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DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT

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SuCCESS 24
Sustainable Cities
Circular Economy
Sub-Saharan Africa

SDG workshop

Fiesta Royale Hotel, Accra
09.12.2021, 09:30 a.m. – 05:00 p.m.

SDG colour wheel: https://www.un.org/sustainabledevelopment/news/communications-material/

Let’s get to know each other!

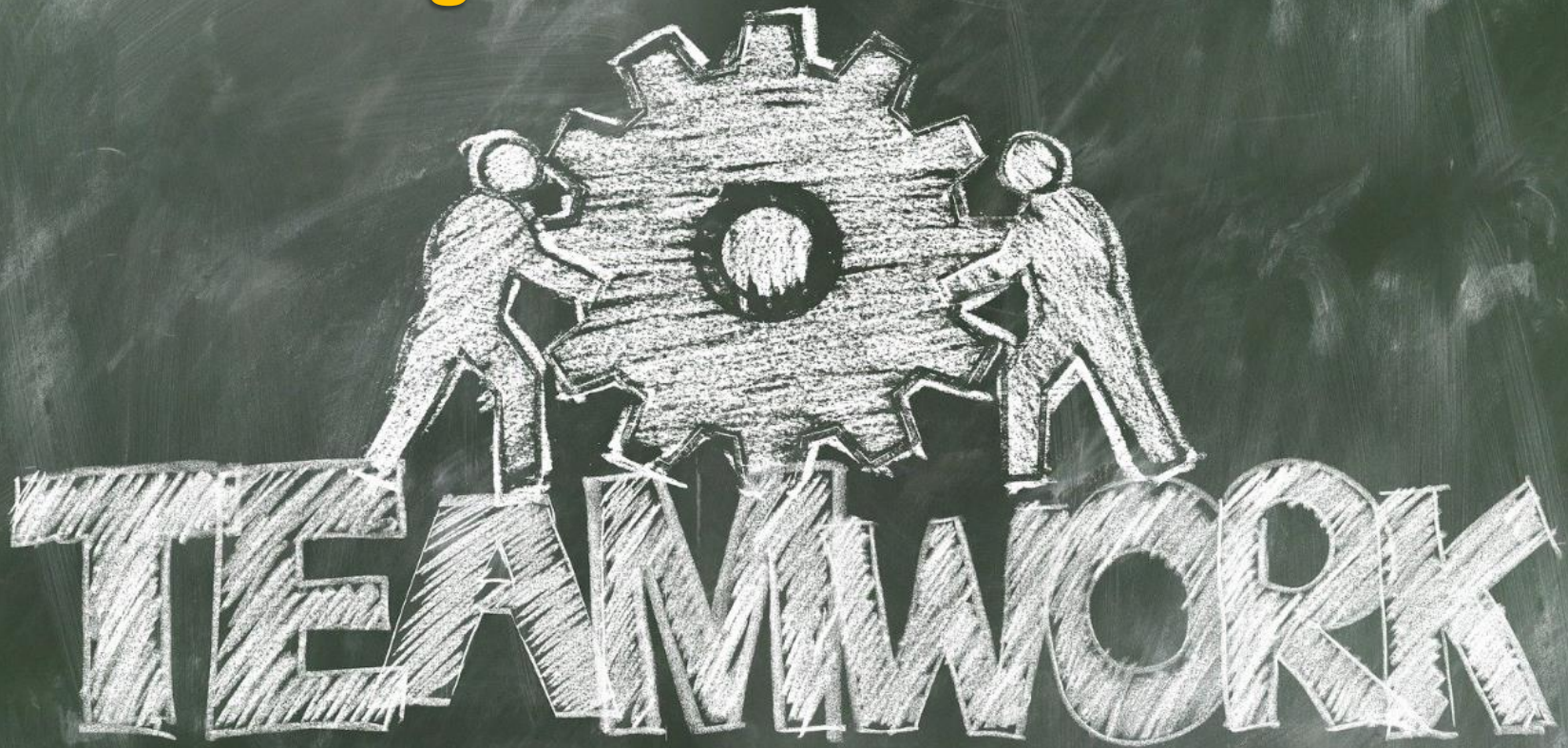

Photo: https://pixabay.com/images/id-2499619/

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Bundesministerium für Bildung und Forschung

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Your workshop team

Prof. Martin Oteng-Ababio
University of Ghana

Dr. Shimelis Kebede
Addis Ababa University

Carla Scagnetti
University of Stuttgart

Haimanot Desalegne
ENDA Ethiopia

Manuel Lorenz
University of Stuttgart

David Aladago
Savanah Research Consult

Kristina Henzler
University of Stuttgart

SDG colour wheel: https://www.un.org/sustainabledevelopment/news/communications-material/

Comment by
Prof. Kwadwo Owusu

Prof. Oteng-Ababio

(Re)Envisioning the prognosis of SMW tragedies in Ghana (1950 – 2020)

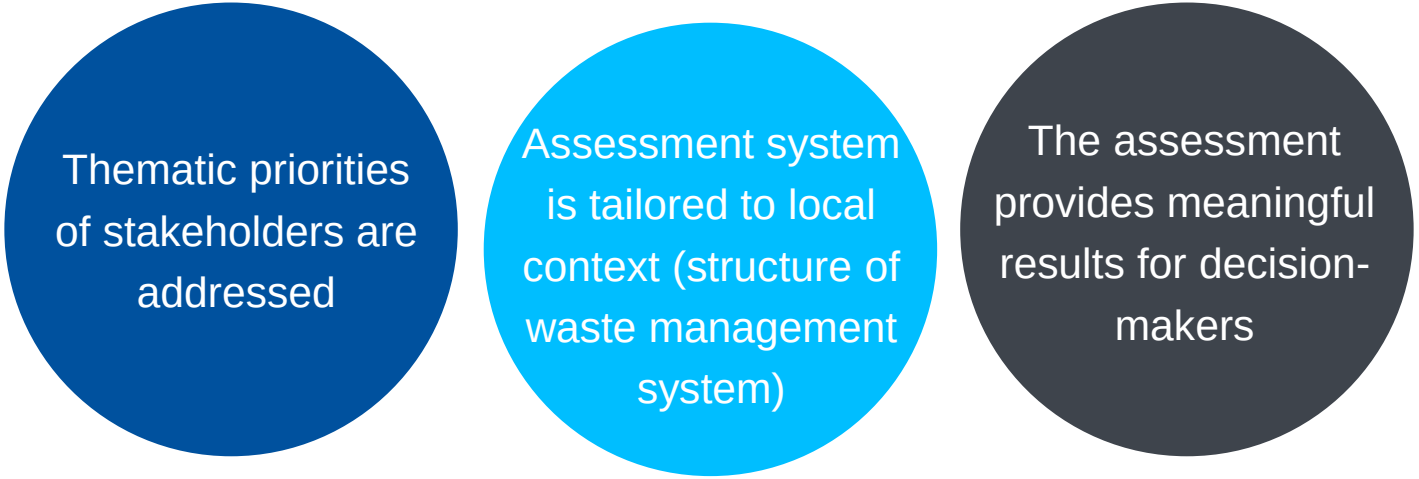
Coffee break

Photo: https://pixabay.com/images/id-4193591/

SDG workshop goal

SuCCESS24 SDG workshop

Need for a tailored SDG-based indicator set



Goal of this workshop

Identification of relevant sustainability topics addressed by the SDGs

SDG pos .org/sustainabledevelopment/news/communications-material/

Goal of this workshop

SDG poster: https://www.un.org/sustainabledevelopment/news/communications-material/

