Waste Classification and Inventorisation

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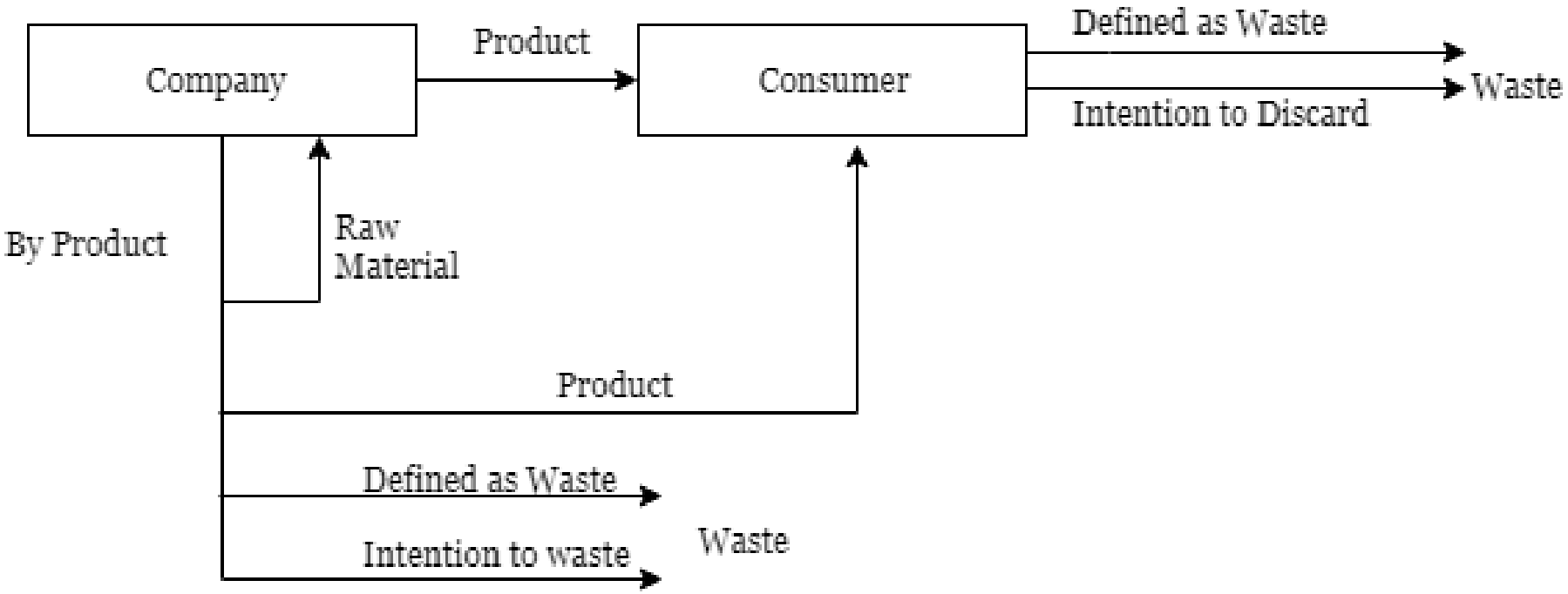
DEFINATION OF WASTE

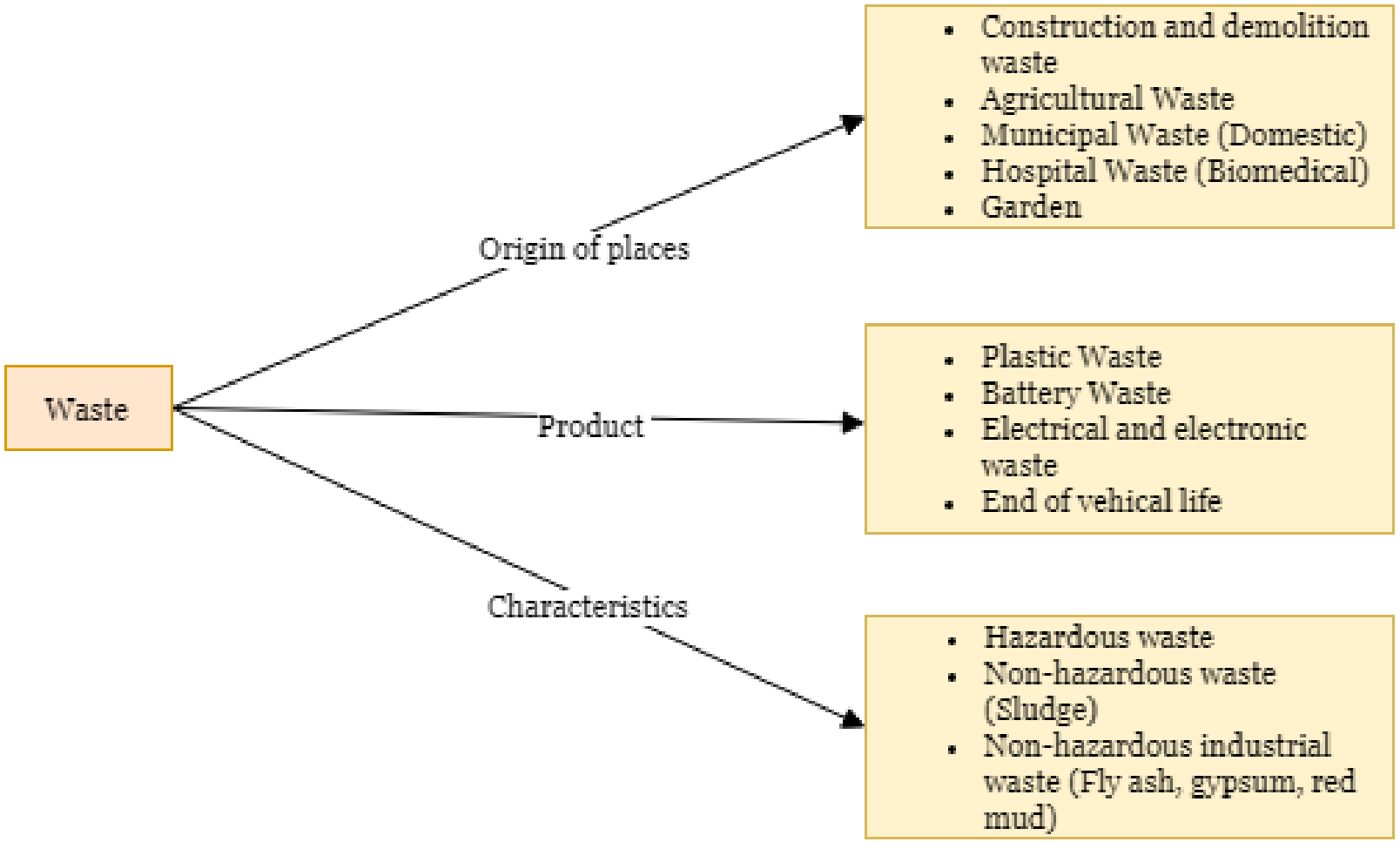
Waste Framework Directive (WFD) - European Commission (EC) ***as "Any substance or object which the holder discards or intends to discard or is required to discard."***

