

# Evaluation of waste management and recycling systems in Addis- Adama economic corridor for the development of sustainable and resilient waste management methods

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# Outlines

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- Project Description
- Objectives
- Methodology
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# Introduction

- ❑ Waste management is one of environmental problems **confronting urban areas** in particular.
- ❑ Many developing nations, particularly in their megacities, need organized **waste collection and recycling infrastructure**, as well as **administrative and legal frameworks** for sustainable waste management.
- ❑ Sub-Saharan Africa is one of the world's regions with the highest **population increase**.
- ❑ This population growth has led to an **increase in solid waste**.
- ❑ Between **2010 and 2018 only 52%** of municipal solid waste was collected in **Sub-Saharan Africa**, in comparison the global average was **81% [1]**.

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- ❑ Formally collected waste often ends up either on a **landfill or is burned**
- ❑ only **7% gets recycled or reused**, which has often been taken care of by **private businesses** and the **informal sector**.
- ❑ While municipal solid waste management takes a **huge part** of the **communal budget**, **recycling is often not the priority**.
- ❑ There is a **high discrepancy in waste collection rates** between cities and rural areas, but also between different areas in a city.
- ❑ Waste in Sub-Saharan Africa mostly consist of **organic and inert material**, but with growing economic wealth and change in consumption behavior the part of **plastic and packing will increase**.

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- ❑ The amount of municipal solid waste is expected to be **1.27 times higher** in 2025 in comparison to 2012, while the collection rate is supposed to grow to **69% by 2025** [2].
- ❑ Ethiopia is **facing rapid urbanization leading to overcrowding** and development of informal settlements with **poor waste management practices**.
- ❑ Solid waste management is becoming a **major public health and environmental concern** in urban areas of Ethiopia.
- ❑ But, In recent years, Ethiopia has become a **regional leader in solid waste management**.
- ❑ In 2018 Africa's **first waste-to energy plant**, was inaugurated at the Koshe **landfill site**, on the outskirts of Addis Ababa, Ethiopia [3].

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- ❑ With the construction of this incineration plant in Addis Ababa, the first approaches to a more **differentiated circular economy have increasingly moved out of focus [4]**.
- ❑ However, the gradual introduction of a **circular economy is becoming more and more urgent**, especially for developing countries.
- ❑ In this context, the international collaboration research was proposed **“Sustainable Cities and Circular Economy in Sub-Saharan Africa 2024-SuCESS24”**
- ❑ It has focused on **development of an SDG-based indicator set for Solid Waste Management in Sub-Saharan Africa**

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- ❑ **Project partners** are: University of Stuttgart (Germany), Addis Ababa University (Ethiopia) and University of Ghana (Ethiopia)
- ❑ The project is funded by **DAAD** (German Academic Exchange Service) and **BMBF** (Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung))
- ❑ This joint research project aims to **strengthen sustainable development** in the Sub-Saharan region using **a circular economy approach** to develop **sustainable and resilient waste management methods**.

