

Baseline Assessment Study – Haridwar & Rishikesh

Background

Objective: Assessment of the quantity, composition and fate of plastic waste in Rishikesh & Haridwar

Duration: September – December, 2020

Challenges:

1. Absence of a India-specific methodology for municipal and plastic waste inventorization;
2. Impact of COVID on waste generation behaviour;
3. Health and safety of surveyors and workers.

3-key components of the study

1. Assessment of current status

- Population and source enumeration
- Existing waste management infrastructure
- Assessment of plastic leakages
- Assessment of informal sector and plastic waste value chain

2. Waste inventory

- Composition
- Quantification
- Plastic Typology

3. Practice, perception, attitude and awareness

- Practice of waste management
- Peoples' perception and attitude towards waste
- Knowledge and awareness on waste management

Assessment of current status of waste management

1. Data Available with municipality

- Availability of infrastructure
- Financial data
- Gap analysis

2. Development of data gap sheet to collect information

- City level information (population, number of hotels, shops, offices, tourists, floating population, etc.)
- Waste generation and management practices from hotels, schools & colleges, and religious places

3. Physical survey of

- Private agencies for waste collection and transportation
- Informal sector and plastic waste value chain (rag pickers, scrap dealers and aggregators)

Waste Inventory

1. Based on physical sampling

- Daily solid waste generation rates in kg/cap/day; verified with waste disposal at dumpsites.
- Composition of waste generated in percentage by weight.
- Source-wise waste generation.
- Particle size distribution.
- Lab Analysis.

2. Plastic typology

- Based on physical sampling and informal sector study
- As per the the BIS standard for plastic classification (IS 14534:1998)

Methodology

1. Sampling methodology

A stratified two-stage sampling methodology was adopted to capture the diversity in economic status and economic activities in the city.

- **Economic status of wards as primary sampling units (PSU)**

- High income residential wards;
- Mixed income residential wards;
- Economically Weaker Section (EWS) residential wards;
- Commercial wards; and,
- Mixed residential and commercial wards.

- **Waste generator type as secondary sampling units (SSU)**

- Households, commercial entities, hotels, etc.

2. Number of sample - The size of SSUs was estimated based on a **95% confidence level and 5% error**.

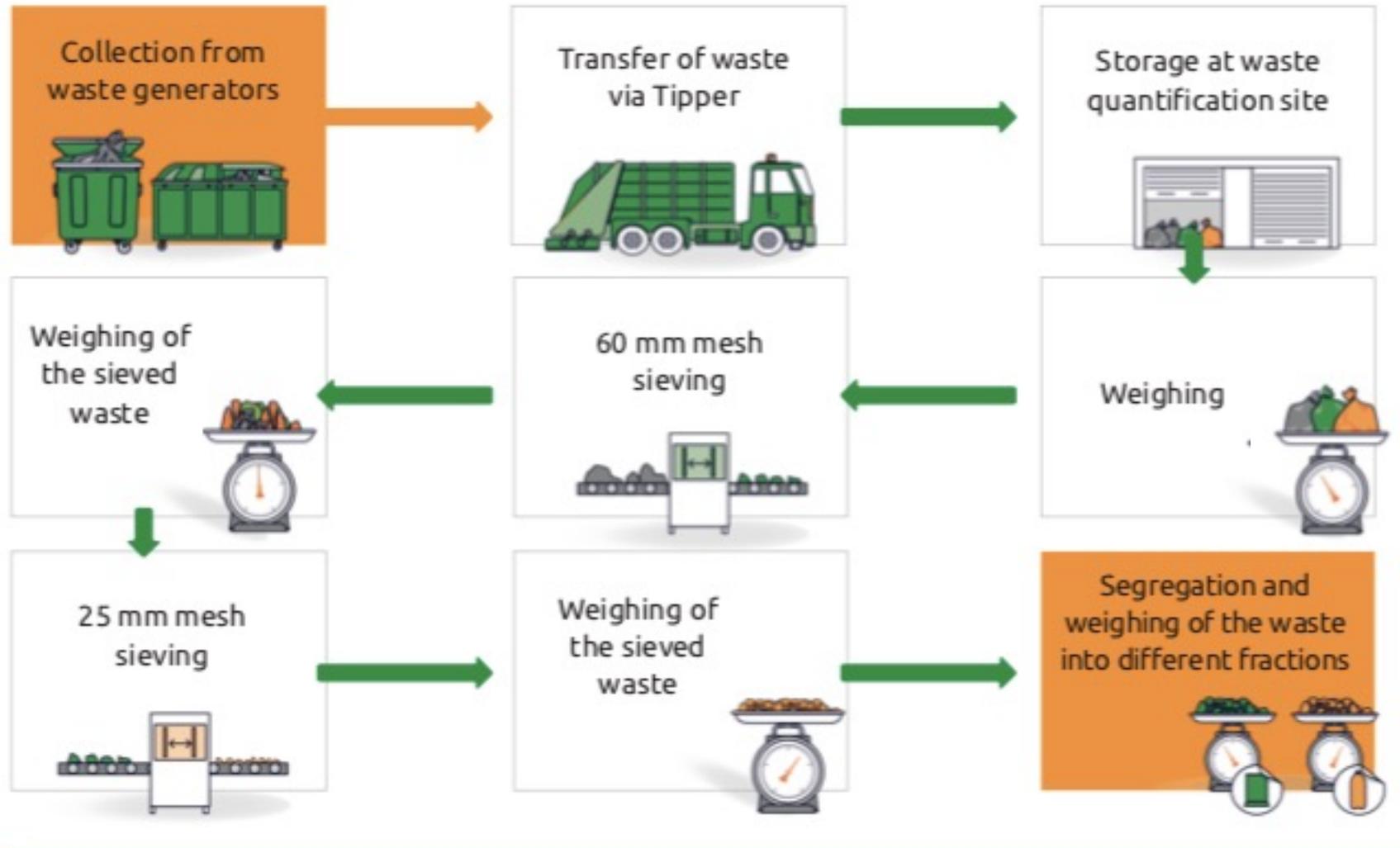
3. Sampling frequency – Once a day at a fixed time for eight successive days (first day waste was discarded).