Basel Convention- ***"Wastes" are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law.***

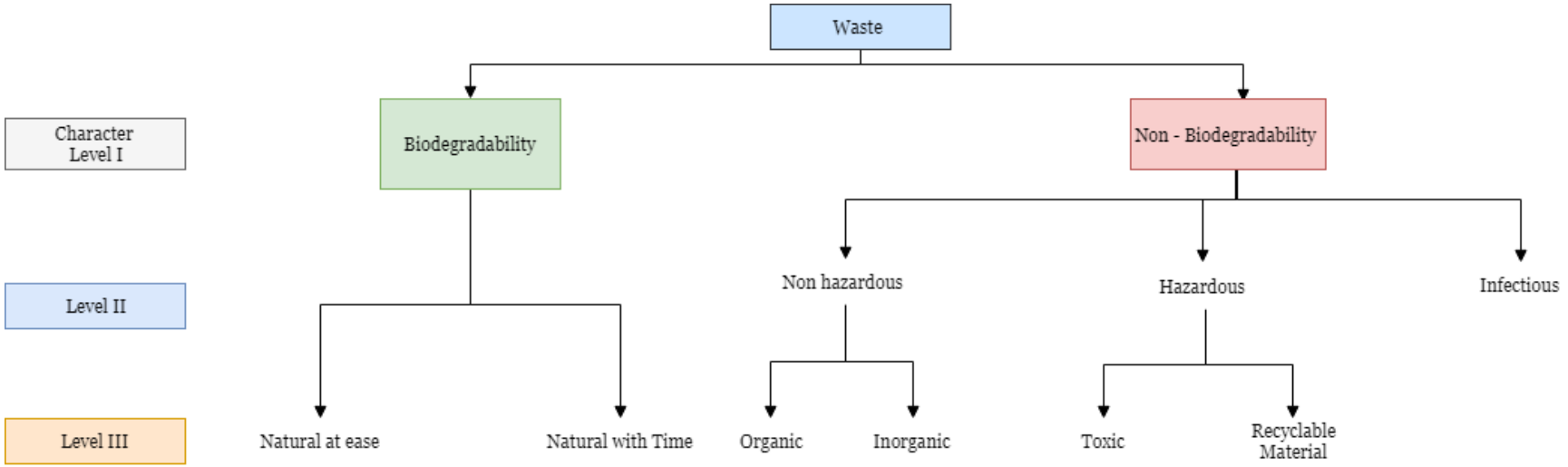
Schematic illustration of the EU legal definition of waste



CLASSIFICATION OF WASTE ON ITS ORIGIN OF PLACE



CLASSIFICATION OF WASTE IN TERMS OF CHEMICAL CHARACTERISATION, UTILISATION AND SAFE DISPOSAL



Technology	Composting/Digest	Recyclable	Recycle/ Reuse	Recyclable Reuse/Landfill	Thermal Destruction	Recycle	Reuse	Recycle/ Reuse	Thermal Destruction
Waste	• Kitchen/ food waste • Sewage sludge from septic tank • Sewage sludge from primary clarifiers and secondary clarifier of Sewage Treatment Plant(STP)	• Paper • Cloth	• Plastic waste	• Building material(Reuse/ landfill) • Dust(Landfill) • Gypsum(Reuse) • Glass waste(recyclable) • Red mud • Flyash(Reuse) • Domestic dust(Landfill)	• Chemical Residue • Toxic waste	• Solvent • Oil waste • Metal/ metal scrap	• Acids • Spent catalyst	• Plastic waste scrap • Glass wire	• Anatomised waste • Discarded medicine

