Identify a predominantly business area where a large number of shops and offices are located
- 4) Select 10 shops and offices for the business area defined in 3) above
- 5) Alternatively, to 3) and 4), further divide the business areas into different categories such as hotels and restaurants, offices, shops and stores, workshops, and for each category select 2-3 samples
- 6) Collect the waste generated in the above areas once a day at a fixed time for 8 successive days to allow variation in waste generation over a week. Note that the samples on the first day will be discarded as they may contain waste accumulated from 2 or more days before

2.3 Procedure

The actual procedure of the waste audit outlined in the WHO Guide is as follows. When JICA conducts the waste audit in PICs, we basically follow the WHO procedure below, but the number of samples to be examined by opening the plastic garbage bag and the number of waste classifications are determined by the counterparts of each country depending on the purpose of the survey and their definition of waste categories.

- 1) Collect the plastic bags from houses and shops/offices according to the pre-specified collection route. In order to make this collection process efficient, the workers in each sample area may need to collect the bags and place them at a certain location prior to loading them on to the truck
- 2) Repeat 1) for each sample area and process to the dump site
- 3) Weigh each plastic bag and record the weight in the data sheets according to the numbers assigned to households, shops and offices
- 4) Randomly select 5-10 plastic bags from those collected in each sample area and record the household or shop/office numbers of these bags in the data sheet for volume measurement
- 5) Open these plastic bags and empty the contents into the bucket until it becomes full. The bucket will then be emptied and the contents will be spread over the plastic sheet. Repeat this process until all the bags for each sample area are emptied and count the number of bucketful loads, which will be recorded for the volume estimation
- 6) Separate the waste on the plastic sheet into different types (e.g. perishables, paper, textiles, plastics, wooden, rubber, metals, glass/ceramic, miscellaneous etc.)
- 7) Measure the weight of each type of waste and record it in the data sheet
- 8) Dump all the waste properly and clean the equipment used
- 9) Repeat 1) to 8) every day for the duration of the study

3. Waste Audit Conducted by J-PRISM - After Starting J-PRISM -

3.1 Outcomes of JICA Waste Audit Trainings before J-PRISM

J-PRISM is a waste management project by JICA that started in 2011 in the Pacific region based on the above background. In particular, the results of the JICA Waste Audit Trainings summarized in 1.3 above have been continuously produced since the start of J-PRISM. One of the trainees who participated in these trainings, Mr. Faafetai Sagapolutele (currently Assistant Chief Advisor of J-PRISM II) instructed the waste audit implementation in Samoa, Vanuatu, Solomon, PNG during J-PRISM I from 2011 to 2016.

In addition, the trained counterparts of Samoa, Vanuatu, Solomon, PNG, Tonga, Fiji, Palau, etc. have conducted waste audits and time and motion surveys themselves and transferred their gained skills to the locals to further enhance individual capacity³.

The PICs counterparts who participated in the aforementioned trainings returned to their home countries, actually conducted various baseline surveys, and summarized the results in the "Practical Guide to Solid Waste Management in Pacific Island Countries and Territories"⁴. This SWM Practical guide jointly published by J-PRISM II and SPREP in 2018 was edited for the purpose of updating the WHO guide published in 1996. This SWM practical guide published in 2018 was originally planned to be co-authored by SPREP and J-PRISM experts only, but it was confirmed that our counterparts in PICs have enough capacity to write by themselves, and they became the main authors at the stage of editorial discussions. This guide covers lessons learned from real practices of baseline surveys and its use. e.g., the waste audit in the Solomon Islands, the public opinion survey in Tuvalu, the time and motion survey in PNG, and the data utilization for strategic planning in Fiji (Lautoka).



³ Such local trainings were recorded into the PIDOC, a database of capacity development activities in the Pacific, jointly developed by J-PRISM and SPERP.

