HOUSEHOLD SOLID WASTE CHARACTERISATION SURVEY TRAINING

May 23 to 27 2011

J-PRISM PROJECT REPORT



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Port Vila, VANUATU

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   - Cecile Dehinavanua
   - Vanessa Vanuasoksok
   - Noel Leo

3) ***University of the South Pacific (USP) Emalus Campus Students***
   - Jim William
   - Betlin Sesai

4) ***Others***
   - Shushei Tagashira (JICA Volunter at Crabs Bay – Malekula)
   - Kombe Rogatien (Melanesian hotel driver)

All your participations and application of knowledge and skills acquired during the training to effective implementation of the J-PRISM activities in Port Vila, Luganville and Lenakel is highly valued. Let us all keep this acronym in mind "PAPA – Positive Attitude Positive Action" to be lead professional waste practitioners in the region to protect and keep our environment clean, green and healthy for today and tomorrow.

1.0 INTRODUCTION

Over the past few years the Government of Japan through Japan International Cooperation Agency (JICA) has provided major donor assistance on waste management through training and other technical development activities in Vanuatu. A huge development through JICA assistance is the construction of Bouffa landfill disposal site at Teouma Etas in Port Vila, in 2006. In 2010, JICA has signed with the government of Vanuatu, a five year plan agreement for the J-PRISM project for 2011 to 2015 on Solid Waste Management (SWM). J-PRISM is Japanese- Promotion of Regional Initiative on Solid Waste Management and, Department of Environmental Protection and Conservation (DEPC) is the coordinating agency for the project here in Vanuatu.

The J-PRISM project for SWM in Vanuatu focuses mainly in; Port Vila, Luganville and Lenakel towns. Waste characterization studies is the major activity in the project's PO (Plan of Operation). The first training for this project on household waste characterization survey study was from May 23rd to 27th 2011. With addition to training of counterpart members, some senior students from Malapoa College and USP Emalus campus were invited to attend the one week training. The training is also an opportunity for students to gain experience, build and broaden their academic interest, knowledge and skills in waste management. Two other interested volunteers from Malekula and Melanesian hotel also joined in for the training.

This report presents the main findings during the survey training on household solid waste characterization at Fresh Wota, Port Vila.

1.1 Rational background

One of the challenges in Vanuatu to keep our environment clean and healthy always is a proper waste management and pollution control system. The J-PRISM project provides great assistance to this country focusing mainly on solid waste management. Fortunately, the training run within this program ensures proper coordination and increase capacity skills to manage other waste types such as commercial, industrial, hazardous, quarantine, medical etc..to improve and enhanced Bouffa landfill management.

This first waste characterization training is a stepping stone to enable counterpart members for the three towns to implement project activities from 2011 to 2015. It is one of the project's objectives through this characterization training and future survey studies that proportion of waste disposed at Bouffa landfill (or other future established landfill) is reduced at a reasonable proportion.

1.2 Objectives

- To enhance capacity of counterparts to carryout waste characterization studies for SWM in Port Vila, Luganville and Lenakel from 2011 to 2016.
- To increase capacity skills in decision making, in developing policies, plans and strategies for counterparts in waste management and minimization in Vanuatu.