AN APPROACH TO DEVELOP SOLID WASTE INVENTORY

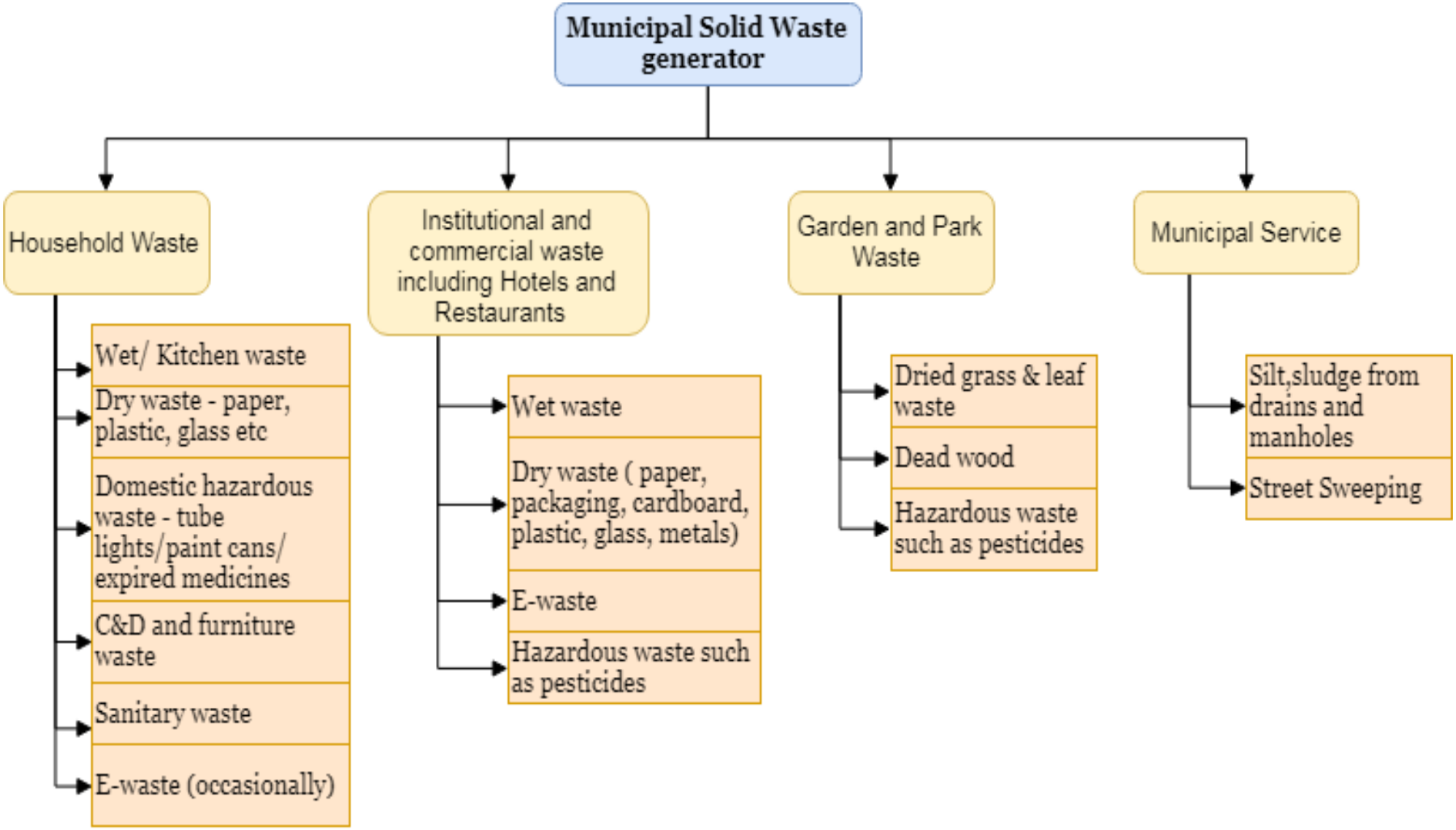
INVENTORY REFECTS REALITY

No policy, no legislation can be successful without proper inventorisation

QUESTIONS FOR SCOPING FOR MUNICIPAL WASTE MANAGEMENT INVENTORY

- How much waste is generated?
- What is the composition of waste?
- How much waste can be recycled?
- How much waste is actually converted to value added product(recycled)
- How much waste is going for dumping/landfilling?
- What is the present management practices?
- How much effective is the present management practice?
- What is the role of the informal sector of waste management?
- Identify the problem areas

Generator of Municipal Waste



Strategy for municipal solid waste inventorisation

STEP 1

- Waste terminology and scope- daily household and commercial waste.

STEP 2

- Pre-investigation- Background information.
- General description of the area under investigation. (Elaborate)

STEP 3

General population information:

- No. of inhabitants
- No. of households
- Income (GNP per capita)
- Type of proportion of residential structure
- Selection of houses (Mapping)

STEP 4

- Waste management information
- General description of organization
- Type of waste streams produced and collected (household, commercial, etc)
- Description waste container system as household bins, communal bins and storage capacities.
- Average numbers of households and/or persons using bins
- Total bin volume, spatial distribution of bins, collection intervals.
- Method of waste collection such as open truck or refuse collection, vehicles compactor and type of waste collected.
- Disposal method- Landfill, reuse, recycling, waste to energy etc.

Strategy for municipal solid waste inventorisation (continued)

STEP 5	•Stratification on the basis of socio economic value.
STEP 6	•Types of sampling units: •Specific bin volume in litres (same bins everywhere) •Specific weight of household /commercial waste •Specific number of persons
STEP 7	Statistical analysis of sample size: •Sample variance and data analysis

Step 2: General description of the area under investigation

- **No. of wards in city area (ward map)**
- **Selected wards under study**
- **Landuse pattern of the selected area**
  - *Residential area*
  - *Commercial area*
  - *Mixed use (Residential + Commercial)*
  - *Institutional Area*
  - *Light industrial area*
- ***Number of houses identified (mapping)***

Example: Mapping of proposed site for decentralised waste management in Shaurimoyo, Stone Town

Site visit to the site after deliberation with municipality over suitability of area

Mapping of 200 households in Shaurimoyo dated 5th July, 2017

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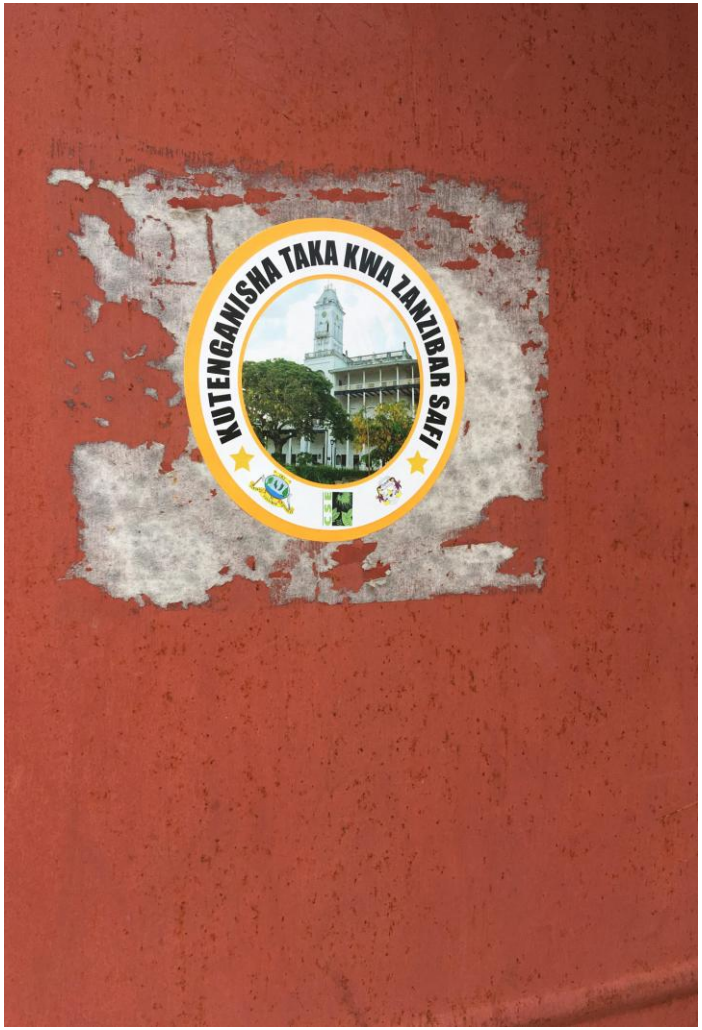
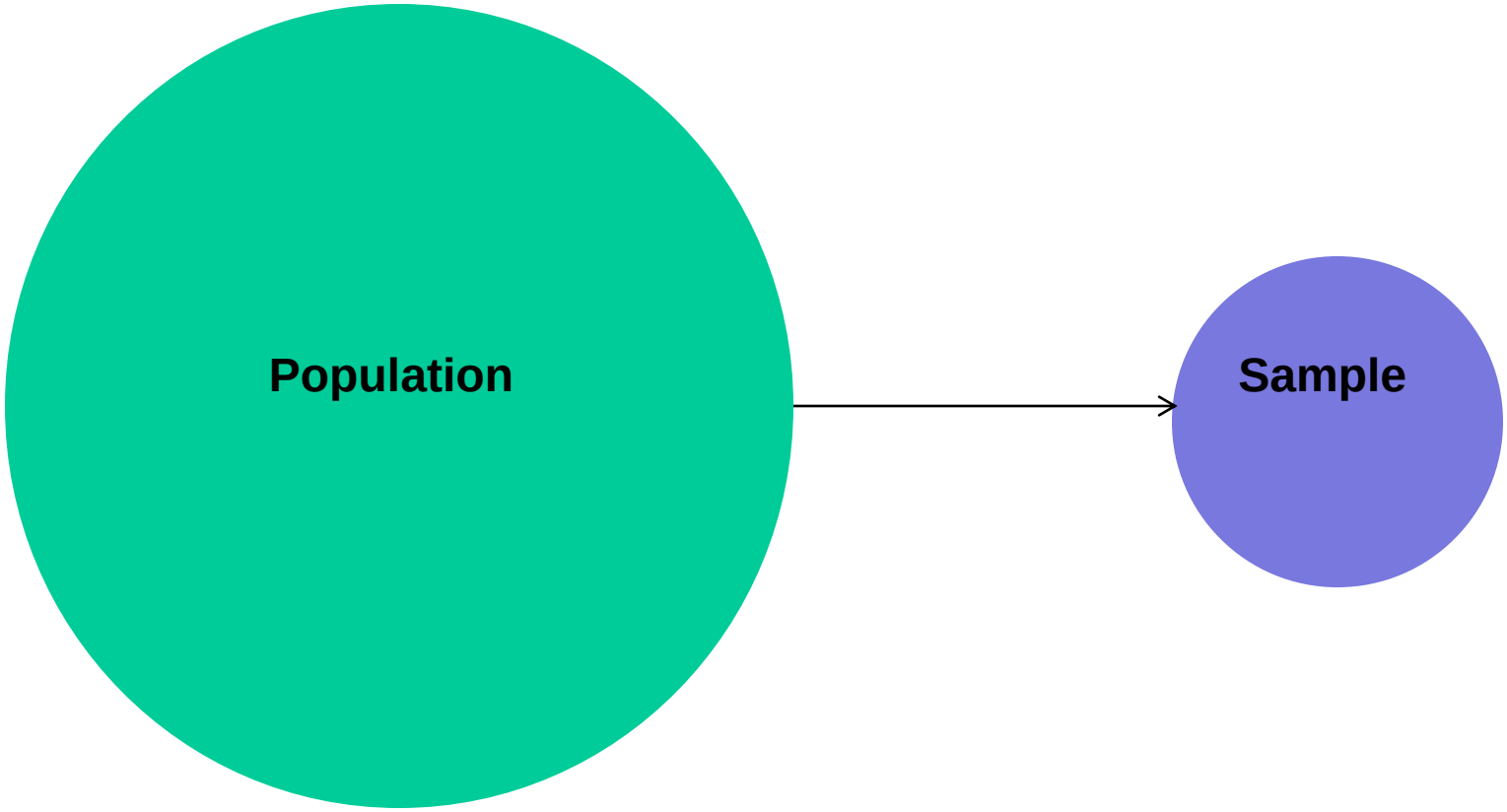
Members from society taking consent from HH to segregate