Identification of **sustainability topics:**

- with a **high relevance**
- for the different **stakeholder groups**
- in the context of municipal solid **waste management**
- in the **Accra Greater Area**

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Joint Research Project SuCCESS24

Sustainable Development Goals Workshop

Manuel Lorenz

Sustainable Cities, Circular Economy in Sub-Saharan Africa 2024

Project Partners:

- University of Stuttgart (ISWA and IABP)
- AT-Association (association for the promotion of socially & environmentally appropriate technologies e.V.)
- Addis Ababa University (AAiT)
- ENDA (Environmental Development Action)
- City Government of Addis Ababa, Solid Waste Management Agency
- University of Ghana (Department of geography and resource development)
- WASCAL (West African Science Service Centre on Climate Change and Adapted Land Use)
- AMA (Accra Metropolitan Assembly)

Funding:

- BMBF (Federal Ministry of Education and Research)
- DAAD (German Academic Exchange Service)
- DLR-PT (DLR Project Management Agency)

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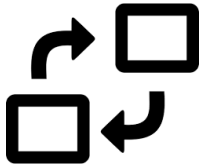
SDG colour wheel: https://www.un.org/sustainabledevelopment/news/communications-material/

Overall objectives of the project

- **Strengthening circular economy and waste management** through methodological development

- Development of a simplified **toolkit for the analysis, assessment and optimisation** of circular economy and waste management systems in cities and urban areas in Sub-Saharan Africa

- Development of a **joint postgraduate education and training programme**



- **Intercultural exchanges**
- **Knowledge exchanges** between the participating universities as well as between academics, students, technicians, decision makers, etc.

Goals and Measures

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Sustainable Cities, Circular Economy, Sub-Sahara Africa 2024

Background

Optimization of waste management systems in Sub-Saharan Africa

Applying **life cycle thinking and sustainable development** in line with the SDGs.

Priority topics

Supporting **circular economy**

Development of sustainable and **resilient waste management** methods

Meet the needs of the population

Contribute directly to the **mitigation of climate change**

Reduction of **land degradation and migration**

Recycling of reusable materials, **recovery** of organic matter and **safe landfilling**

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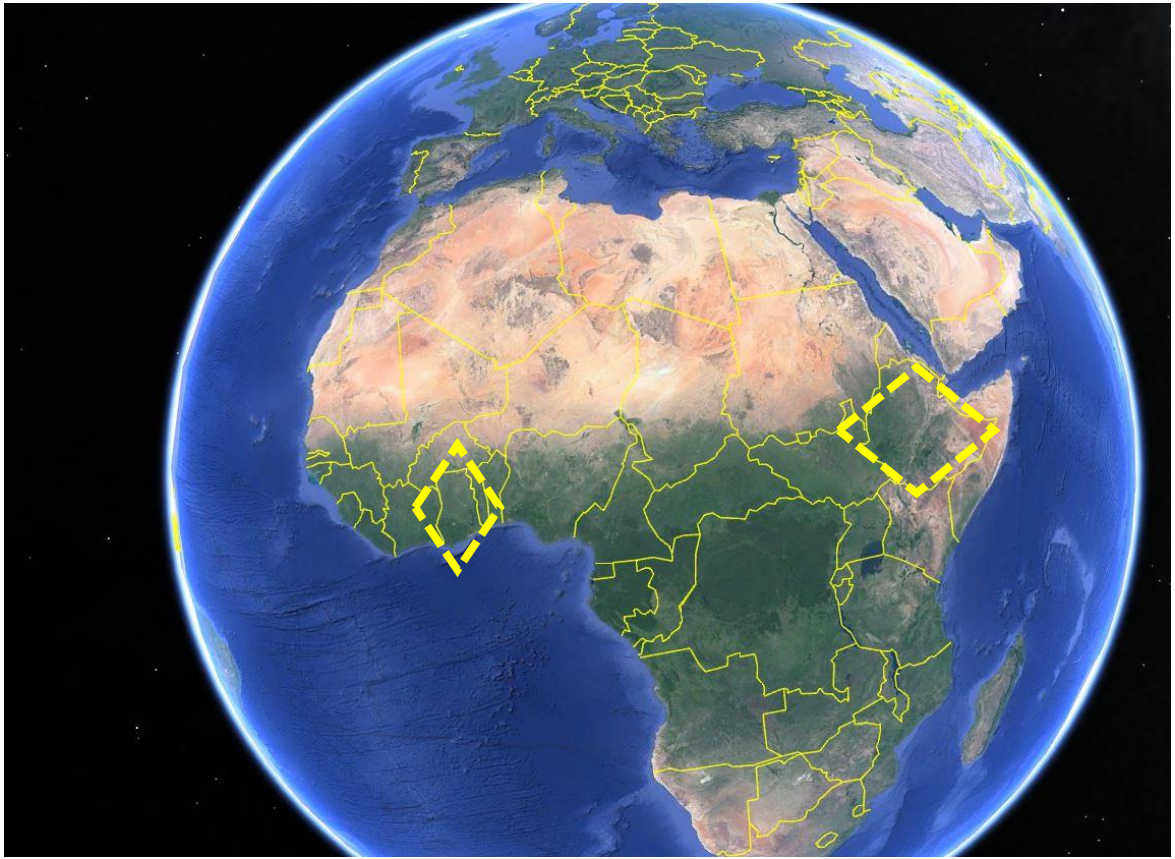