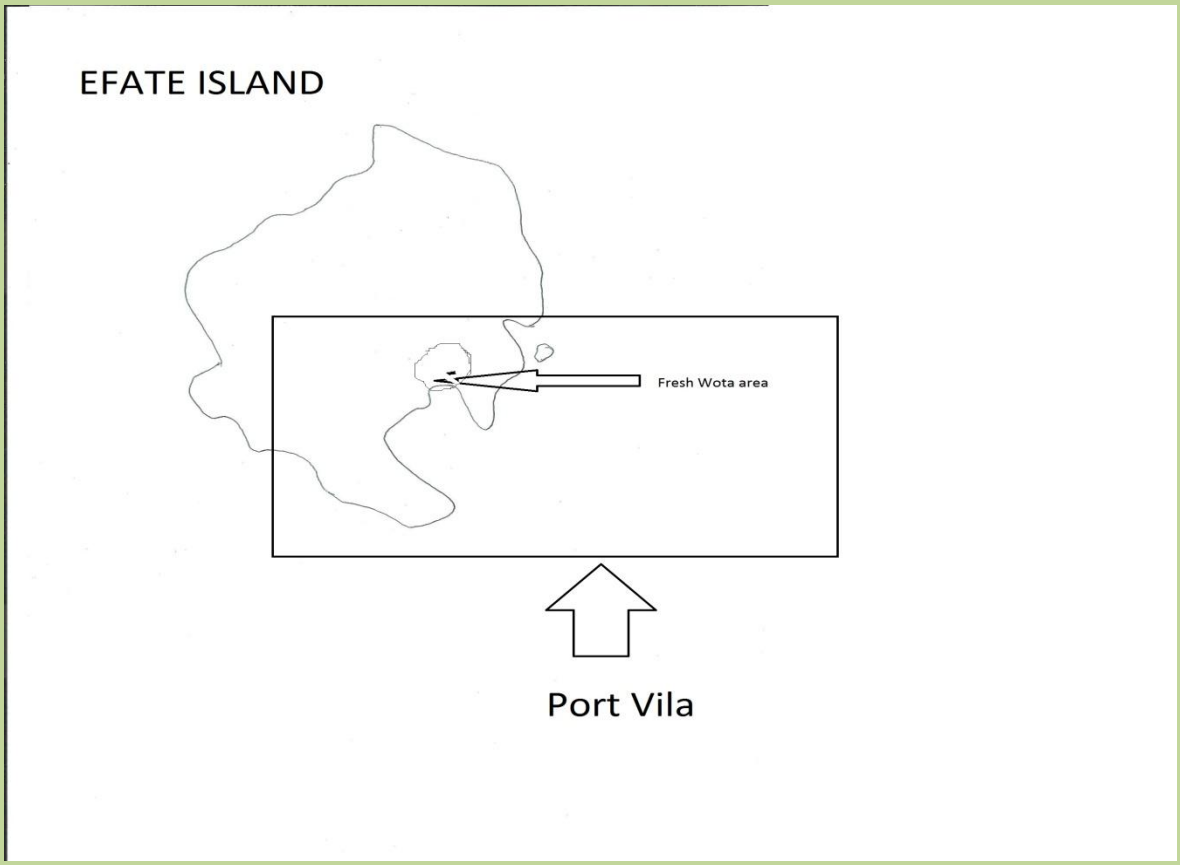
- To build and enhance knowledge and skills of students in waste management to become future professional waste practitioners in Vanuatu.

1.3 Specific objectives for the trainings

- To determine household waste generation rate
- To determine proportion of waste composition generated per households
- To determine density of waste generated and disposed at Bouffa land fill

2.0 STUDY AREA

Below is a map of the study area location, Fresh Wota in Port Vila. Ten randomly chosen households were selected in this area during the training using the WHO guideline for sampling.



3.0 METHODOLOGY

The training is based on the WHO Solid Waste Generation and Characterization Guidelines as attached (Annex 1: Solid Waste Generation and Characterization Procedure).

Households selected were randomly chosen at Fresh Wota 4 area. Port Vila Municipal Yellow trash bags were labeled and then given to the selected families to store their daily generated waste and these bags were collected, assessed and analyzed at Bouffa landfill on daily basis for three consecutive days. See Annex III for the tentative training programme.

Step 1: <u>Location of household samples and Interviewing at Fresh Wota 4 area</u>

The ten randomly selected households were interviewed and briefed on collection schedules. Refer to attached copy of questionnaire used for the survey in annex II.



Survey briefing to household members



Household samples



Location of household samples

Step 2: <u>Collection of trash bags and analysis</u>

The yellow trash bags from the selected households were collected daily and then transported to Bouffa landfill for analysis. At Bouffa the trash bags were weighed to determine daily waste generation rate, composition and density.



