

Waste Characterization Survey Methodology Training Workshop in Lesotho



Module 2: Survey Design, Sampling & Pre-preparation



Lancers Inn

Date: 15 June 2026



From
the People of Japan

Trust Nhubu

Tel: +263 777 342 295

Email: tnhubut@unisa.ac.za, nhubustrust@gmail.com



Module Outline



STEP 1: PREPARATION

- 1.1 Gain Political and Senior Management Endorsement and Support
- 1.2 Establishment of Working Team
- 1.3 Preparation of Tools and Equipment
- 1.4 Identification of Key Stakeholders and Partnerships
- 1.5 Prepare Workflow and Budget
- 1.6 Gather Necessary Preliminary Data



STEP 2: HOUSEHOLD MSW GENERATION AND COMPOSITION

- 2.1 Preparation
 - 2.1.1 Define sample size
 - 2.1.2 Select survey areas and households
 - 2.1.3 Prepare informed consent letter from municipal government
 - 2.1.4 Prepare the survey team, equipment, and transport
 - 2.1.5 Mark each liner bag
 - 2.1.6 Print recording sheets and prepare the WaCT Data Collection Tool
 - 2.1.7 Find a location for the waste amounts and composition measurement



From
the People of Japan

STEP 2: NON HOUSEHOLD MSW GENERATION AND COMPOSITION

The Preliminaries





STEP 1. PREPARATION



From
the People of Japan



1.1 Gain Political and Senior Management Endorsement and Support

Need	Facilitate	Make
Need for city's Mayor or top officials' support for the assessment.	Facilitate the different approval procedures and necessary resource mobilization within the city government	Make sure the intended purpose and significance of the assessment for the improved environmental management in the city is well communicated and gain political and senior management endorsement before starting the assessment.



From
the People of Japan



1.2 Establishment of Working Team



Survey Team Members per Survey Area	2 - 3	
Survey Areas	9	15
Size of Survey Team	18 - 27	30 - 45



- Survey team members must be dedicated full-time for the 8-10 days
- Led by 2-3 well trained experts dedicated for a combined total of about 6 working weeks per city
- Need for 1 to 2 days training of the survey team members
- Local Language – At least one of the survey team members
- Mobility – Survey team members resides in the survey areas
- Field visits – waste disposal and recovery facilities
- Environmental health and safety – PPE and environmental safeguards



From
the People of Japan





1.3 Preparation of Tools and Equipment

Things to Prepare	Quantity		
	1 Survey area	9 survey areas (average city)	15 survey areas (mega-city)
Survey team	2-3 people	18-27 people	30-45 people
Transportation for waste collection	1 collection vehicle trips	9 collection vehicle trips	15 collection vehicle trips
Liner bags (vol: 60L)	80	720	1200
Identification tape (tag bags)	1	9	15
Pens	3	27	45
Markers	1	9	15
Hanging Weighing scale (up to 60 kg)	1	9	15
Thick plastic sheet (at least 4 x 4 metres)	1	9	15
Waste containers or bags (60 L)	12	89	180
Scissors	1	9	15
Spades	1	9	15
Brooms	1	9	15
Camera/ Smart Phone	1	9	15
Reporting sheets	1	9	15
Informed consent letters (with space for signing and dating) for each sample member	10	90	150



From
the People of Japan





1.3 Preparation – Necessary PPE

Things to Prepare	Quantity		
	1 Survey area	9 survey areas (average city)	15 survey areas (mega-city)
Hat or cap (sun and dirt protection)	2-3	18-27	30-45
Glasses (eye protection)	2-3	18-27	30-45
Masks	2-3	18-27	30-45
Long sleeve shirts	2-3	18-27	30-45
Thick gloves	2-3 pairs	18-27 pairs	30-45 pairs
Apron (stomach protection)	2-3	18-27	30-45
Long pants	2-3	18-27	30-45
Rubber boots	2-3 pairs	18-27 pairs	30-45 pairs
Hand sanitizer	1	9	15
Disinfectant	1	9	15
Soap	1	9	15
First aid kit, including eye bath	1	9	15