Sticker put on the door of every house that pledges to segregate



Step 5 Stratification on the basis of socio-economic value

Sample shall be representative of total population



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- **Sampling programme shall be stratified on the basis of:**

- **Land use pattern**
- **Literacy levels**
- **Built up area**
- **Type of construction- thatched, permanent (individual or flats)**

Step 6: Sampling

Bins of 20 litres to be distributed to 200 mapped households in Shaurimoyo area, shall give estimates of waste characterisation

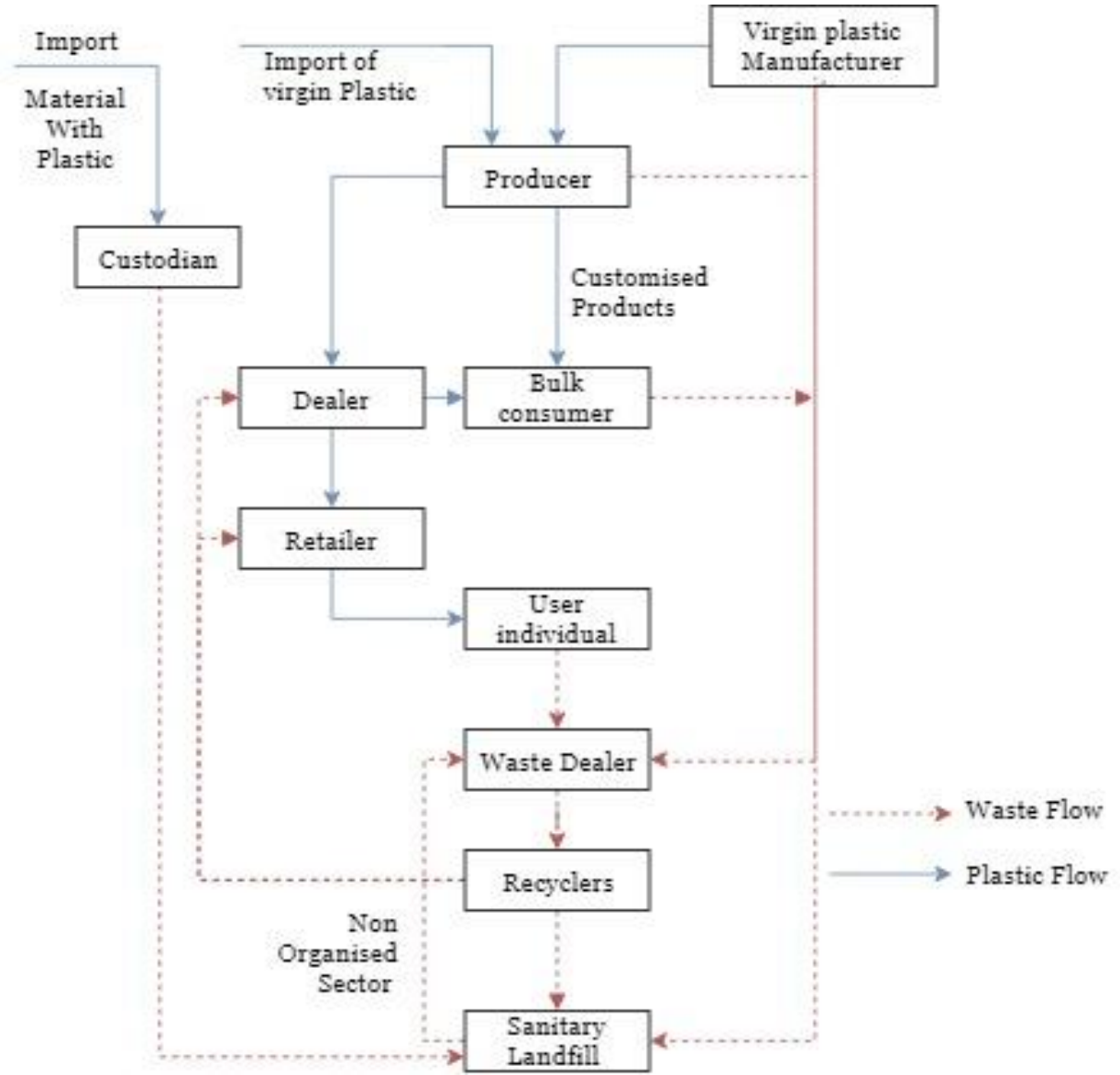
PRINCIPAL OF ESTIMATION OF PLASTIC WASTE INVENTORY

- **Material Flow**
- **Mean service life time of plastic product and sales value**
- **Assessment at waste dealer**
- **Sample survey at source generation**