Survey of the SSUs

1. Computer assisted personal interview (CAPI) was used for the survey
2. Captured information on HHs, waste generation and disposal habits, awareness etc.
3. Survey was also used to inform the SSUs about the study and the collection mechanism
4. Provided the selected sample with bins/bags to accumulate the generated waste.



Waste quantification and composition – Process flow scheme



Step 1: Collection of the waste

A volunteer was made responsible for coordinating the sample collection alongside the municipal waste collector in each ward.

Step 2: Transfer of the collected waste

- The waste from each ward was collected separately and carefully marked with the total number of households that have given waste on any given day
- Similarly separate collection was done for commercial establishments and institutions
- The waste was transferred to the sorting station with the help of the tipper



Step 3: Weighing of the waste

- The collected waste from each ward was emptied in a bucket and weighed



Step 4: Particle size distribution

- The weighed waste was subsequently screened into three different size fractions > 60 mm, 25-60 mm and < 25 mm, using rectangular meshes with an edge length of 25x25 mm and 60x60 mm.



Step 5: Sorting and quantifying

- A temporary platform with HDPE liner was made for waste quantification at the sorting station.
- The sorting was carried out with the help of pre-trained workers, a pictorial banner was provided for ease.
- The dry waste was first segregated into;
 - Papers
 - Glass
 - Textile
 - Plastic
 - Rubber & Leather
 - Metals
 - Others

Each category was weighed separately



Step 6: Plastic typology

- The Plastics waste were further characterised into 7 different segments as per the BIS standards.

Each category was weighed Separately.

1 **PET**
(Polyethylene
Teraphthalate)

Water bottles, softdrink bottles,
Juice bottles/Rigid cosmetic jars/
Microwavable containers

2 **HDPE**
(High Density
Polyethylene)

Shampoo Bottles/Toys/Chemical
Containers/Pipe Systems/Recycling
Bins/Flower Pots

3 **PVC**
(Polyvinyl
Chloride)

Water pipes/Insulation wiring
and cables/Biomedical drips and
tubings

4 **LDPE**
(Low Density
Polyethylene)

Carry bags (grocery, dry cleaning,
bread, bin liners)/Plastic wraps/
Milk pouch/Squeezable bottles

5 **PP**
(Polypropylene)

Bottle lids/Straws/Lunch boxes/
Take-out food containers/Ice cream
containers/Syrup bottles

6 **PS**
(Polystyrene)

Foam packaging/Teacups, plates
and disposable cutlery/Containers/
Yoghurt container

7 **0**
(Others)