From
the People of Japan



1.4 Identification of Key Stakeholders and Partnerships

Stakeholder	Justification
National Ministries or environmental regulatory authorities	Policy making, regulatory authorities, responsible for setting framework conditions, licensing/permitting, inspecting, and enforcing requirements for MSW collection, recovery, and disposal activities
City waste management office and other departments	Cities have statutory responsibilities for a wide range of MSWM service provisions
Waste generators	Responsible for waste generation and recipients of MSW management services
NGOs and CBOs	Intermediaries between governments and local communities, sometimes involved in solid waste service provision and/or providing support of informal collection/ recycling service providers.
Public collection service providers	Responsible for MSW collection
Formal private collection service providers	Hired agents collecting MSW on behalf of LAs
Informal collection service providers	Informal MSW collection
Informal and formal value chain enterprises	Businesses and enterprises collecting and or receiving recyclables for trading and recycling purposes



From
the People of Japan



1.5 Prepare Workflow and Budget



POLITICAL BUY
IN



HUMAN
RESOURCES



FINANCIAL
RESOURCES

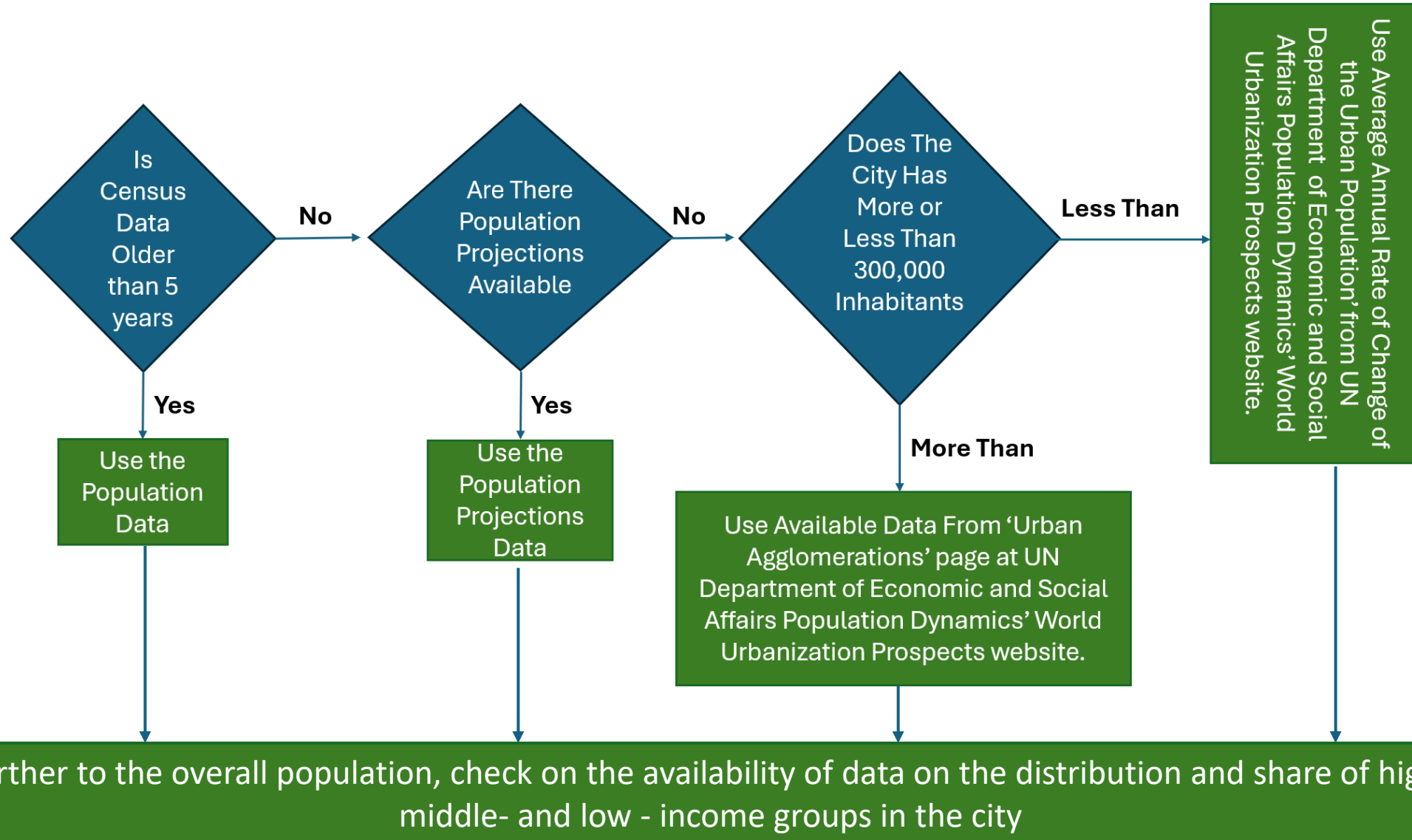


EQUIPMENT

1.6 Gather Preliminary Population Data



From
the People of Japan



1.6 Gather Preliminary Business Licensing Data



Provides the number of units for different businesses and premises in the city



Number of beds for hospitals



Chairs for restaurants, Floor space for supermarkets



Students for schools, etc.



Very important for the estimation of MSW generation from non-household sources



Check availability of such data from the municipal or city statistics office for the system boundary and whether the data is up to date (not older than 5 years).



If the data is neither available nor up to date, use the proxy to determine MSW generation from non-household sources



From the People of Japan



STEP 2: HOUSEHOLD MSW GENERATION AND COMPOSITION



From
the People of Japan



2.1 Preparation

Motivation

Provides the assessment methodology for per capita household solid waste generation and average household waste composition

Applied when there is no up-to-date data on MSW generation and composition

information is essential, especially for expanding resource recovery efforts, and as first step towards establishing an urban circular economy

Key Considerations

Waste generation from households fluctuates depending on day of the week (weekdays and weekends)



Assessment must be carried out throughout an entire week (7 days).



Human beings generate waste, not households.



It is important to record the number of people actually living in the household rather than taking the official average number of family members.

Waste generation differs according to the household's income-level or housing type