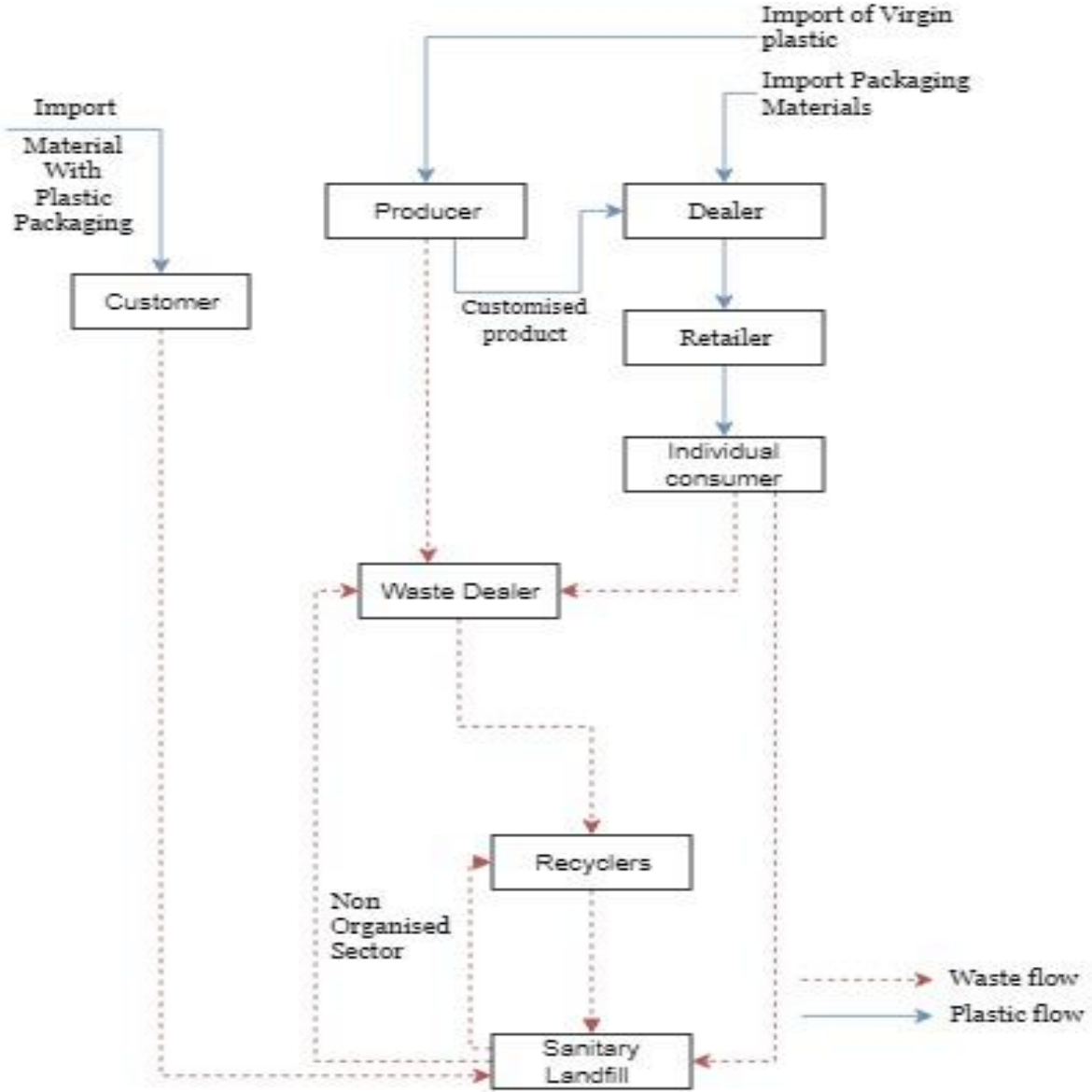
MEAN SERVICE LIFE TIME OF PLASTIC PRODUCT

S.no	End product	Service life (years)
1	Films/Flexible packaging	1
2	Injection moulded goods	5-15
3	Wire and cables	30
4	Extrusion coating	1
5	Rotomolded product	10
6	Woven sacks	3
7	Blow moulding product	8
8	Pipes and conduits	35
9	Monofilaments	3
10	Footwear	2
11	Sheets (thick)	10
12	Profiles	30
13	Hoses and tubes	5
14	Appliances	20
15	Others	1-3
	Mean Weighted Average	8

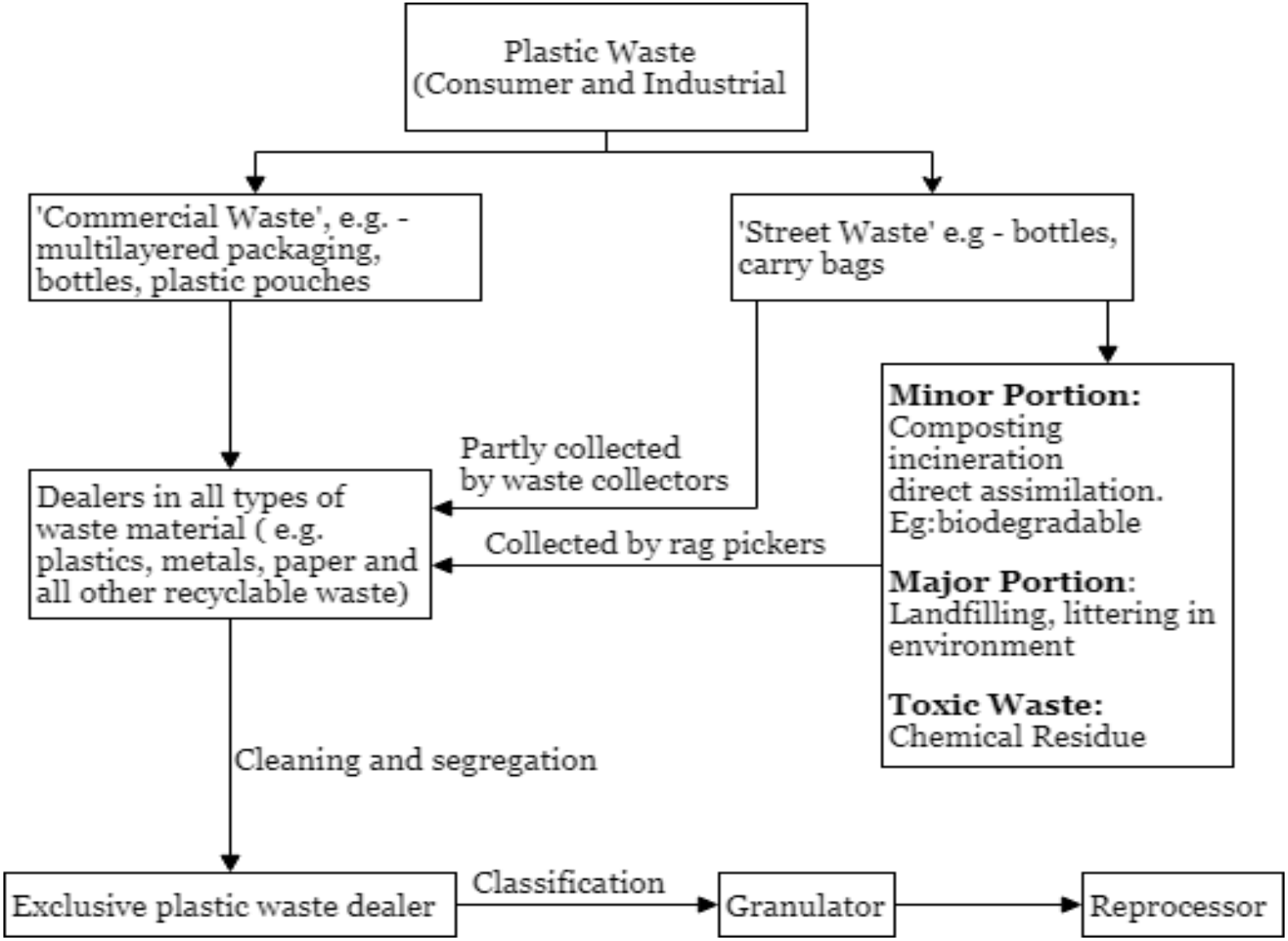
Inventorisation of plastic waste (where virgin plastic is manufactured)