Collection of waste trash bags



Segregation of Waste compositions



Organic waste composition

Step 3: Data Information Collection



Recording of waste generation weights



determining density of waste disposed



Analyzing waste data records

4.0 RESULTS

Below are detailed summary of data obtained during the study. Table 1 shows data for generation rate; table 2 shows waste composition and table 3 shows density of waste from the ten households for three consecutive days.

1. **Generation Rate (amount of waste generated per person per day)**

Table 1: Waste Generation Rate

Household No.	Family Size	Days			Total Weight (kg)
		1	2	3	
1	15	4	8.5	3.6	16.1
2	6	0.1	0.4	0.2	0.7
3	6	0.6	0.6	1.2	2.4
4	5	0	3	1.7	4.7
5	10	0.2	0.2	0.1	0.5
6	12	0.1	0.1	1.6	1.8
7	4	0.5	0.1	0.1	0.7
8	6	0.7	3.1	4.8	8.6
9	5	2.9	2.2	6.8	11.9
10	8	1.1	2.6	0.8	4.8
Total	**77**	**10.2**	**20.8**	**20.9**	**52.2**

Table 1 above during the 3 day collection and analysis, as shown that household 1 has generated far greater waste (16.1kg) followed by household 2 (11.9kg). Unfortunately household 6 with 12 members in total has generated far less waste (1.8kg) which is unexpected. The differences may be due to income earned from household members. According to the information supplied from the questionnaire forms, members of household 1 are high income earners compared to household 6 with low income. Other possible factors to this could be due to cultural beliefs that restrict members to dispose into the provided trash bags for collection.

The correlation to income and total household members is that, as the amount of income increases per family, consumption of electricity and waste generation also increases.

The current total population of Port Vila is 44,039 people with approximately 9,000 households altogether. Interestingly the generation rate of waste per capita obtained during the training survey was 0.2kg/person/day.

Table 2: Composition of waste generated

Category	**Day**			**Total Weight**	**Percentage composition of waste (%)**
	1	**2**	**3**		
Organic	6.8	17.1	12.4	36.3	72.6
Plastics	0.3	0.8	2.4	3.5	7
Metals	0.4	1.4	1.3	3.1	6.2
Paper	0.3	0.1	1.0	1.4	2.8
Glass	0	0.5	0.6	1.1	2.2
Textiles	0.1	0.1	0.7	0.9	1.8
Miscellaneous	1.1	1.5	1.1	3.7	7.4
Total	**9**	**20.1**	**19.5**	**50**	**100**

Data on table 2 shows the different categories of waste generated from the 10 different families selected. According to this data, organic waste contributes to more than 72.6% proportion of waste generated per household. A possible reason to this is due to lack of space for backyard composting to dispose food scraps or generated organic (green) waste. Usually food scraps or green waste are given to pigs and dogs, unfortunately due to abiding to the city council By – laws no pigs are allowed by Port Vila municipal residents, this lead to a high proportion of organic waste generated.

Also noted on the above compositions table, the miscellaneous category was second in proportion to organic waste. This is a primary survey characterization study, the miscellaneous category in this case includes diapers etc. which contributes to increase weight. Plastics, metals

and papers are next categories that contribute to increasing proportion of waste generated in Port Vila households.

Table 3: Density of generated waste

Day	No. of 60L bucketful loads	Litre (L)	Cubic Metre (m^3)
1	2 + 1/3	140	0.14
2	3 + 1/3	200	0.2
3	4	240	0.24
Total	**9 + 2/3**	**580**	**0.58**

Density of bulk waste over the three days:

Volume (L) = 580L

Weight (kg) = 52.2kg

Density (kg/L) = 52.2kg/580L = 0.09kg/L

= 10.8kg of waste fills the PVMC 120L green wheelie bins

= 10.8kg per 0.12 cubic meter

= 90kg per cubic meter

= 540kg of waste per readymade rubbish truck of 6 cubic meter size.