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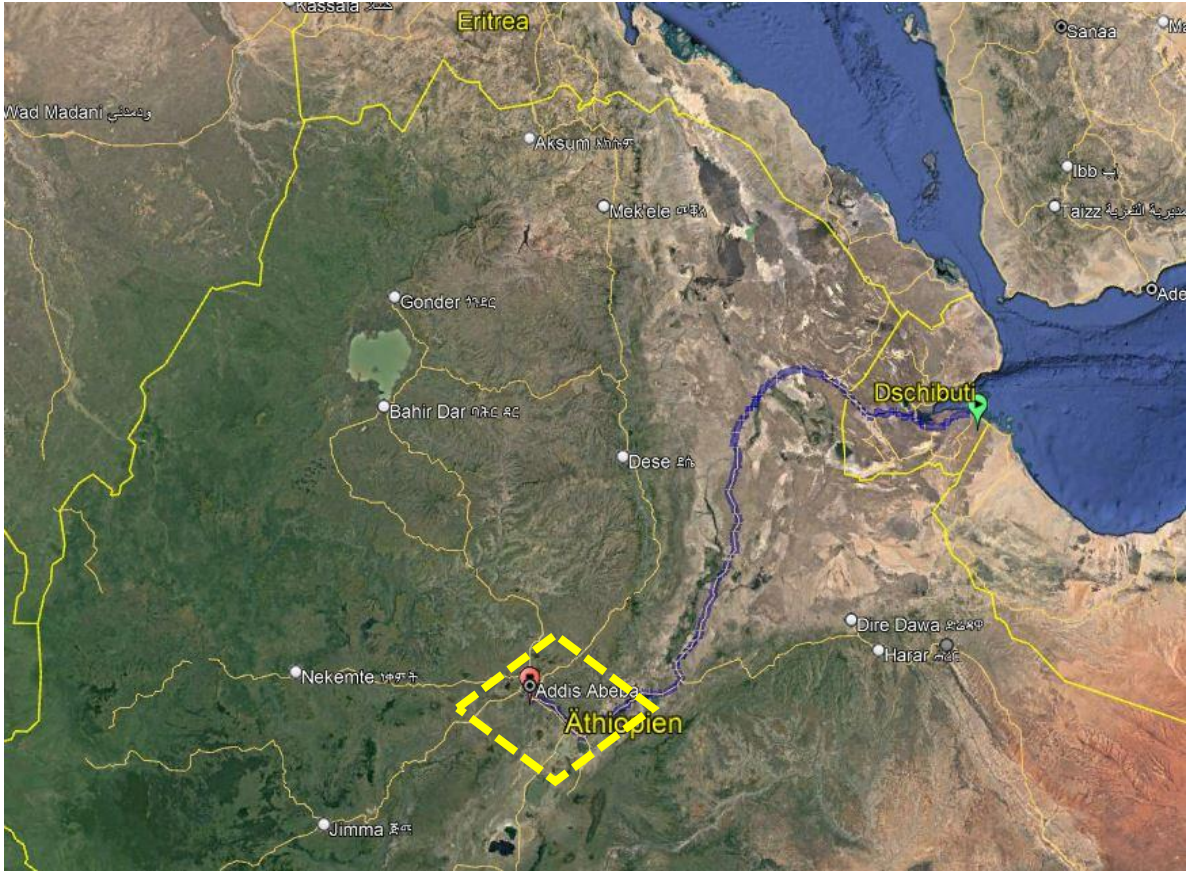

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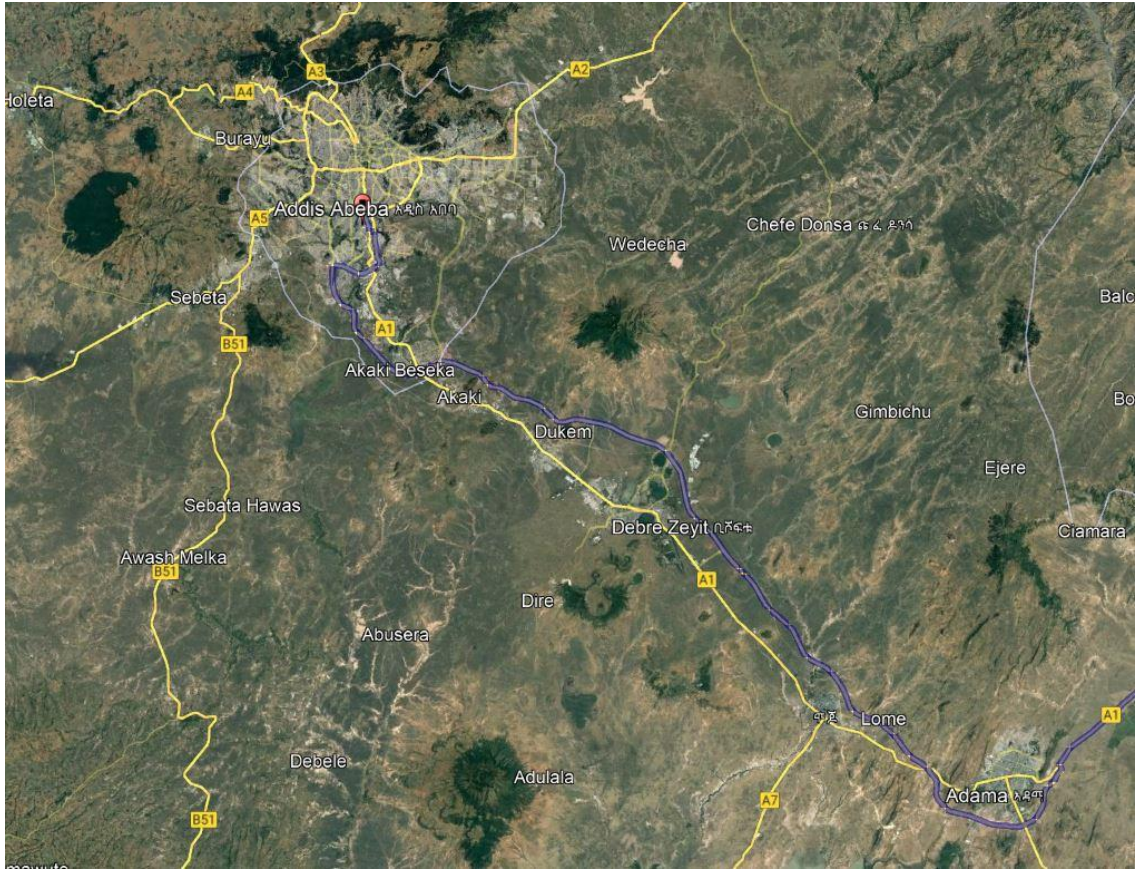