Households and survey areas to be classified based on income levels



Waste generation varies seasonally, as well as during festive periods hence need take into account those local variables that may affect waste generation during the time of the survey



Ideally a year long longitudinal sampling and crucial to be consistent with your method maintaining same sample size and the same calculation methods



2.1.1 Defining Sample Size

Sample determines the statistical significance of the results obtained

City Size	Sample Households	Low Income	Middle Income	High Income	Confidence Level	Margin of Error
Ideally 10k to 10 million inhabitants	370 to 384	123 - 128	123 - 128	123 - 128	95%	5%
Mega City	150	50	50	50	95%	10%
Average City	90	30	30	30	95%	10%

Income Level	Housing Type Example
High	Luxury condominium, single detached house with garden, sophisticated alarm systems.
Middle	Apartments , single detached house without garden.
Low/ informal settlements	Slums, apartments with single rooms (apartments mud house, Rent less than 5% of GDP per capita



From
the People of Japan



2.1.1 Defining Sample Size...ctd



Urban Area	2016 Population	Survey Areas	Total Number of Targeted Households	High Density or Low Income	Medium Density or Medium Income	Low Density or High Income
<u>Maseru</u>	343,541	15	150	50	50	50
Mafeteng	43,247	9	90	30	30	30
Hlotse	41,986	9	90	30	30	30
Maputsoe	59,126	9	90	30	30	30
Mokhotlong	13,810	9	90	30	30	30
<u>Thaba-Tseka</u>	16,010	9	90	30	30	30



2.1.2 Selection of Survey Areas and Households



Selection Method	Description
A	Simple and easy method called the lottery method, where each household in the income group is assigned unique number and the sample households are selected from this thoroughly mixed list. This way, each household has an equal chance of being selected as subject
B	Use a computer to do a random selection from a list of all households in the selected neighbourhood.
C	Obtain a map of the city with larger scale than 1:2,500 and overlay a grid of 1cm x 1 cm over the map. Each cell represents a 25 m x 25 m piece of land on the map. Assign one number to each cell and randomly select 30 cells per survey area. One household per each cell will be the random sample of household. Once in the field, be consistent on how you select your sample household from each cell. For example, always start from the households nearest to the top left corner of the cell and visit ground floor upwards in the case of high storey buildings. If not successful, move to the next door and so on, always making sure you do not exit the cell of the grid.
D	Option D: in the case of cities where households with different income levels are interspersed and it is difficult to clearly identify “areas” of low, middle and high income, use housing types to stratify your sampling areas instead. Obtain a map with a scale of 1:5,000 and overlay a 1cm x 1cm grid over the map. Select 30 cells randomly and identify one household per income level according to the housing types.