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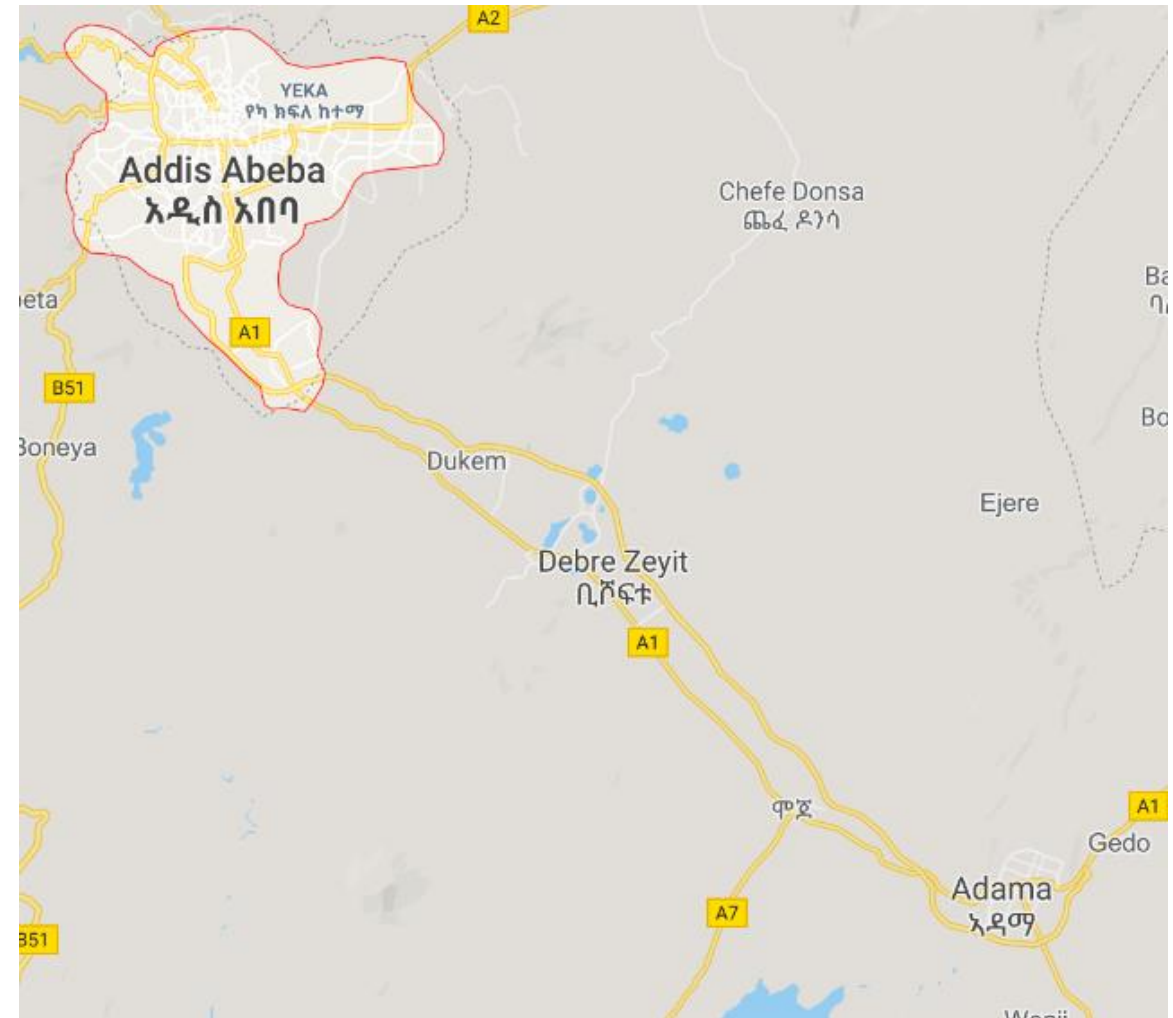
- ❑ The direct and indirect ways in which the population of this region will be benefited are
  - ❑ 1) Reduction of **greenhouse gas emissions** and
  - ❑ 2) Decrease in **land degradation** and **migration** respectively.
  
- ❑ Specific tasks planned and performed during this project to fulfill the above mentioned objectives are **recycling of reusable materials**, **recovery of organic matter**, and **safe landfilling** along with the formal and informal transport logistics.



# Project area

For this particular task in Ethiopia, Addis Ababa – Adama economic corridor was selected.

The corridor consists of **logistic hubs** between Addis and Adama (in particular the so called "Dry Port" in Mojo near Adama), which are connected by two newly constructed arteries, the **Addis-Adama Express Highway** and the railway line, in addition to the old A1 highway.



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- ❑ For years, the two "poles" Addis Ababa and Adama have been characterized by high population growth, but more recently, **increasing urbanization** and massive growth in **Dukem, Bishoftu (Debre Zeyit) and Mojo**, which are towns in this corridor.
- ❑ Moreover, so far, along this corridor, there are **neither at the municipal nor at the regional level any significant circular economy concepts or methodological approaches for their development [5]**.
- ❑ Within the framework of this project, a **transferable methodology** for the **analysis, evaluation and optimization** of waste management and **recycling systems** will be developed that meets the concrete requirements of the Sub-Saharan context.

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- ❑ However, there is no **baseline data** (such as waste generation rate, waste characterization and solid waste management practice) for the cities (Dukem, Bishoftu and Mojo) within the corridor except Addis Ababa and Adama city.