5.0 CONCLUSION

This training has allowed us to develop action plans for implementation of successful waste management in Vanuatu. Minimization strategies and proper waste collection system now need to be developed to help in reducing the amount of waste disposed to Bouffa landfill to improve volume and capacity too. Waste characterization in Port Vila including Luganville and Lenakel will allow for proper segregation of waste at source by separating recycling waste from composting and disposal waste. The J-PRISM counterparts from Port Vila, Luganville and Lenakel towns need to carryout waste characterization techniques to allow people to better adapt to the waste management system and also reduce amount of waste going to disposal site.

5.1 Household waste generation rate

The generation rate obtained for Port Vila according to this survey is 0.2kg per person per day. Sagapolutele, F (2008) states that for Small Island Developing States (SIDS), the average generation rate of solid waste is about 0.5kg per person per day while the generation rate at developed countries like the United States of America, Japan and others is 1kg per person per day or more. The generation rate obtained is yet expected to increase in Port Vila with improved standard of living and changing life style.

5.2 Waste composition

Interestingly, about 72.6% of waste generated per household in Port Vila is organic waste. Second to Organic (green) waste are; plastics (7%), metals (6.2%) and papers (2.8%). During the training it was noted that appropriate strategies can be put in place as tools to appropriately deal with these waste with higher contents. Setting up of appropriate recycling operations such as composting for the generated organic waste, as well as recycling of plastics and other waste materials can be adopted to reduce final proportion of waste disposed at Bouffa landfill.

5.3 Waste density

Organic waste contributed to the highest proportion of waste generated. The size of the Port Vila Municipal garbage truck is $6m^3$. The current total number of operating garbage vehicles is four. Conversion of data obtained in this training shows that 2.5 trips of garbage collection is made per day per $6m^3$ garbage truck to Bouffa landfill for disposal.

Density allows for proper designing of waste trash bags, wheelie size bins and compactor trucks for collection. Organic waste with high content of waste composition can be appropriately transported by an open truck. Plastics, papers and metals which are easily compacted can be transported by a well designed compactor truck to Bouffa landfill (or other future established landfills).

5.4 Household Waste Collection System in Port Vila

The waste collection system here in Port Vila is run by Port Vila city council. The council divided their areas into six sections for collection throughout the week. Out from these six sections, four of these section (the most populated areas); collection is done three times per week that is Monday, Wednesday and Friday. Two remaining sections (less populated), collection is only done twice per week, i.e. Tuesday and Thursday.

Yellow trash bag is strongly encouraged for all individual household collection within municipal boundaries. This collection system has commenced implementation this year to allow the city

council with funds for improvement in collection services. Unfortunately there is no segregation at source for waste recycling to minimize waste going to Bouffa landfill.

5.5 Training Evaluation

Outcome of the training with Mr Faafetai was great. Participants find the training interesting and motivating because they have learnt that waste characterization studies will bring benefit to the waste management system of Vanuatu in planning, policing and strategizing to minimize waste and improve landfill structure and capacity.

At the closing, participants were awarded certificates for their participation throughout the training programme. Certificates were handed by JICA – Vanuatu Resident Representative, Mr. Suzuki Tadanori.



Participants with their certificates at the Department of Environmental Protection and Conference room, Port Vila

Seated infront is Mr. Suzuki Tadanora (JICA Vanuatu Resident Representative) and Mr. Faafetai Sagapolutele (Trainer)

6.0 REFERENCE

1. Sagapolutele, F, 2008; The Domestic Solid Waste Generation & Characterization Study on Upolu & Savaii Islands, Apia, Samoa
2. WHO, 1996; Guides for Municipal Solid Waste Management in Pacific Islands, Kuala Lumpur, Malaysia.

7.0 ANNEXES

7.1 Annex I – WHO Solid Waste Generation and Characterization Procedure

PROCEDURE FOR SOLID WASTE GENERATION SURVEY
(Source: Annex 1 of Reference 7)

1. Objectives

(1) To determine the volume required for on-site storage, transportation, transfer facilities and disposal of solid waste;

(2) to identify recycling/resource recovery potential of solid waste;

(3) to determine appropriate methods of collection and disposal of solid waste; and

(4) to estimate the expected life span of a disposal site.