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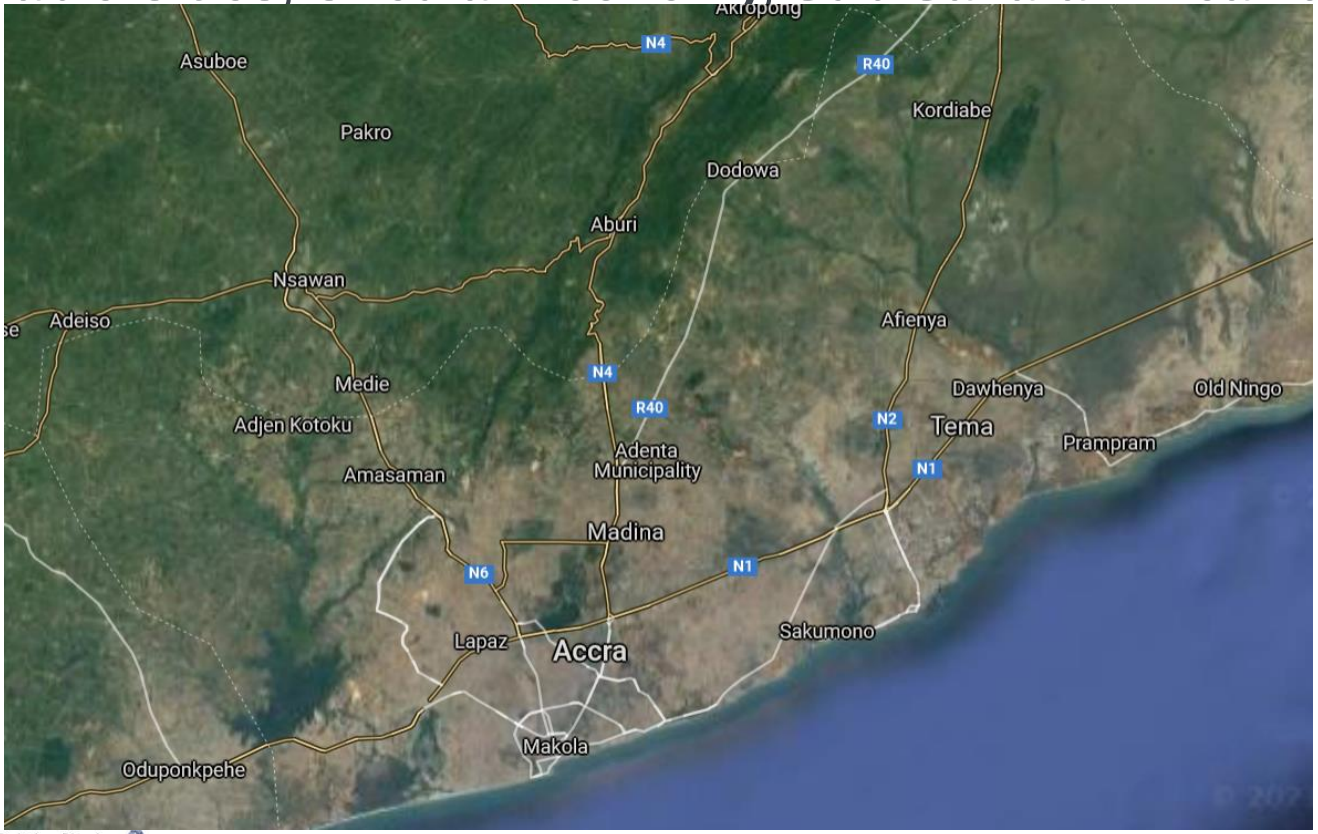

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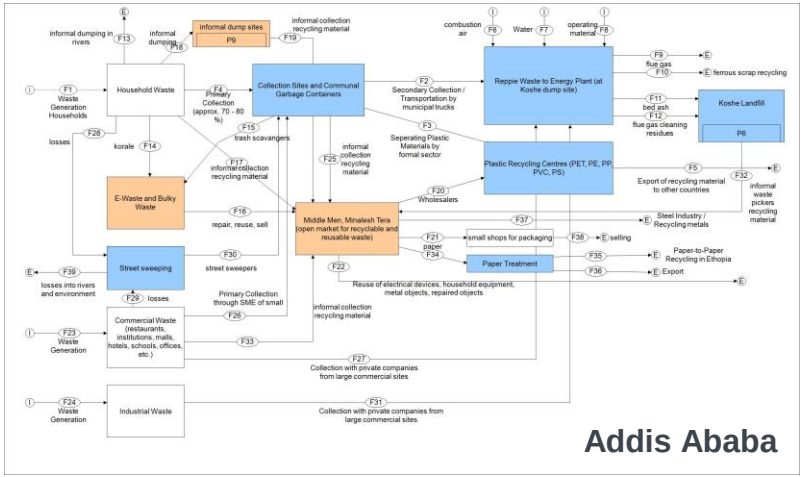
Applied Methodology 1: ***Material Flow Analysis*** *(MFA)*

<u>System analysis of material flows in the corridor</u>:

MFA of resource and waste streams in Addis Ababa - Adama corridor
Hot-spot analysis and system modelling

→Data research
→Interviews
→Questionnaires
→Site visits
→Model development
→Model verification



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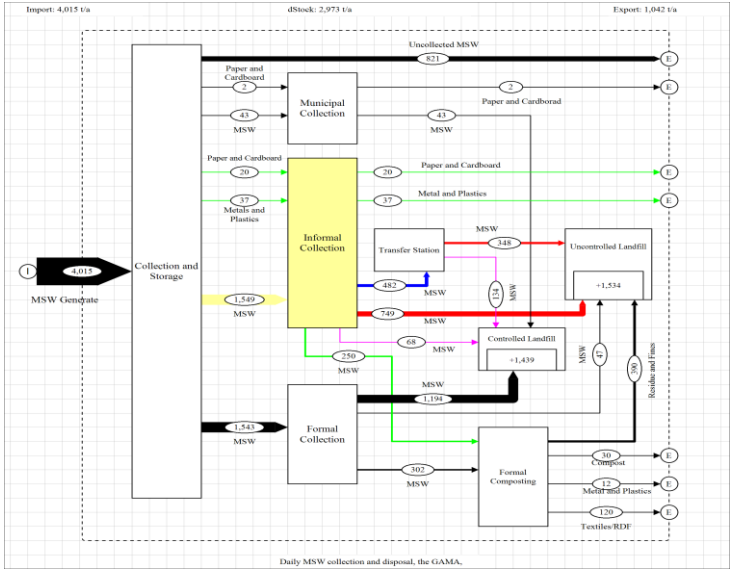
Applied Methodology 1: ***Material Flow Analysis*** *(MFA)*

<u>System analysis of material flows in the corridor</u>:

MFA of resource and waste streams in Accra - Tema corridor
Hot-spot analysis and system modelling

→Data research
→Interviews
→Questionnaires
→Site visits
→Model development
→Model verification



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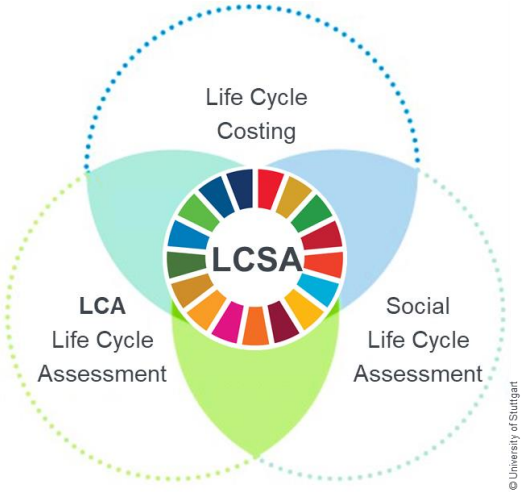
Applied Methodology 2: ***Life Cycle Sustainability Assessment*** *(LCSA)*