# Objective of the study

- ❑ The evaluation intended to collect **important information** such as **waste generation, waste characterization, recycling system** and waste management practice in general.
- ❑ These data then **will be used as a baseline to examine the flows of waste and resources** as they move across the corridor through material flow analysis (MFA) approach to propose **optimized waste management system with respect to the Sustainable Development Goals (SDGs)**,
- ❑ also by **integrating important framework conditions** (administrations, natural environment, climate, social issues - job creation) and economic aspects (formal/informal) in line with circular economy concepts [6].

# Methodology

- ❑ Cross-sectional descriptive survey design and both qualitative and quantitative methods was used in this study.
- ❑ The quantitative study method was used to collect data on the solid waste generation rate and physical characterization and composition from household, industrial as well as commercial activities.
- ❑ Sample size was determined based on the method described in waste wise cities tool (*Step by Step Guide to Assess a City's Municipal Solid Waste Management Performance through SDG indicator 11.6.1 Monitoring*)

# Result: Waste Generation

## Waste Generation

Towns	Dukem	Bishoftu	Mojo
Estimated Population	159,209	234,970	93,264
Area (Hectare)	9,630.6	4,532.6	20,574
Distance from Addis Ababa (km)	47	37	70
Households	35,380	46,994	10,552
Waste Generation (Kg /person. Day)	0.20	0.31	0.21

# Waste generation multipliers ( kg/day) for different commercial sectors

Dukem

Waste Source	Daily amount of Generation (Kg)	Annual Generation (Kg)	waste quantity [T/a]	weight-% of total generated waste
Households	33,274.7	12,145,265.5	12,145.3	45.00%
Commerce	13,687.3	4,995,864.9	4,995.9	19.00%
Institutions	2,973.42	1,085,298.3	1,085.3	4.00%
Industry	23,814.86	8,692,423.9	8,692.4	32.00%
Total	73,750.3	26,918,852.6	26,918.9	100%

# Waste generation multipliers ( kg/day) for different commercial sectors

## □ Bishoftu

Commercial sectors	Unit (kg/day)
Hotels	146.43 kg/day/hotel
Restaurant	69.93 kg/day /res
Cafe	6.74 kg/day/caffe
Super markets	4.66 kg/day/sup mar
Mini-market	0.926 kg/day/min mar
Open market (kg/shop)	1.0057 kg/day/shop



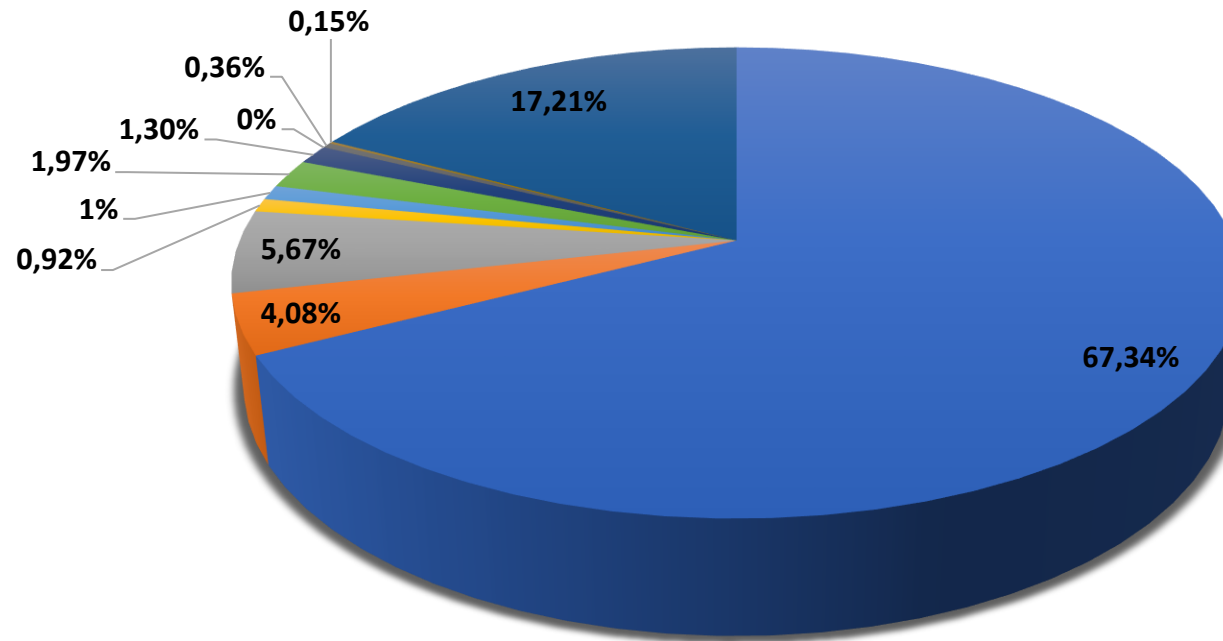
# Waste generation multipliers ( kg/day) for different commercial sectors