2. Outputs

(1) Daily generation rates in kg/person/day for residential waste and in kg/sq.m/day for commercial waste;

(2) bulk density of solid waste generated in kg/L or in kg/cu.m; and

(3) composition of solid waste generated in percentage by weight.

3. Selection of sample areas

(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 100 (10-20 for Pacific island countries) households for each of the residential areas defined in (1) above (totalling 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 50 (10 for Pacific island countries) 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 10-20 (2-3 for Pacific island countries) 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.

Annex 1

4. Preparation

(1) Transport of waste - an open (pick-up) truck will be required to transport the waste collected to the dump site where all the measurements will be taken.

(2) Workers - a driver and an assistant worker will be required for transportation of the waste. In addition, one or two collection workers will be required for each sample area to collect and load the waste on to the vehicle. At the dump site, two or three workers will be required to measure the weight and volume of waste, and separate the waste into different categories. A supervisor-cum-data recorder will also be required.

(3) Equipment:

Plastic bags	-	8 (days) x (No. of households + No. of shops and offices)
Weighing scale	-	one or two to weigh the waste with an accuracy of 100 grams
Buckets	-	(a) to measure volume of waste; and (b) to be used as a container for weighing
Plastic sheet	-	to spread waste over it for sorting
Gloves	-	for workers to handle waste

(4) Assignment of numbers to households, shops and offices - for purpose of data recording and analysis.

(5) Coding of plastic bags by markers - according to the numbers assigned to households, shops and offices.

(6) Data sheets - examples are given in Tables 1 through 3.

(7) Survey of family size and floor area - the number of persons in each household and the floor area of each shop and office will be recorded in the data sheets.

(8) Determination of collection route - the collection route will be recorded on a map.

(9) Determination of volume and weight - the volume and weight of a bucket will be measured and recorded.

(10) Instruction to workers - the workers will be instructed as to how they should carry out their work.

(11) Distribution of leaflet and plastic bags - a leaflet, which explains the study and requests for cooperation, together with 8 plastic bags will be distributed to each household, shop and office in the sample areas.

5. Procedure

(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 proceed 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) Select randomly 25 (5-10 for Pacific island countries) plastic bags from those collected in each sample area and record the household or shop/office numbers of these bags in the data sheets 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. vegetables/putrescible matter, bones, paper, textiles, plastics, grass/leaves/wood, leather/rubber, metals, glass/ceramic, miscellaneous). The separated waste will be put into different buckets for weight measurement.

(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) everyday for the duration of the study.

7.2 Annex II– Survey Questionnaire

PORT VILA SOLID WASTE GENERATION SURVEY QUESTIONNAIRE, MAY 2011

Introduction: This questionnaire aims to collect baseline information to assist us in improving our waste management facilities and services. The information collected will be confidential and will only be used for the purpose of this training exercise. Your cooperation will be highly appreciated in providing the required information in this questionnaire. We thank you in advance for your cooperation.

Thank you

DEPARTMENT OF ENVIRONMENTAL PROTECTION AND CONSERVATION

1.0. HOUSEHOLD CONTACT INFORMATION

Sample No……..

Name of Family……..

Contact Numbers ……

Email (if available) ……..……

2.0. POPULATION DETAILS

Number of People in the Family ……..……

No of male: ……..……

No of female ……..……..

No of baby (s)……..……..

3.0. WAY OF LIFE

Usual items purchases on a weekly basis

…… ……

…… ……..

…… ……..

Usual Daily Food

…… ……..

…… ……

…… ……..

Average electricity monthly bill

……

4.0. ESTIMATED INCOME

Number of employed members of the family ……

Employment 1 Fortnightly Salary ……..

Employment 2 Fortnightly Salary ……..

Employment 3 Fortnightly Salary…….

Employment 4 Fortnightly Salary……

5.0. WASTE COLLECTION AND DISPOSAL

How many rubbish bags your family generate every week ……

How do you dispose of your waste?