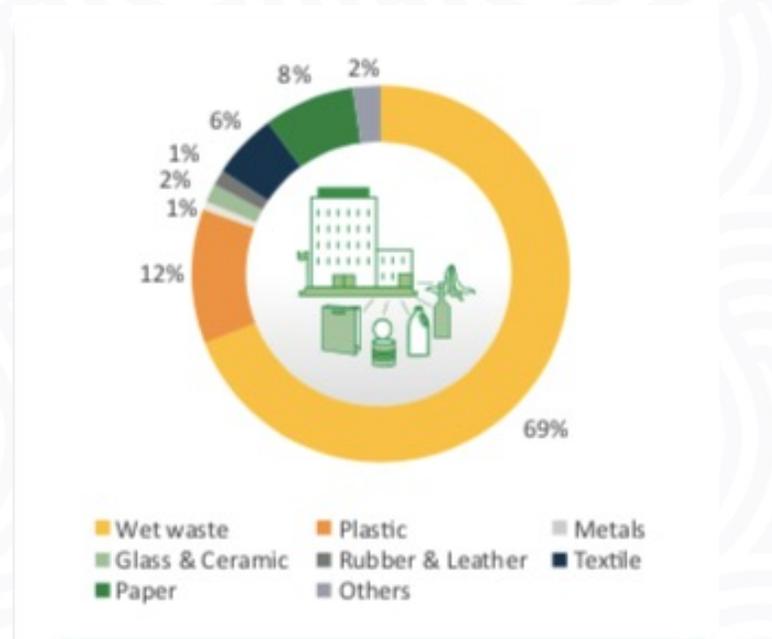
Multilayered packaging
of chips, biscuits etc.

Source: As per BIS
classification of plastics

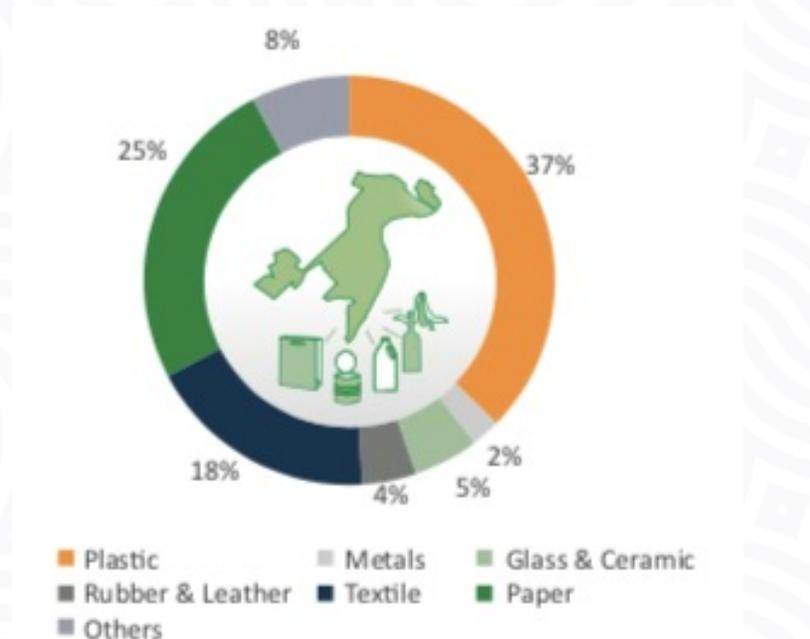
Step 7: Waste quantification and enumeration

- Based upon the analysis and the data collected from the survey per capita waste generation for different wards is established
- Percentage composition of different waste fraction