<u>Method development based on the Sustainable Development Goals (SDGs)</u>:

Analysis of social, economic and environmental impact of resource and waste management structure



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MFA: material flow analysis of waste streams in Addis Ababa corridor

LCSA: Life Cycle Sustainability Assessment method development based on the SDGs

Tool kit:
Development of a practical tool kit for application by local decision makers

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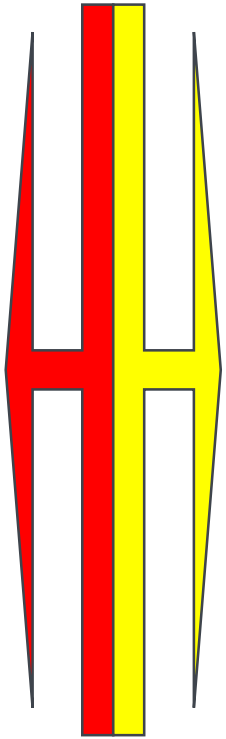

Increase the visibility of African scientists

- Scholarship opportunities
- Especially for African scientists
  - Winter schools in Ethiopia
  - Summer schools in Ghana
  - Supervision of postgraduate research projects
  - Master theses
  - PhD theses
- 2021 - 2024

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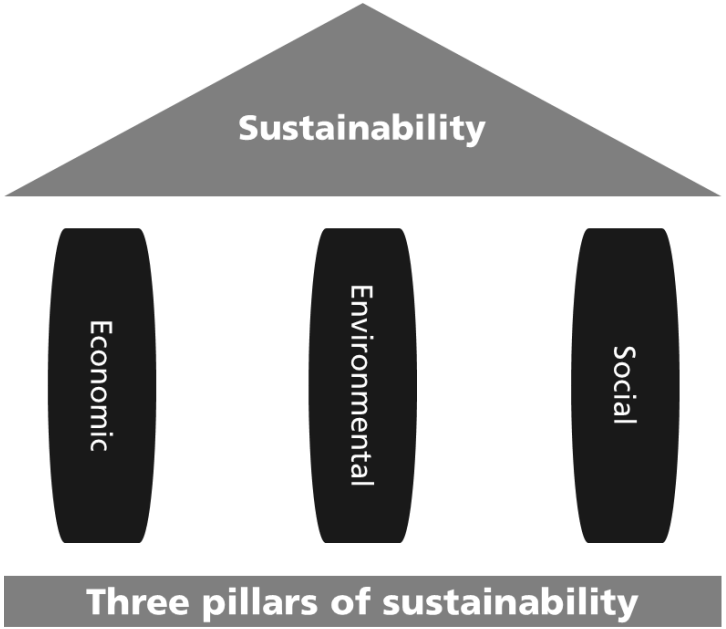
Thank you
for your attention