Through the City Council Collection Service ……..

How many times ……..

Through a Private Company ……..

Throw or bury at the backyard …….

Other means ……..

For more information please contact:

Carol Rovo – 5675142 (Department of Environmental Protection and Conservation)

Roger Tari – 5566021 (Port Vila Municipality)

Amos Mathias – 5566016 (Port Vila Municipality)

We thank you for your cooperation.

7.3 Annex III – Tentative Training Programme

TENTATIVE TRAINING PROGRAMME
ON HOUSEHOLD SOLID WASTE CHARACTERIZATION STUDY AT PORT VILA, VANUATU

DATE	ACTIVITY	DETAILS	EQUIPMENT & MATERIALS REQUIRED
Friday, 20th	9AM: Meeting at DEC Office	Discussion of: • Purpose and objectives of the survey • The Survey Methodology / Sampling method and procedure • Assigning of survey team to their responsibilities to perform • Some aspects to consider when performing the survey to eliminate errors. • Survey Questionnaire, the type of data it collects and the use of those data for waste services planning purposes • Practicing the filling of survey forms. • Marking of the first set of trash bags to be distributed	• Overhead Projector for presentation • 20 Trash bags • 1 White Spray paint for marking • 20 Printed Information Page • 20 Printed Survey Questionnaire
	2AM: Field Visit	Out in the field to: • Locate 10-20 households to be selected randomly along a normal collection route. Determining on the number of participants, we can have two to three groups. • Visit the individual selected households and give them the survey information page, questionnaire to be filled. • Give households their trash bags to be used for storing their Sundays waste.	• 20 Trash bags • 1 tarpolen (4m x 4m) • 1 100 Litre Bucket • 1 hanging weighing scale • 20 disposable hand gloves • 10 disposable face masks • White board • 10+ lunches & water or softdrinks)
Monday, 23rd	9AM: Field Work	• Visit the 10-20 households and collect the first trash bags. At the same time hand over to them the second trash bags to store their new waste. • Start collecting questionnaire forms from families if ready. If not remind them to fill the questionnaire and return please. • Deliver the collected trash bags and transport to the Bouffa Landfill for weighing and analysis. • Weighing of the collected trash bags and recording every bag. • Analyse the contents of the collected bags and determine the composition and volume of waste20 bottle of water	Same as above
	PM: Office Work	• Inputting of data in survey forms by DEC & City Council	White Board (DEC Conference Rm) Laptop
Tuesday, 24th	Same	• Collect trash bags from the 10-20 households and hand over to them the third trash bags to store their new waste. • Deliver the collected trash bags and transport to the Bouffa Landfill for weighing and analysis. • Weighing of the collected trash bags and recording every bag. • Analyse the contents of the collected bags and determine the composition of waste and volume.	Same as above
Wednesday, 25th	Same	• Collect trash bags from the 10-20 households and hand over to them the fourth trash bags to store their new waste. • Deliver the collected trash bags and transport to the Bouffa Landfill for weighing and analysis. • Weighing of the collected trash bags and recording every bag. • Analyse the contents of the collected bags and determine the composition of waste and volume.	Same as above
Thursday, 26th	Same	• Collect trash bags from the 10-20 households and hand over to them the fifth trash bags to store their new waste. • Deliver the collected trash bags and transport to the Bouffa Landfill for weighing and analysis. • Weighing of the collected trash bags and recording every bag. • Analyse the contents of the collected bags and determine the composition of waste and volume.	Same as above
Friday, 27th	9AM: Meeting in DEC Room	Discussion of: • Presentation of recorded data from Mon to Thursday • Calculation of Generation Rate from the data • Calculation of Waste Composition from the data • Calculation of Waste Volume from the data • Discussion of these data and their uses in general waste management planning purposes • Draft Report of the Survey to be completed by DEC and participants	• Overhead Project for presentation
	AFTERNOON (LUNCH)	• Closing of the Training and distribution of Certificates	• Certificates for Participants