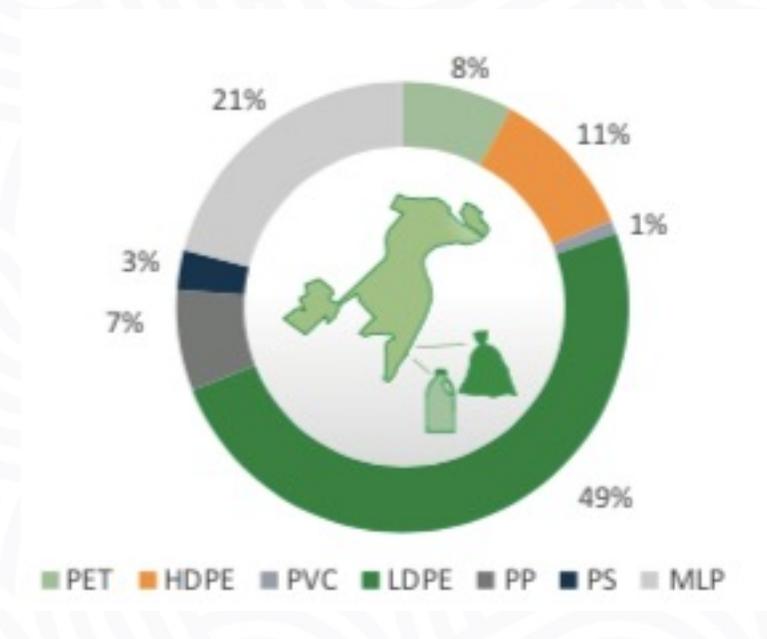
Overall municipal waste



Dry waste



Plastic waste



Practice, Perception, Attitude and Awareness

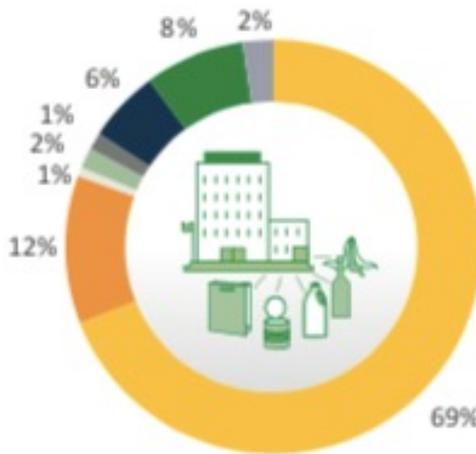


Key findings

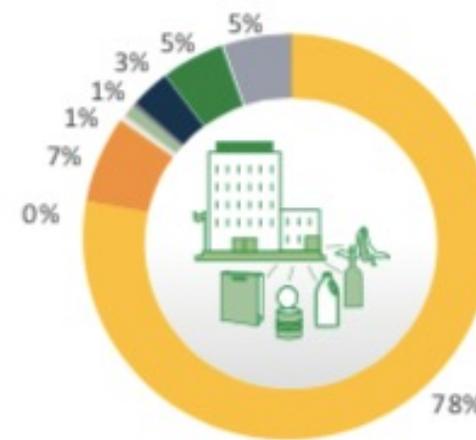
- 1. Waste generation and disposal behaviour is quite consistent**
- 2. Segregation at source is poor**
 - Around 70 % household in Haridwar and 90 % households in Rishikesh use single bin for waste disposal
 - Infrastructure needs to be redesigned to promote source segregation
- 3. Decentralized processing missing**
 - Promotion of decentralized waste management system required as 70 – 75 % waste is wet waste
- 4. Plastic composition is huge**
 - Plastic waste constitutes 30 – 35 % of total dry waste fraction