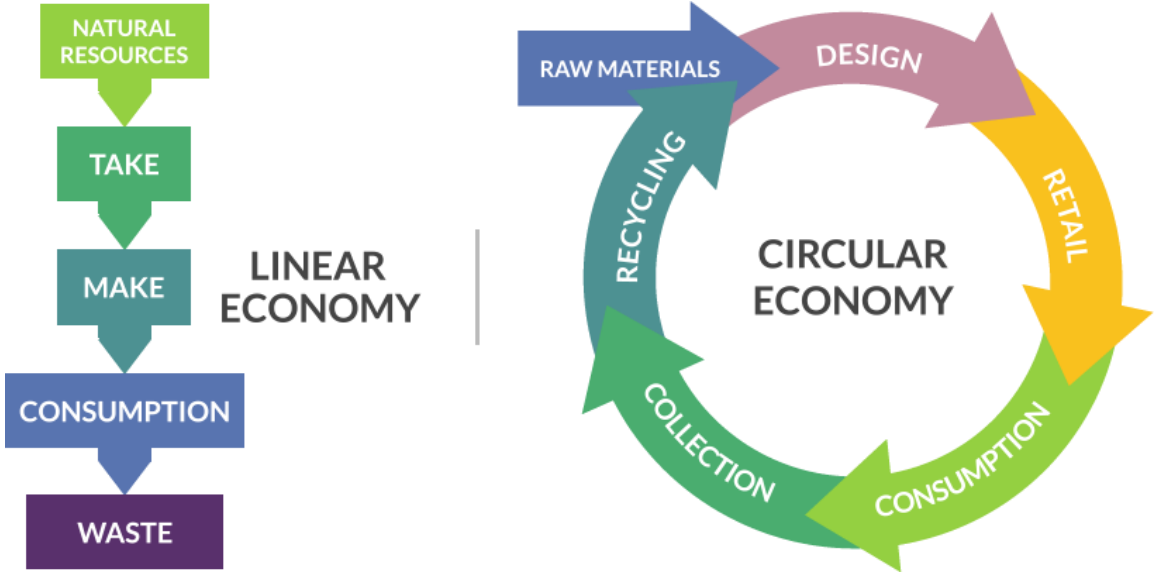
Introduction to LCA and LCSA

Sustainability



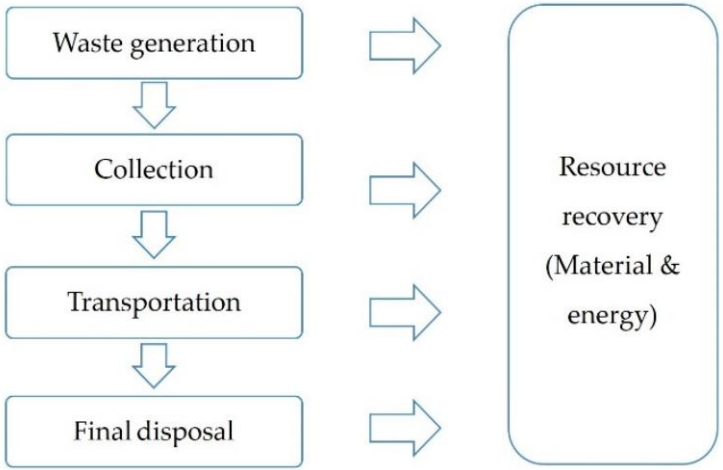
Circular Economy

- Moving away from a linear economy into a sustainable circular economy



Life cycle of a Municipal Solid Waste Management

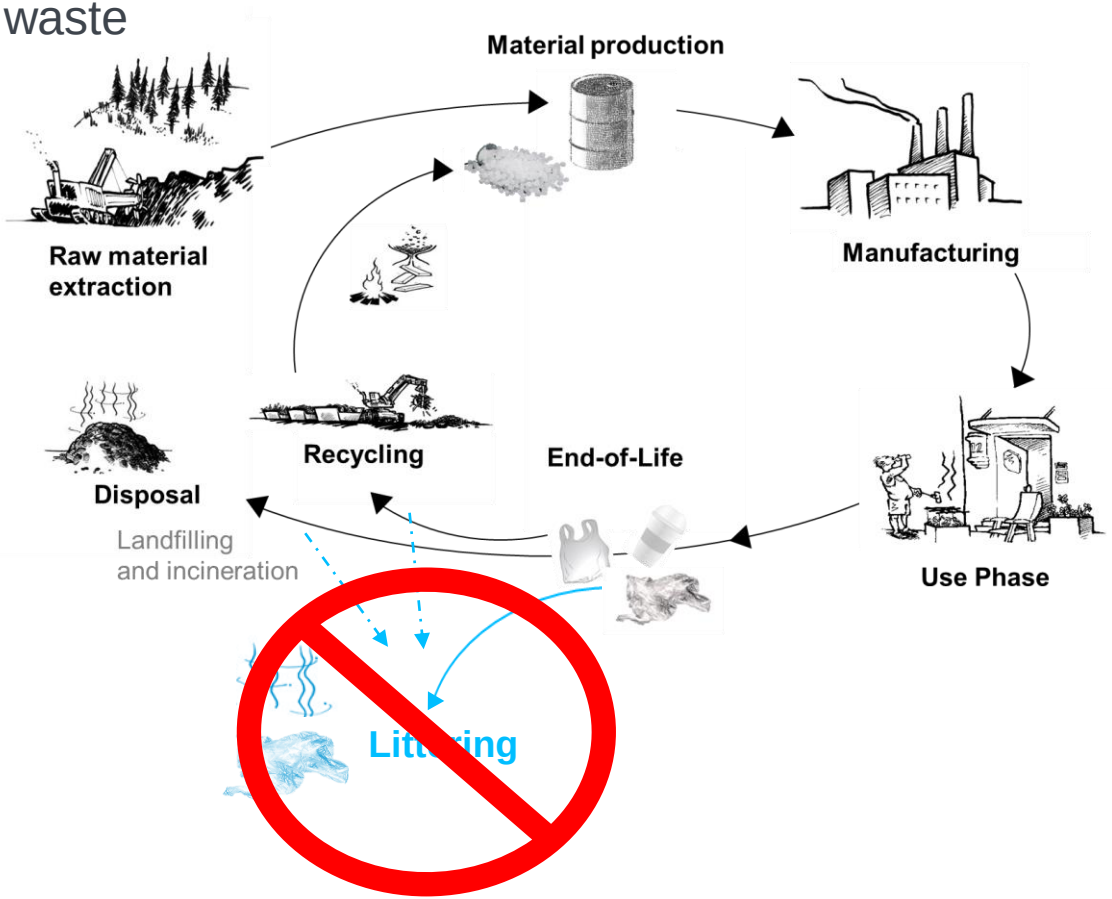
Municipal solid waste (MSW) generally refers to household waste, while it also includes commercial and industrial waste and construction and demolition waste generated from small businesses and institutions.



Source: Simplified life cycle of Municipal Solid Waste Management by Wang et al. (2018): https://www.mdpi.com/2071-1050/10/9/3208/htm

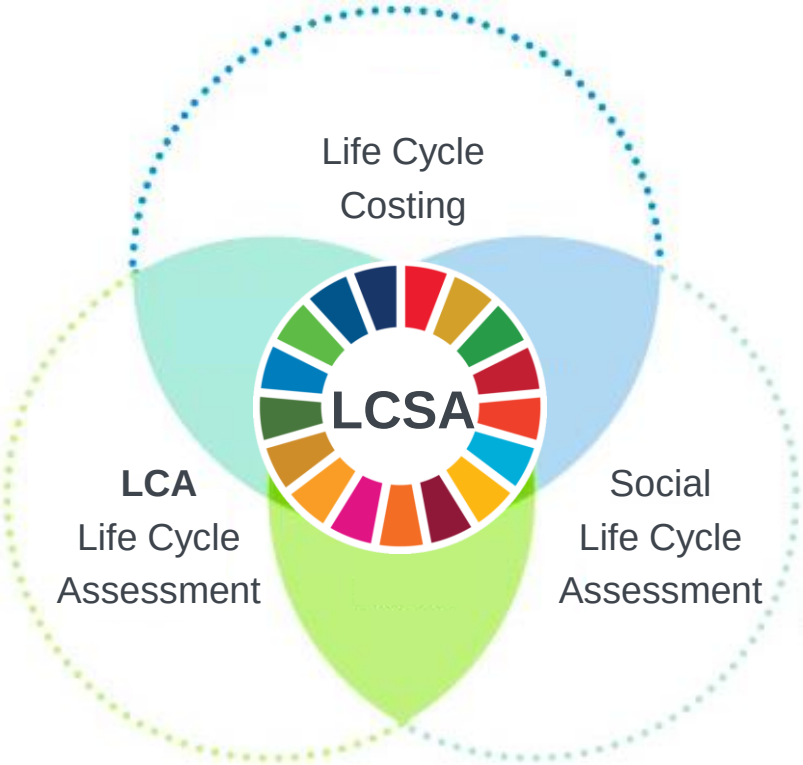
Life Cycle Assessment *
Example: plastic packaging waste

- Whole life cycle stages
- Input: resource consumption
- Output: emissions
  Example: carbon footprint
- Climate change: measured in CO_2- equivalents.



***Life Cycle Assessment** "compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system **throughout its life cycle**" Source: (DIN EN ISO 14040).

Life Cycle Sustainability Assessment (LCSA)



FINAL TAKE-HOME MESSAGE

Basic Idea of Life Cycle Thinking

Avoid...

...solving a problem...

... by creating

a problem.

Thank you
for your attention

Introduction to SDGs and SDG-based LCSA

Introduction to SDGs

Sustainable Development Goals (SDGs)

SDG poster: https://www.un.org/sustainabledevelopment/news/communications-material/

- **2030 Agenda for Sustainable Development**
- Adopted by all **United Nations Members** in **2015**
- **17 goals** to reach peace and prosperity for people and planet, now and into the future

Sustainable Development Goals (SDGs)

- Balance the **3 dimensions** of sustainability development: economic, social and environmental
- Every goal has **8 to 12 targets**
- Total of **169 targets**
- Every target has **1 to 4 indicators**
  - Used to measure, monitor and visualize progress towards each target
  - total of **231 indicators**

SDG poster: https://www.un.org/sustainabledevelopment/news/communications-material/

Sustainable Development Goals (SDGs) - Example

Goal 13: Climate Action

- **5 targets** and **8 indicators**
- **Exemplary targets:**
  - 13.1 **Strengthen resilience** and **adaptive capacity** to climate-related hazards and natural disasters in all countries
  - 13.2 Integrate climate change measures into **national policies, strategies and planning**
  - 13.3 **Improve education, awareness-raising** and **human** and **institutional capacity** on climate change mitigation, adaptation, impact reduction and early warning

https://www.un.org/sustainabledevelopment/news/communications-material/

Sustainable Development Goals (SDGs) - Example

Goal 13: Climate Action

Target:

13.2: Integrate climate change measures into **national policies, strategies and planning**

Indicators:

13.2.1: **Number of countries** with **nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications**, as reported to the secretariat of the United Nations Framework Convention on Climate Change

13.2.2: Total **greenhouse gas emissions** per year

https://www.un.org/sustainabledevelopment/news/communications-material/

Why are the SDGs relevant for Waste Mgmt?