Mojo

No.	MSW Generator	MSW generated per day(in kg)	MSW generated per day(in m3)	MSW generated per annual (in kg)	MSW generated per annual (in ton)	MSW generated percentage
1	Households	18598.9	62.33	6788598.5	6788.60	65.25
2	Commercial	1060.6	3.29	387119	387.12	3.72
3	Industries	8451.42	26.21	3084768.3	3084.77	29.65
4	Institutions	391.28	1.31	142817.2	142.82	1.37
	Total	28502.2	93.14	10403303	10403.30	100

# Result: Waste Composition

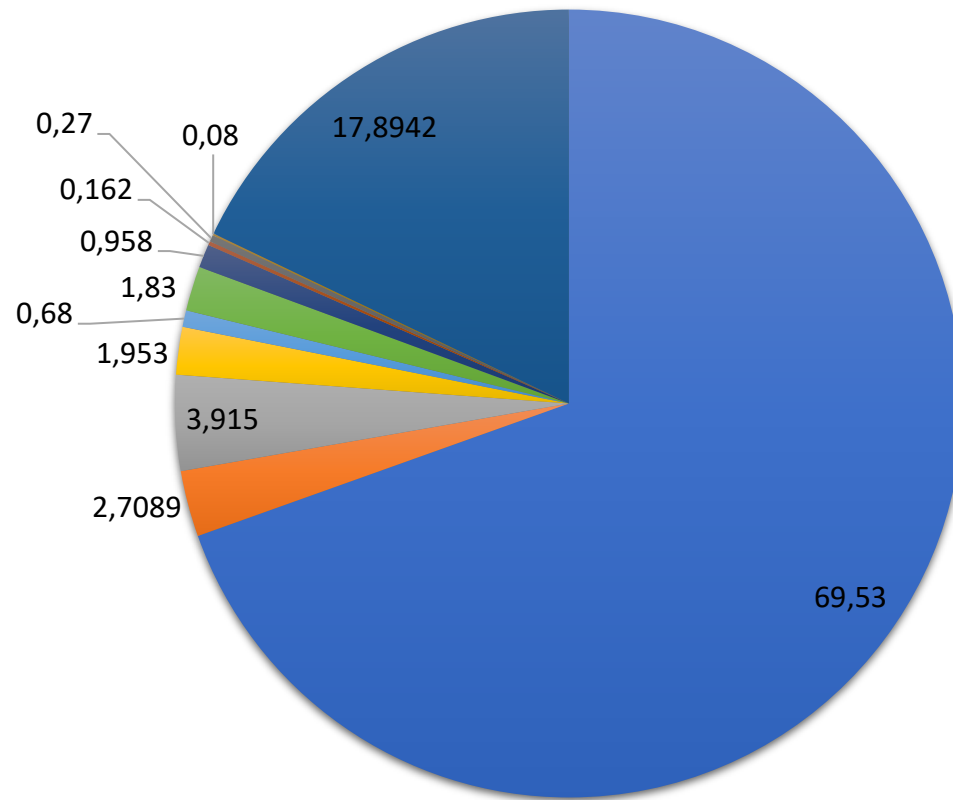
## Waste Composition for Dukem City



- Organic Waste (67.34%)
- Paper and Cardboard (4.08%)
- Plastics-film(5.67%)
- Plastics-dense(0.92%)
- Metals(1%)
- Glass(1.97%)
- Textiles and Shoes(1.3%)
- Wood(0%)
- Special Waste (0.36%)
- Composite Products (0.15%)
- Other (17.21%)