Inventorisation of Plastic waste where virgin plastic is not produced)



PLASTIC WASTE FLOW



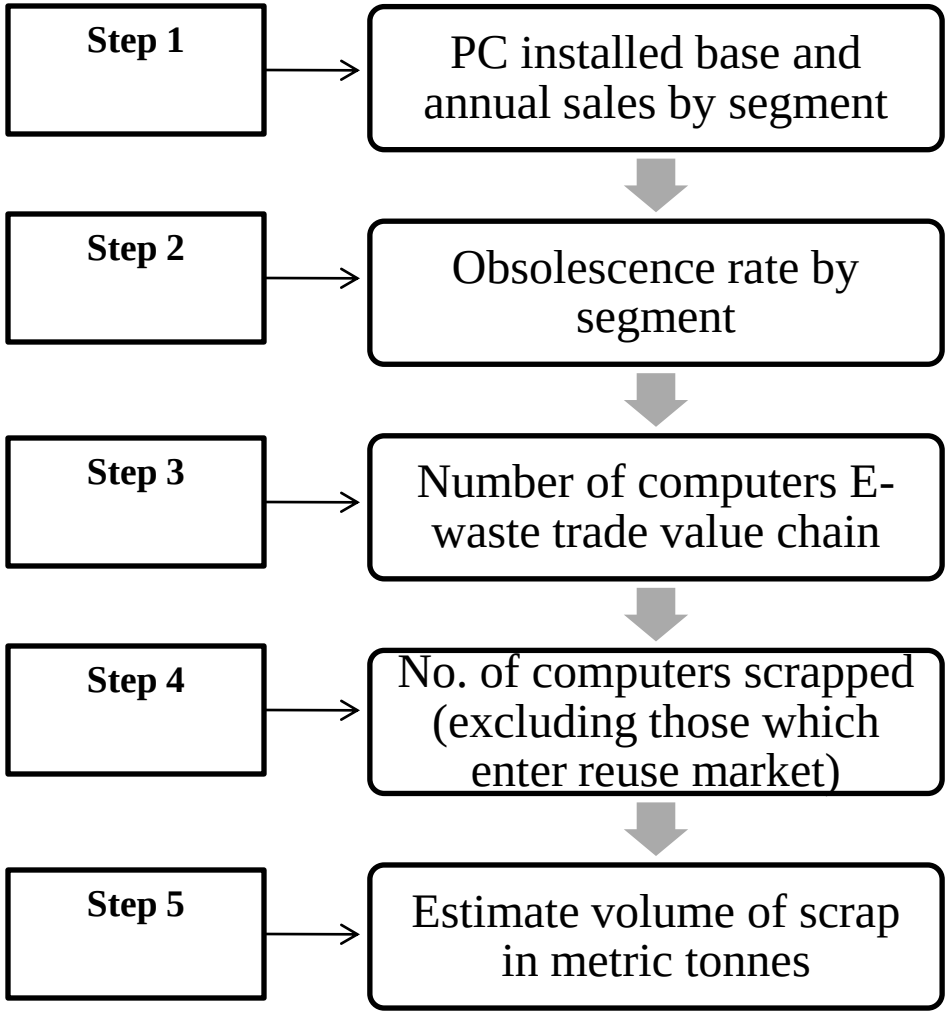
PACKAGING APPLICATION AND RECYCLING PRODUCTS OF THERMOPLASTIC PLASTICS

S no.	Types of Plastic	Packaging Application	Recycling Product
1	Polyethylene Tetra Phthalate (PETE)	Drinking bottles, microwavable packaging, soft drink bottles, food jars for butter, jelly and pickles, plastic films	Fibre fills for sleeping bags, carpet fibres, ropes, and pillows etc.
2	Polypropylene (PP)	Drinking bottles, bottles for milk, juice, grocery bags	Plastic lumber, households, grids, luggage
3	Poly vinyl Acetate (PVA)	Food packaging, plastic toys, wire cables, insulation flexible packaging	Footwear, irrigation and other drainage pipes, mats etc
4	Poly Vinyl Chloride (PVA)	Plastic bags, frozen foods, stretch films, container lid	
5	Polystyrene (PS)	Food containers, bottle caps, medicine bottles, straws	Plastic lumber, cassette tape, boxes, flower pots
6	Low density Polyethene (LDPE)	Disposal cups, glasses, plates, spoon, CD and cassette boxes	Grocery bags, shelter films, household items
7	High density Polyethene (HDPE)	Custom packaging	Flower pots, trash cans, traffic cones, detergent bottles, soap cases, other household items.