The SDGs address **waste management** with various targets and indicators.

https://unhabitat.org/wwc-tool

Why are the SDGs relevant for Waste Mgmt?

The SDGs address **waste management** with various targets and indicators.

Goal 11: Sustainable cities and communities

Target 11.6: By 2030, **reduce** the **adverse** per capita **environmental impact** of cities, including by paying special attention to air quality and **municipal** and **other waste management**

https://unhabitat.org/wwc-tool

Goal 6: Clean water and sanitation

Target 6.3: By 2030, improve water quality by **reducing pollution eliminating dumping and minimizing release of hazardous chemicals and materials**, halving the proportion of untreated wastewater and substantially increasing **recycling** and **safe reuse globally**

Why are the SDGs relevant for Waste Mgmt?

The SDGs address **waste management** with various targets and indicators.

Goal 12: Responsible consumption and production

Target 12.5: By 2030, **substantially reduce waste generation** through prevention, reduction, recycling and reuse

https://unhabitat.org/wwc-tool

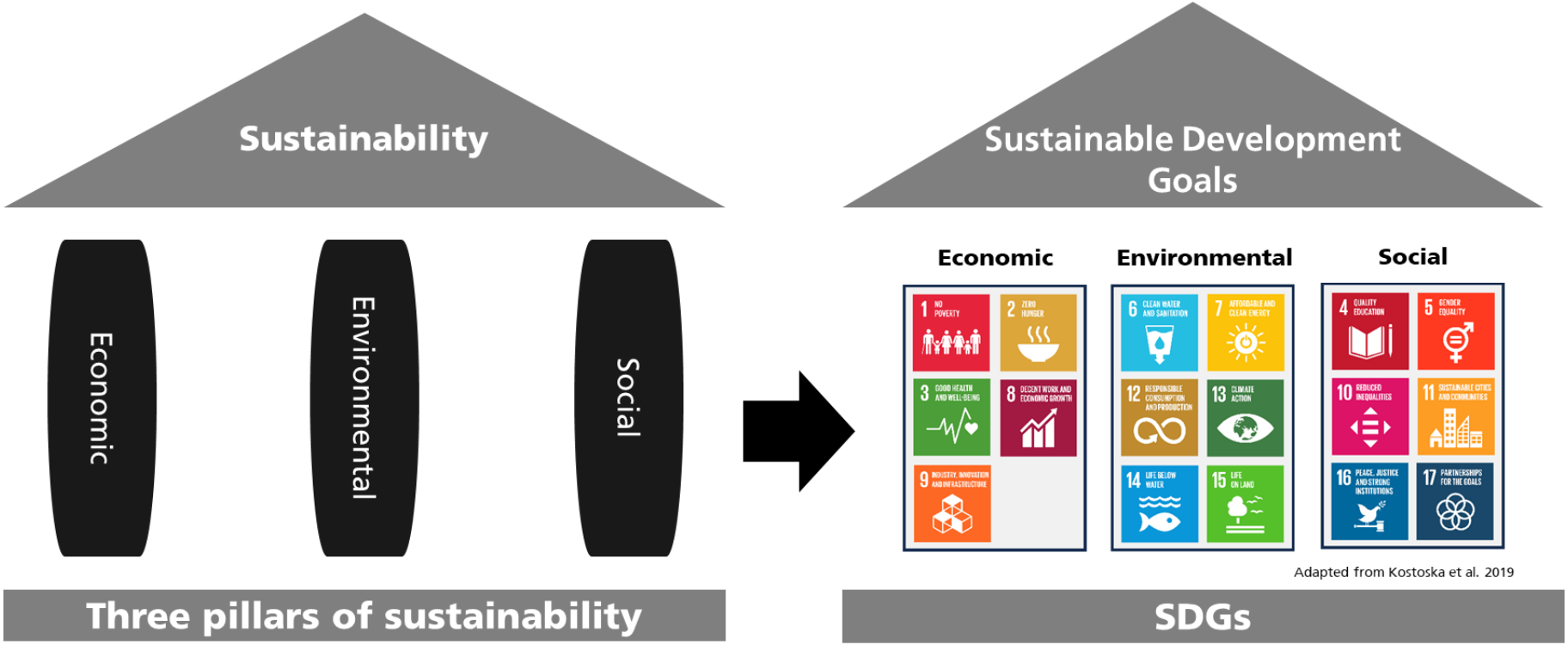
Goal 14: Life below water

Target 14.1 By 2025, prevent and significantly **reduce marine pollution** of all kinds, in particular from land-based activities, **including marine debris** and nutrient pollution

Introduction to SDG-based LCSA

SDG-based sustainability assessment

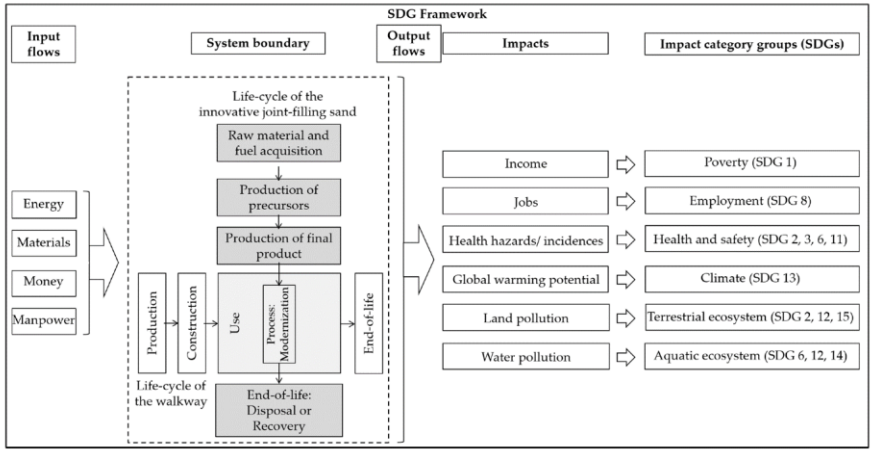
Embedding the SDGs in the three pillar model



SDG-based sustainability assessment system

- **SDG-based method** by Maier et al. (2016), Wang et al. (2018), Henzler et al. (2020)
  - ➢ Linking LCA models with SDG-based indicators
  - ➢ Foreground system (primary data required) + LCA background system
- **Operationalization of global sustainability goals**
  - ➢ Identification of “shift of burden” between:
    - Life cycle phases
    - Sustainability dimensions