⁴ [Practical guide to solid waste management in Pacific island countries and territories | Pacific Environment \(sprep.org\)](https://www.sprep.org/publications/practical-guide-to-solid-waste-management-in-pacific-island-countries-and-territories)

3.2 Example of Use of Waste Audit Results in Waste Management Planning and Policy Making

Under J-PRISM II, waste audits were often conducted in order for governments to grasp the current situation of waste management and the material flow, and to identify issues, and develop mid-long-term strategies such as in Palau, State Government of FSM, RMI, and Samoa. Along with these strategies, the obtained data allowed for the quantification of achievements targets. It was also notable that such policy documents supported some states of FSM in proposing and securing budget allocations for solid waste management activities from the federated state government.

The waste audit conducted in Vanuatu in 2018 aimed to update the data on waste generation rate per capita and its composition in Port Vila, and to utilize the collected data to analyze the impact of ongoing activities and the future plan on solid waste management. The officials from both national and local government oversaw the survey's planning, preparation, implementation, as well as its analysis with the help of J-PRISM's experts and local volunteers.

More particularly, the clarified waste generation rate per capita has helped three FSM States (Yap, Kosrae, Pohnpei) and Palau (Babeldaob island) develop collection service expansion plans, by identifying waste generation amounts from the target areas, collection frequency, transportation costs, service charge rate, etc. Such target areas were also studied by the incoming waste survey at public landfill which indicated direct transportation from non-served areas.

Implementing Countries/ States/ Cities	Date	Surveys Involved	Examples of using survey results for policy making
Samoa	Nov. 2017	Waste audit (household)	MNRE, Samoa National Waste Management Strategy 2019-2023, 2019
Port Vila, Vanuatu	Nov. 2018	Waste audit (household, and commercial entities) with a household questionnaire survey	
Port Vila, Vanuatu	Jan.- Feb. 2020	Waste audit (shops and restaurants): focusing on organic waste	
Tulagi, Solomon Islands	Aug. 2019	Waste audit (household, and commercial entities) with a household questionnaire survey)	
Palau	June 2017	<ul style="list-style-type: none"> • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • Public opinion survey on discharge manners 	BPW, National Waste Management Strategy 2017-2026 (Action Plan 2017-2021), 2017
Yap State, FSM	June 2017	<ul style="list-style-type: none"> • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • Public opinion survey on discharge manners 	Yap State Solid Waste Management Strategy 2018-2027 (Action Plan: 2018-2022), 2018
Chuuk State, FSM	June-July 2017	<ul style="list-style-type: none"> • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • Public opinion survey on discharge manners 	Chuuk State Solid Waste Management Strategy 2019-2028 (Action Plan: 2019-2023), 2019
Pohnpei State, FSM	July 2017	<ul style="list-style-type: none"> • Waste audit (household) • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • Public opinion survey on discharge manners 	Pohnpei State Solid Waste Management Strategy 2020-2029 (Action Plan: 2020-2014), 2020
Kosrae State, FSM	July 2017	<ul style="list-style-type: none"> • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • public opinion survey on discharge manners 	Kosrae State Solid Waste Management Strategy 2018-2027 (Action Plan: 2018-2022), 2018

RMI (Majuro atoll, Kwajalein atoll)	Aug. 2017	<ul style="list-style-type: none"> • Incoming waste survey at landfill (identifying waste amount and dischargers but not composition) • Public opinion survey on discharge manners 	Majuro Atoll Waste Company, Solid Waste Management Plan for Majuro 2019-2028 (Action Plan: 2019-2023) Kwajalein Atoll Local Government, Kwajalein Atoll Solid Waste Management Plan 2019-2028 (Action Plan: 2019-2023)
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Waste Audits and Baseline Surveys Conducted in J-PRISM II

4. Conclusion

JICA and J-PRISM have been studying waste management data collection methods locally suitable for the PICs counterpart through a history of baseline surveys for more than 20 years. As a result, it is a significant accomplishment that the counterparts themselves lead the baseline survey including waste audit, and can voluntarily conduct surveys without the technical support from outside consultants.

In recent years, various international development partners in the PICs have provided technical support for the baseline data collection works, and the methodologies used in some cases differ. However, JICA and J-PRISM believe that it is critical for each country to collect official waste management data from its own national or local government, and that it is preferable to develop data collection and survey methodologies in accordance with its own policy goals and decisions.

JICA and J-PRISM will continue to support the creation of waste management baseline data together with the Pacific Island Countries partners based on these past, present and future visions.