Key findings – Overall waste composition

5. Wet waste composition is 69 % at Rishikesh and 78 % percent in Haridwar



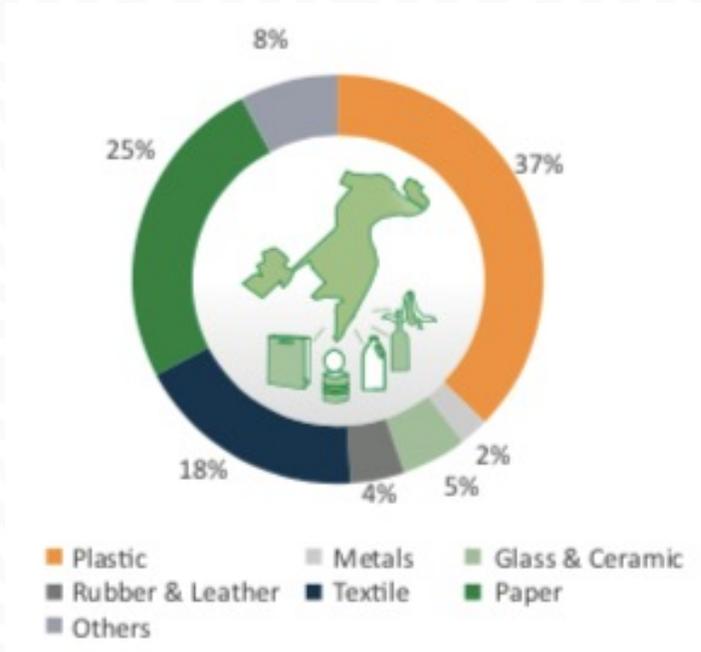
Rishikesh



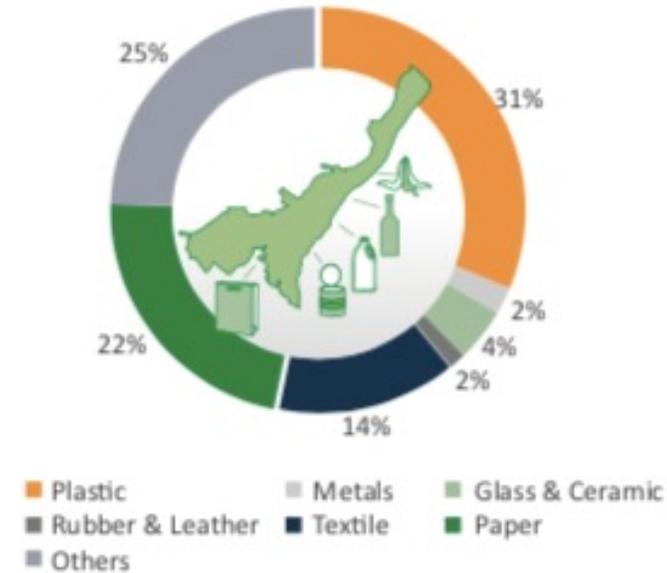
Haridwar

Key findings – Dry waste composition

6. **Plastic and paper** are the major components (plastic constitutes 37 % at Rishikesh and 31 % at Haridwar)



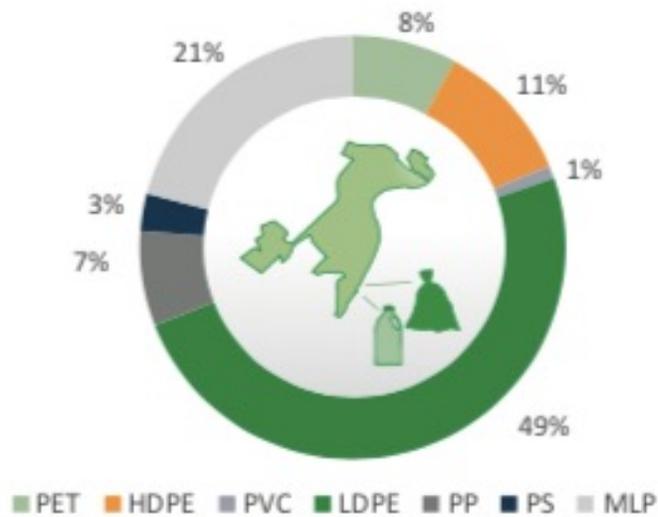
Rishikesh



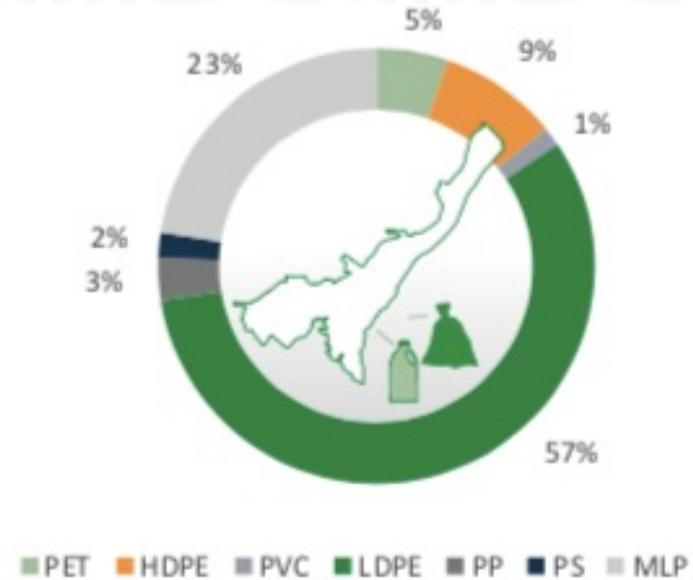
Haridwar

Key findings – Plastic waste typology

7. **Plastic typology** – Major part is the LDPE and MLPs which are of low value but high concern, they constitutes around 70 % at both the places