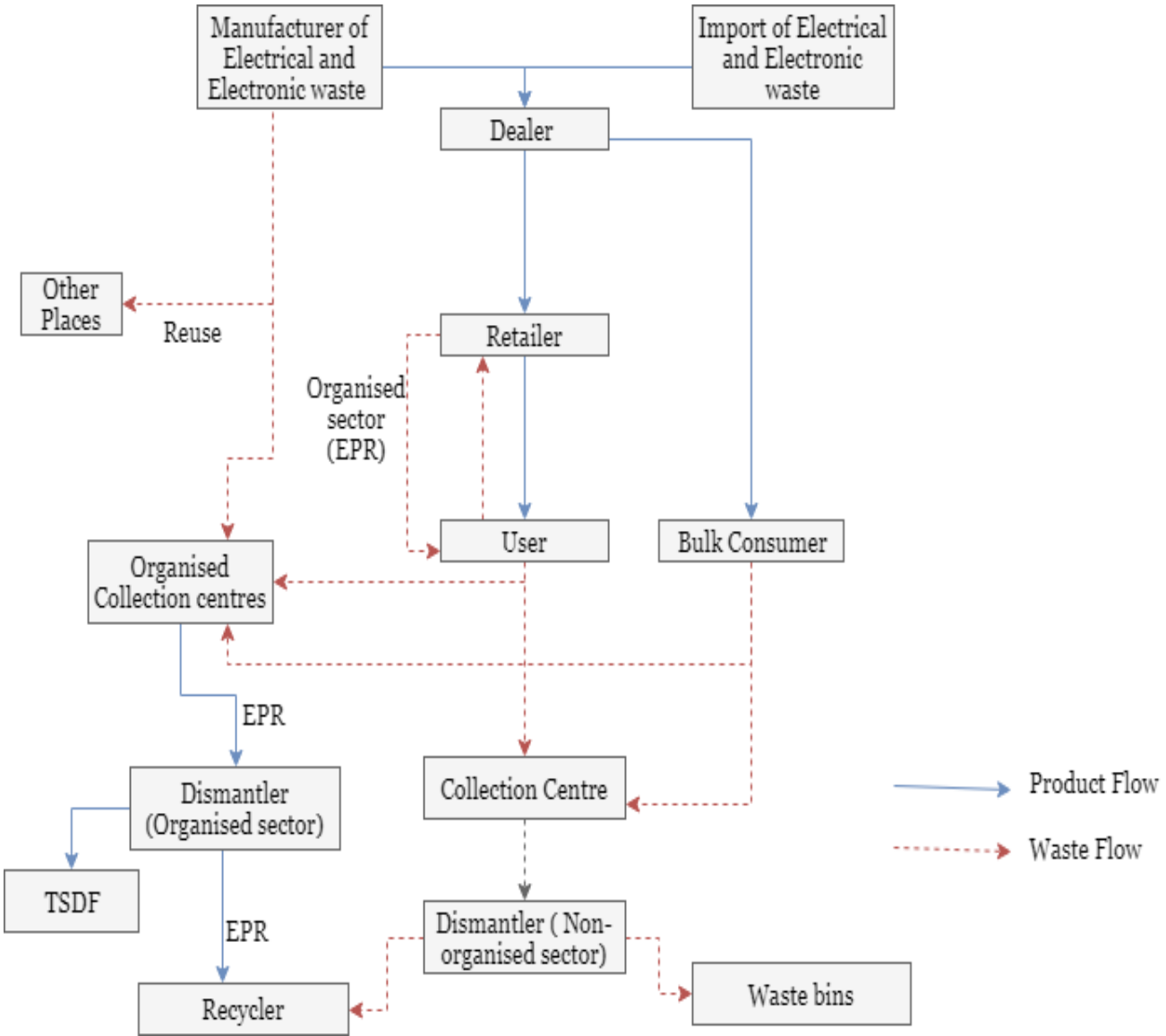
ASSESSMENT OF ESTIMATION OF E-WASTE

- Input – sale value
- Average Life – Primary average life (first use + second use life)
- Sample Survey
- Estimation at collection center/ dismantling unit

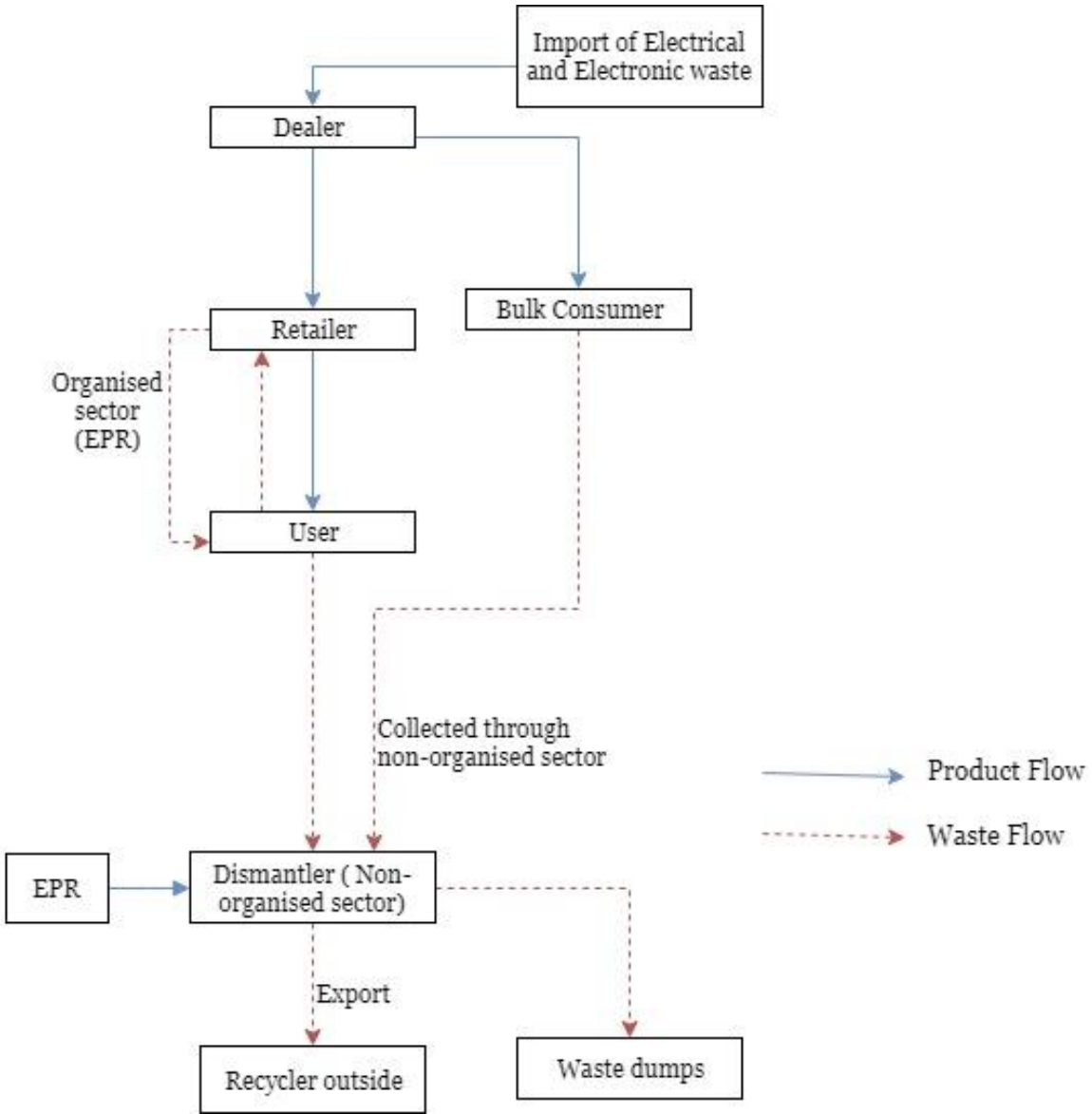
ASSESSMENT METHOD- STEPWISE APPROACH



FLOW CHART TO IDENTIFY SAMPLE SURVEY - INVENTORISATION OF E-WASTE GENERATED IN INDUSTRIALISED COUNTRIES



FLOW CHART TO IDENTIFY SAMPLE SURVEY - INVENTORISATION OF E-WASTE GENERATED IN NON-INDUSTRIALISED COUNTRIES



STRATEGY OF BIOMEDICAL WASTE INVETORY

- **Categorisation of health care facility**
- **Classification of hazardous medical waste**
- **Form for quantification of biomedical waste generation**
- **Design sample survey**