From
the People of Japan



2.1.3 Prepare informed consent letter from municipal government

Annex 1: Sample introduction letter

LETTER OF INTRODUCTION

Dear Madame, Sir,

We are glad to inform you that *[name of organisation/local government]* is conducting a survey to collect data on the Sustainable Development Goal indicator 11.6.1 in *[name of city/municipality]*. This includes collecting information and waste from households and institutions.

Background of the study is the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, which provides a shared blueprint for peace and prosperity for people and the planet, now and in the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action to all countries in a global partnership.

SDG 11 aims at "making cities and human settlements inclusive, safe, resilient and sustainable". Target 11.6 intends "by 2030, [to] reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management".

To monitor the progress towards this target, an indicator 11.6.1 "proportion of Municipal Solid Waste collected and managed in a controlled facility out of total Municipal Solid Waste generated, by cities" was set, and *[name of organisation/local government]* would like to obtain information to assess this. The data obtained from the survey will be used to develop strategies and plans to improve waste management and achieve better urban living environment for residents in *[name of the city]*.

We would appreciate your collaboration in allowing *[name of organisation/local government]* staff to collect the information and material necessary for assessing SDG indicator 11.6.1.
Sincerely,

Name of signatory

Position

Name of organisation/local government

- Explains the purpose of the survey,
- What and how the information will be used
- Requesting the consent of households to participate in the survey.
- The households must consent and sign



From
the People of Japan





2.1.5 Marking Liner Bags

- Liner bags are marked with the house number and letter denoting the neighbourhood, the survey date and survey area
- The bag will contain the waste generated in that household on the written date.
- Do not note the householder's name, in order to protect the confidentiality of the people who have kindly agreed to participate in your survey



From
the People of Japan



2.1.6 Recording Sheets Waste Generation

Annex 2: Recording sheet for household waste sampling

This form should be used for each survey area.

Survey Area:	HH1	HH2	HH3	HH4	HH5	HH6	HH7	HH8	HH9	HH10
Number of residents										
Weight of bag (in kg)										
Day 2, Date:										
Day 3, Date:										
Day 4, Date:										
Day 5, Date:										
Day 6, Date:										
Day 7, Date:										
Day 8, Date:										



From
the People of Japan





2.1.6 Recording Sheets Waste Composition

Annex 3: Recording sheet for waste composition analysis

This form should be used for both household surveys (Step 2) and disposal facility surveys (Step 6). Print one of these sheets for each survey area (total 9 sheets), and for the disposal facility composition survey (total 3 sheets).

Survey Area:	Composition analysis 1 (kg)	Composition analysis 2 (kg)	Composition analysis 3 (kg)	Sum (kg)	Average (kg)
Categories					
1.Kitchen/ canteen waste					
2. Garden/ park waste					
3. Paper & cardboard					
4. Plastics - film					
5. Plastics - dense					
6. Metals					
7. Glass					
8. Textiles & shoes					
9. Wood (processed)					
10. Special wastes					
11. Composite products					
12. Other					
Total					



From
the People of Japan



2.1.7 Find a location for the waste amounts and composition measurement



- According to the estimate of the volume of daily collected waste from the households, choose a site where you can store waste and conduct the measurement of waste as well as the composition survey.
- Ideally, this site should be flat and covered, have enough space, be accessible by vehicle, have access to water for drinking and washing purposes and offer protection from pests