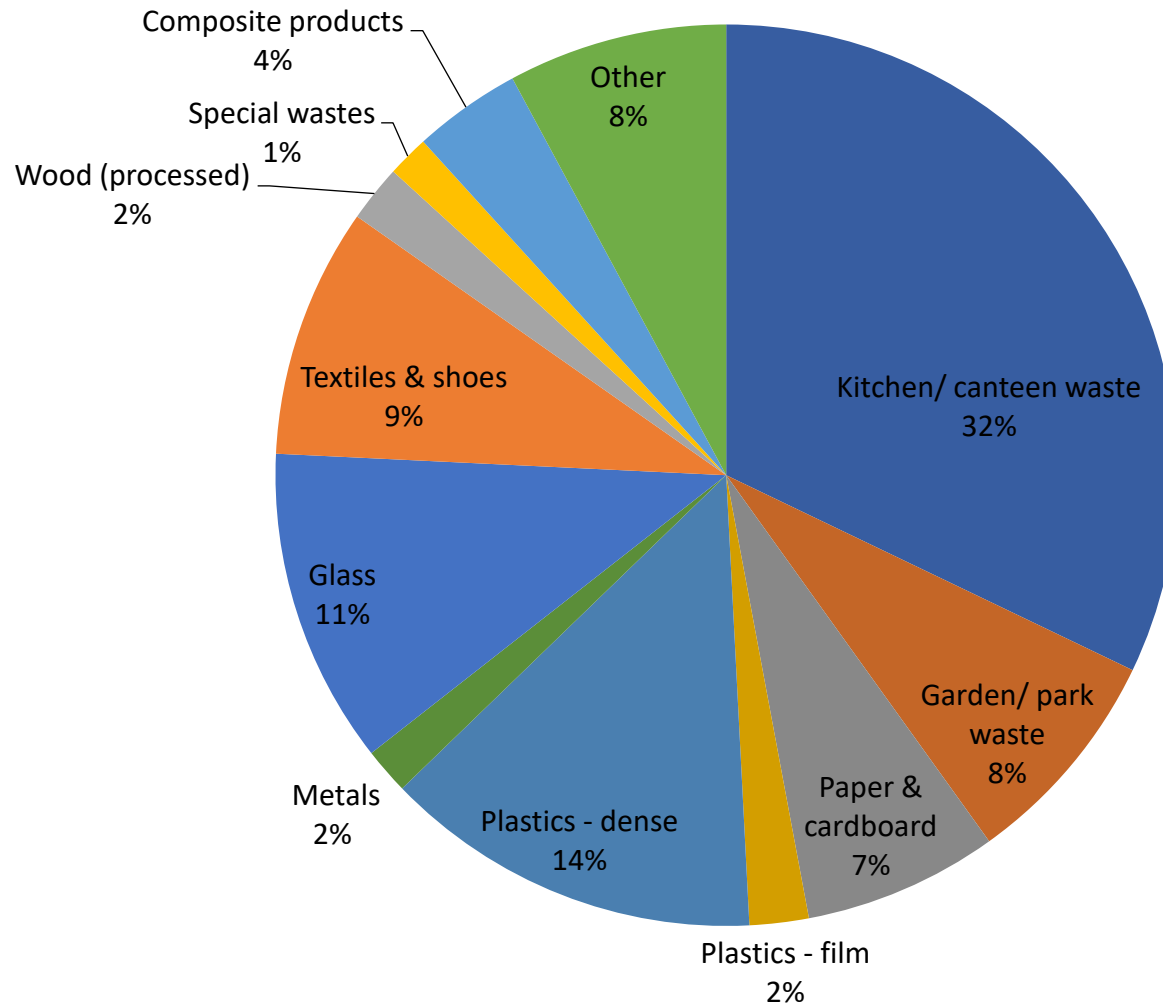
# Result: Waste Composition

Waste composition Bishoftu City



■ kitchen and Gar ■ paper ■ plastic-film ■ plastic-dense ■ Metal ■ Glass ■ Textile ■ wood ■ special ■ composite ■ other

# Result: Waste Composition



# Waste management practice and recycling

## □ Dukem



# Waste management practice and recycling

## □ Bishoftu

Annually 40851 t of waste is generated from major solid waste generator and only 70 % of the total generated waste is collected

the remaining  
30% of the waste.