CATEGORISATION OF HEALTH CARE FACILITIES

Categorisation	Region/State wise number of such facilities	
	Number	Region
Primary Health Facilities		
≤50 bed facility		
>50 to ≤100		
>100 to ≤ 250		
>250 to ≤500		
>500		

CLASSIFICATION OF HAZARDOUS MEDICAL WASTE

S.no	Classification of Hazardous medical waste	
1	Sharps	Waste entailing risk of injury
2	a. Waste entailing risk of contamination.	Waste containing blood, secretions or excreta entailing a risk of contamination.
	a. Anatomical Waste	Body parts, tissue entailing a risk of contamination.
	a. Infectious Waste	Waste containing large quantities of material, substances of cultures entailing the risk of propagating infectious agents (culture of infectious agents) waste from infectious patients placed in isolation wards.
3	a. Pharmaceutical Waste	Spilled/unused medicines or expired drugs and used medication inceptacles.
	a. Cytotoxic Waste	Expired or left over cytotoxic drugs equipment contaminated with cytotoxic waste.
	a. Heavy Metal	Toxic waste, Batteries, mercury waste (broken thermometer or manometers, fluorescent or compact fluorescent light tubes).
	a. Chemical Waste	Waste containing chemical substance, Left over laboratory solvents, disinfectants, photographic developers and fixers.
4	Pressurised Containers	Gas cylinders, aerosol cans
5	Radioactive Waste	Waste containing radioactive substances radio nuclides used in laboratories or nuclear medicines, urine or excreta of patients treated.

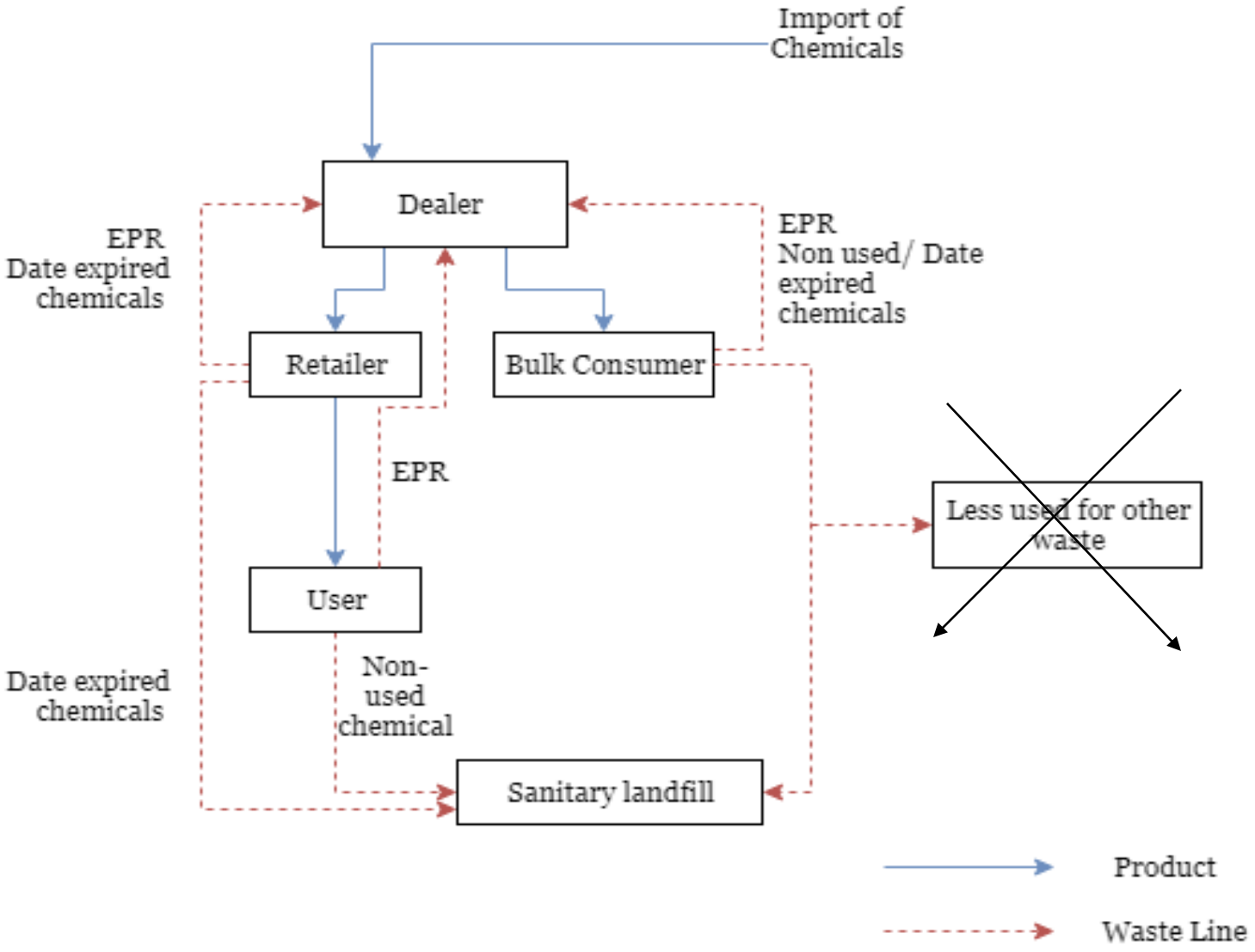
FORM FOR QUANTIFICATION OF BIOMEDICAL WASTE GENERATION

S no.	Types/Quantities (Kg/day)	Operating theatre	Wards	Public areas	Radiology	Admin	Laundry	Kitchen	Total (Kg/day)
-	Household refuse								
-	Plant waste, kitchen waste								
1	Sharps								
2a	Wastes entailing risk of contamination								
2b	Anatomical Waste								
2c	Infectious Waste								
3a	Pharmaceutical Waste								
3b	Waste containing heavy metals								
3c	Chemical Waste								
4	Pressurized containers								
Total (kg/day)									
Total (kg/day/patient)									

INVENTORISATION OF HAZAOURDOUS WASTE (NON-INDUSTRIAL)

- Identify the area of generation
- Sample survey

IDENTIFY THE AREA OF GENERATION FLOW DIAGRAM



ONE CORRECT INVENTORY IS EQUIVALENT TO HUNDRED EXPERTS OPINION