From
the People of Japan





STEP 3. NON HOUSEHOLD MSW GENERATION AND COMPOSITION



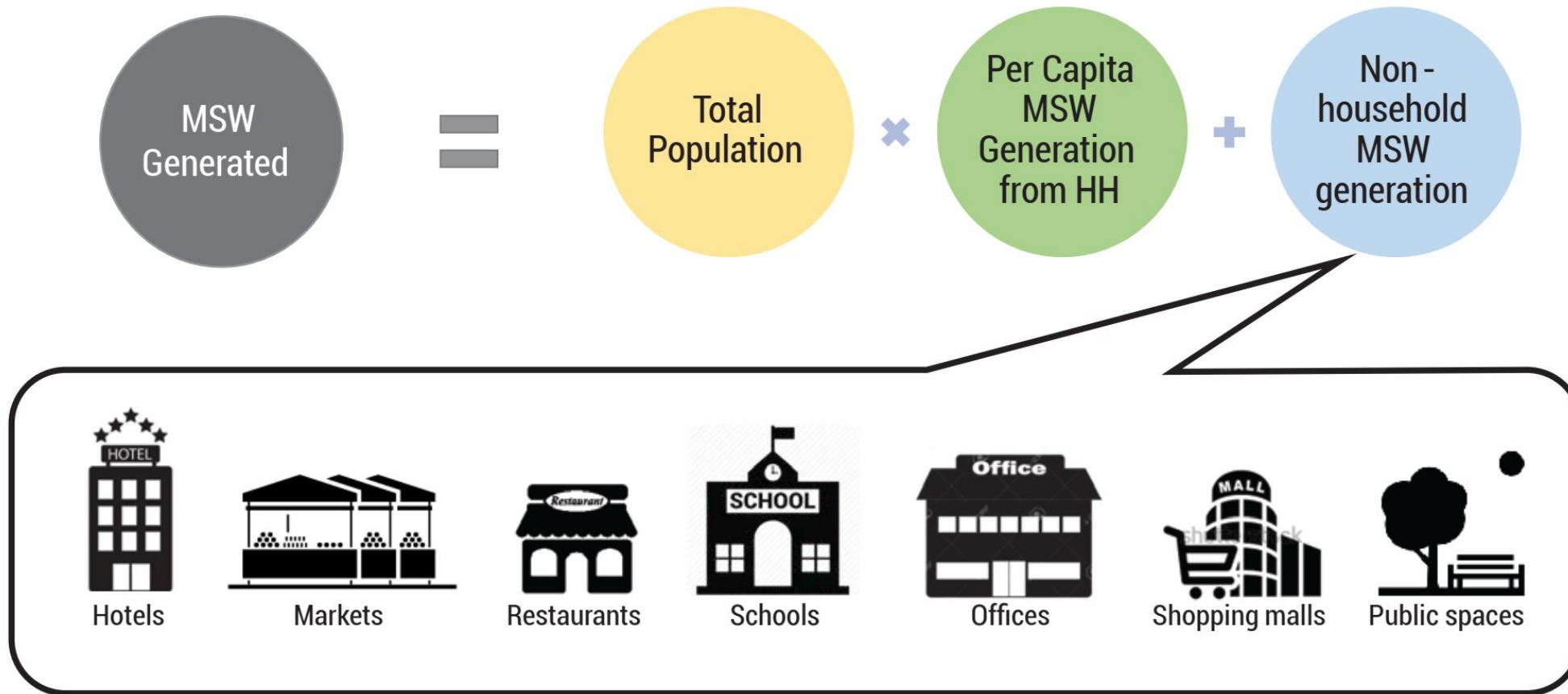
From
the People of Japan



What Constitutes Non-Household MSW



From
the People of Japan



Approaches for Quantifying Non Household MSW



Conduct waste sampling from non-household MSW sources through random sampling, similar to the household waste survey. This approach yields more accurate results, but it is more resource intensive.

Conduct interviews with non-household MSW sources and their waste collection service providers to get approximate amounts of generated waste. This approach is less resource intensive, but the results are less accurate than option a) and it is recommended to take when you have reliable business licensing data. See more details from sub step 3.2 to 3.5.

If there are no reliable business licensing data available or no resources to conduct a comprehensive survey, use a proxy to estimate the MSW generation from non-household sources. This guide recommends the use of a proxy of 30%⁵ to estimate MSW generated by non-household sources. See more details in sub step 3.1.



**Which is applicable in
Lesotho???**



From
the People of Japan



Thank You