15.1% is treated  
at the source (compost, reuse  
and treatment)

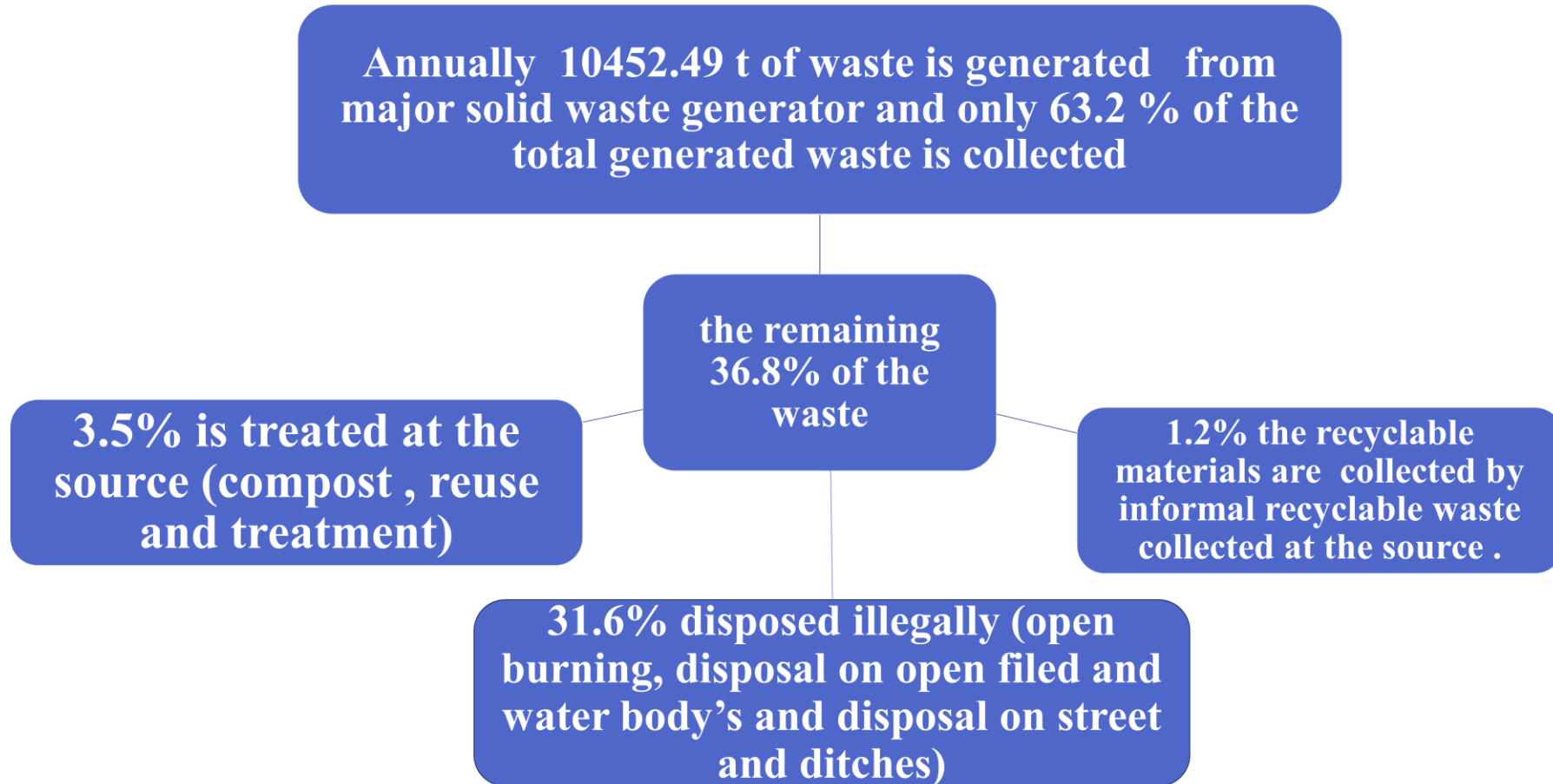
13.3% disposed illegally (open  
burning, disposal on open filed  
and water body's and disposal on  
street and ditches)

And 1.6% the recyclable  
materials are collected by  
informal recyclable waste  
collected at the source.

- 61.1 % is composted at house hold ,
- 2.7 % is reused at house hold level
- 36.2 % is industrial waste and treated at the industries by different mechanism at the source

# Waste management practice and recycling

## Mojo



# Conclusion

- ❑ The waste from each town is characterized by high organic content which is estimated on the average 67 %
- ❑ Plastic waste also account more than 10%
- ❑ Recycling practice is almost very insignificant
- ❑ Therefore, all the data showed that there is high potential on recycling waste materials back into the economy



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**Thank You!**