Rishikesh

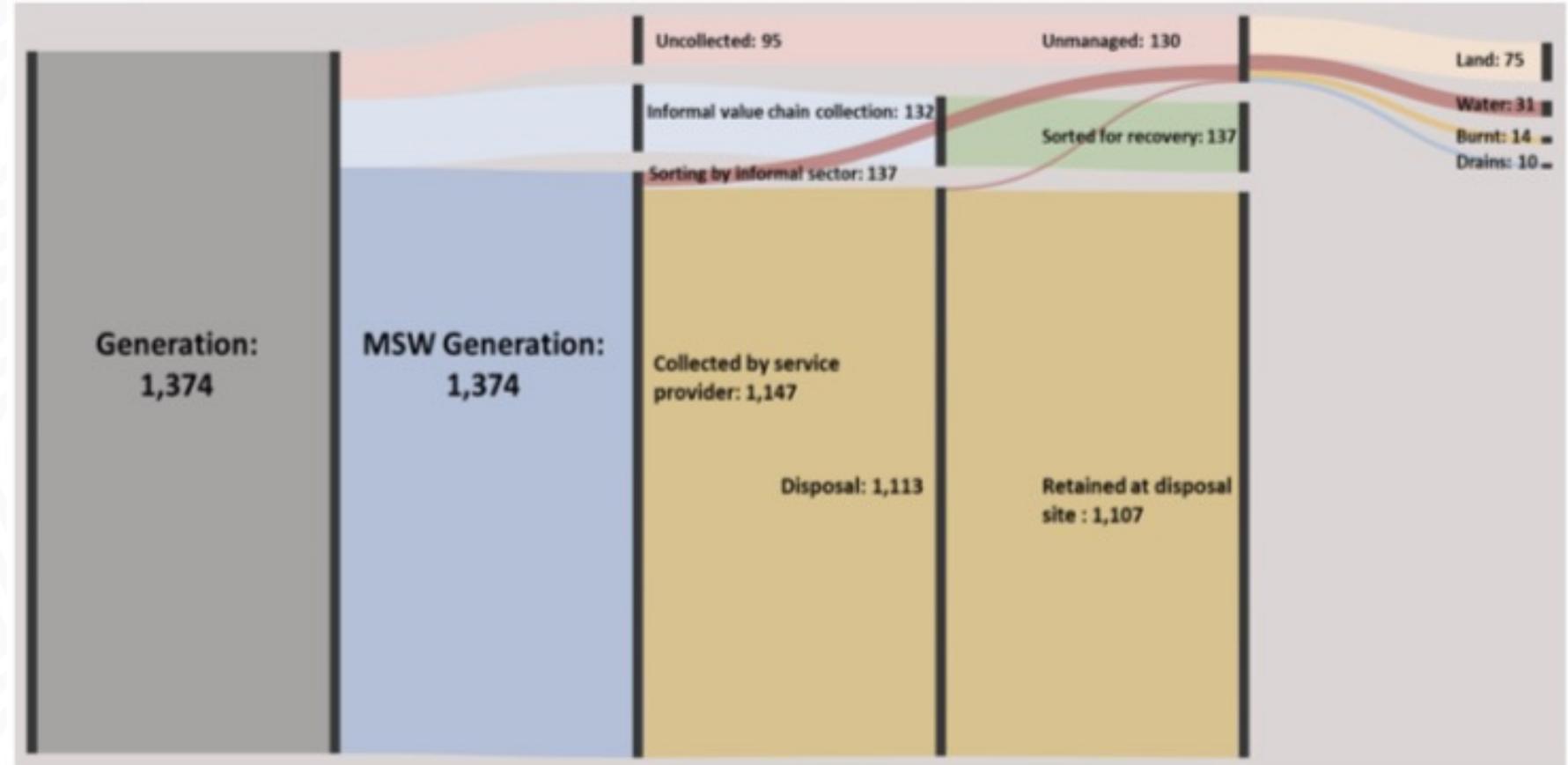


Haridwar

Key findings – unmanaged plastic waste at Rishikesh

10 % of unmanaged plastic waste is burnt

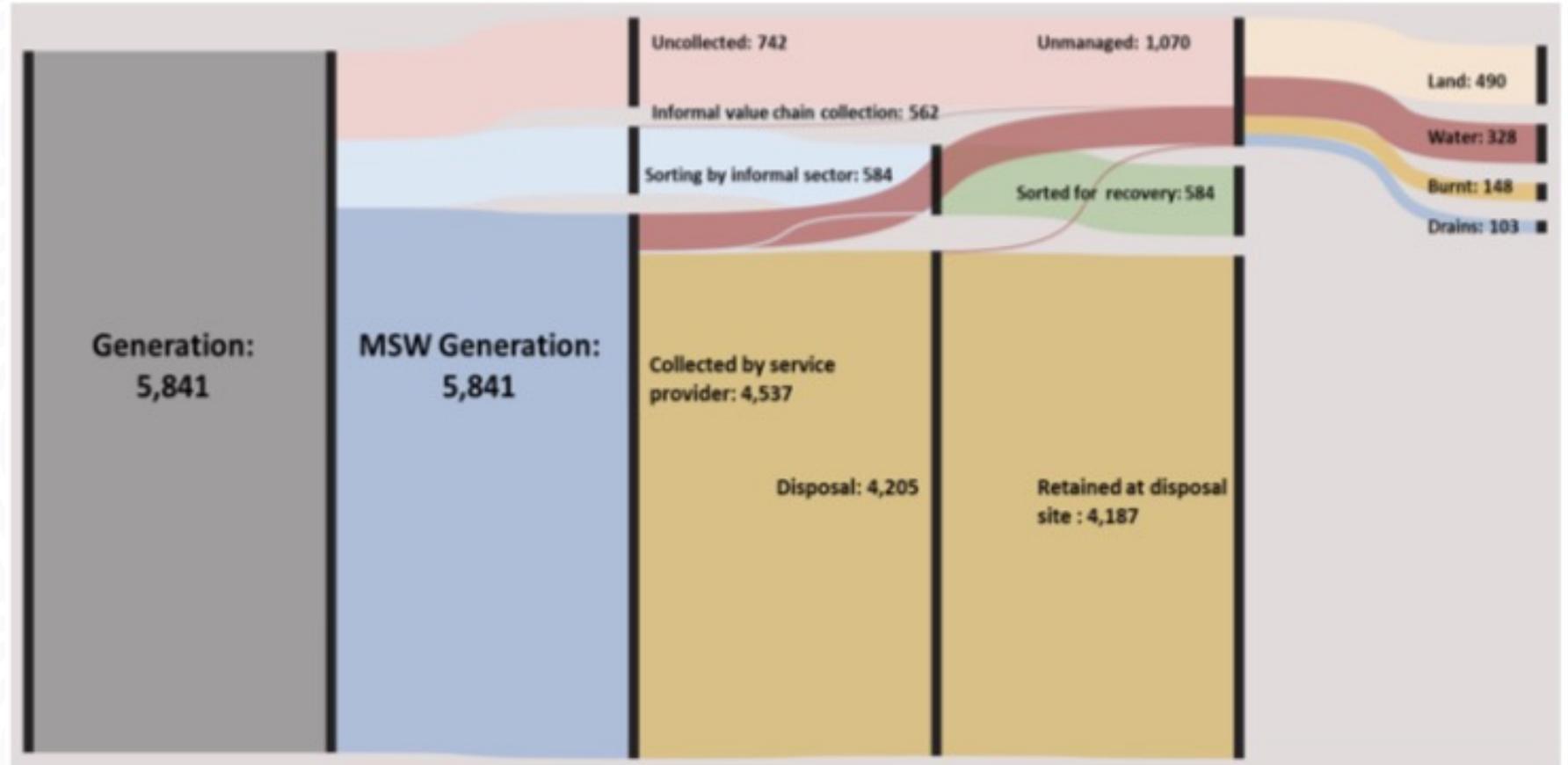
25 – 30 % of unmanaged plastic waste end up in water bodies



Key findings – unmanaged plastic waste at Haridwar

13 % of unmanaged plastic waste is burnt

30 – 35 % of unmanaged plastic waste end up in water bodies



Key findings

8. Data management System is weak

- Proper Management Information System (MIS) on solid waste management is not present

9. Overestimation

- Municipalities end up overestimating the waste quantity in lack of proper waste inventorization methodology

10. Institutional strengthening

- Municipalities needs to develop a mechanism to train its staffs at all level on different aspects of waste management at a regular interval

11. Public participation

- To ensure public participation for sustainable waste management awareness programmes and campaigns should be focused on bringing in behavioral changes and concept of 4 Rs

THANK YOU!



aviral

Reducing Plastic Waste
in the Ganga

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