    → Requires harmonization of existing methods
- Applying **Life Cycle Thinking**

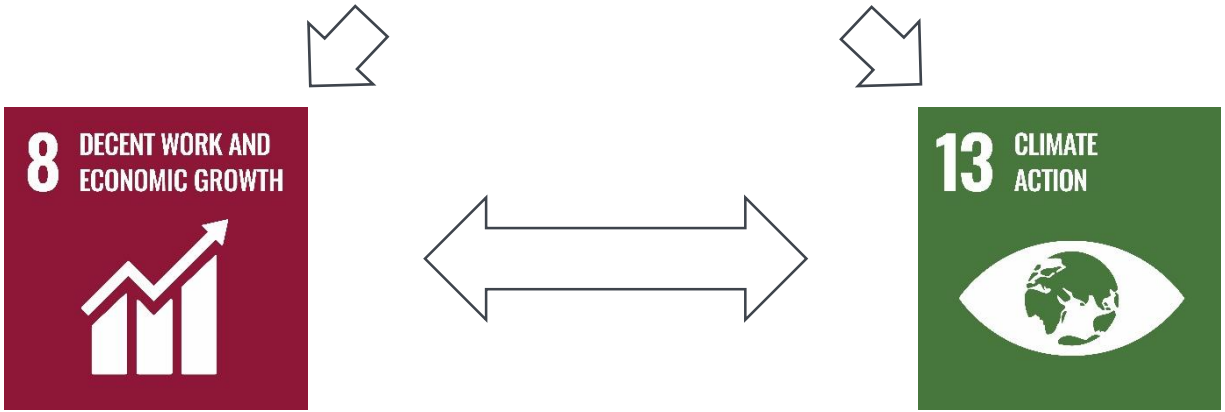


Henzler et al. (2020) based on Henzler et al. (2019) and Maier (2016)

SDG-based sustainability assessment system

Advantages of an SDG-based sustainability assessment

Is the introduction of the innovation sustainable?

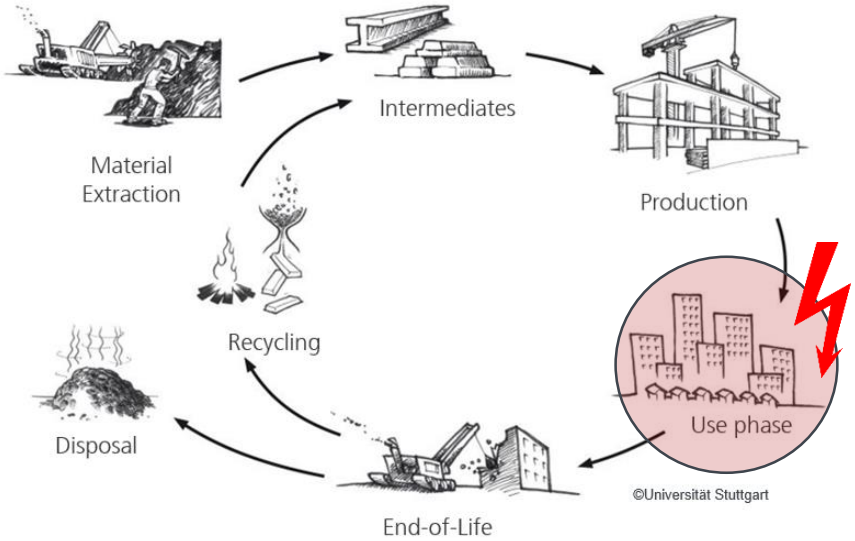


SDG Icons: https://www.un.org/sustainabledevelopment/news/communications-material/

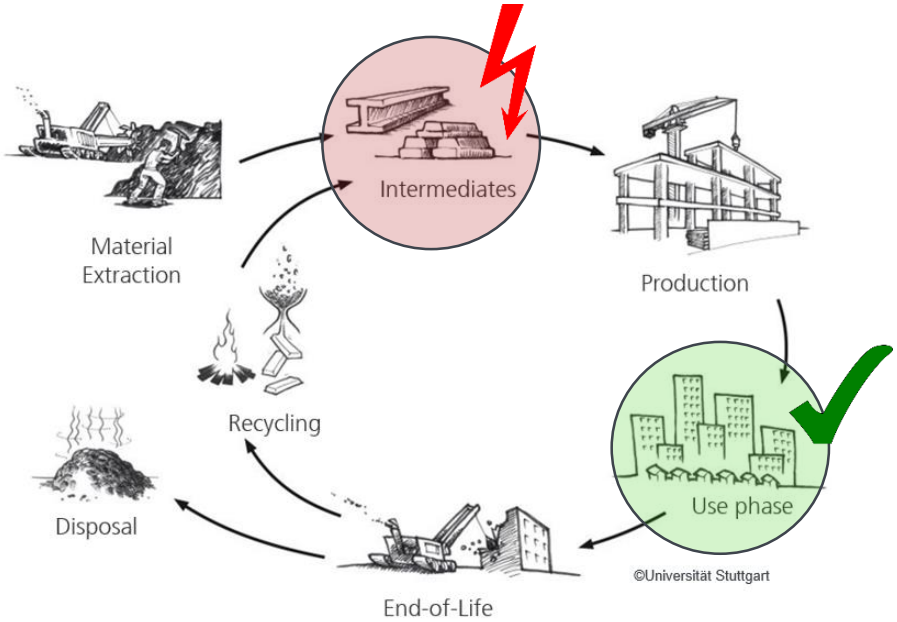
SDG-based sustainability assessment system

Advantages of an SDG-based sustainability assessment

Conventional product



Innovative product



Shift of burden

SDG-based sustainability assessment system

- **Possible questions**
  - What are the potential impacts of the innovation in the three dimensions of sustainability within the system boundary?
  - How could the innovation impact on the achievement of the SDGs?
- **Potential outcomes**
  - Identification of the potential sustainability impacts of the innovation and its impacts on the realization of the SDGs along the life cycle
  - Identification of "shift of burden"
  - Recommendations to municipalities regarding:
    - the introduction of the innovation
    - the optimization of sustainability impacts (hot spots)

SDG-based sustainability assessment system

Exemplary SDG-based indicators

Image: https://unhabitat.org/wwc-tool

SDG-based sustainability assessment system

Exemplary SDG-based indicators

Economic sustainability

Topic: Job and employment
Indicator: Job creation

Data requirement:
Number of jobs

Image: https://unhabitat.org/wwc-tool
Indicator from Wang et al. (2018)

SDG-based sustainability assessment system

Exemplary SDG-based indicators

Data requirement: number of accidents

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Image: https://unhabitat.org/wwc-tool
Indicator from Maier et al. (2016)

SDG-based sustainability assessment system

Exemplary SDG-based indicators

Data requirement: material and energy flows, emissions to air, water, …

Environmental sustainability

Topic: Climate
Indicator: Global Warming Potential

Image: https://unhabitat.org/wwc-tool
Indicator from Wang et al. (2018)

SDG-based sustainability assessment system

Exemplary SDG-based indicators

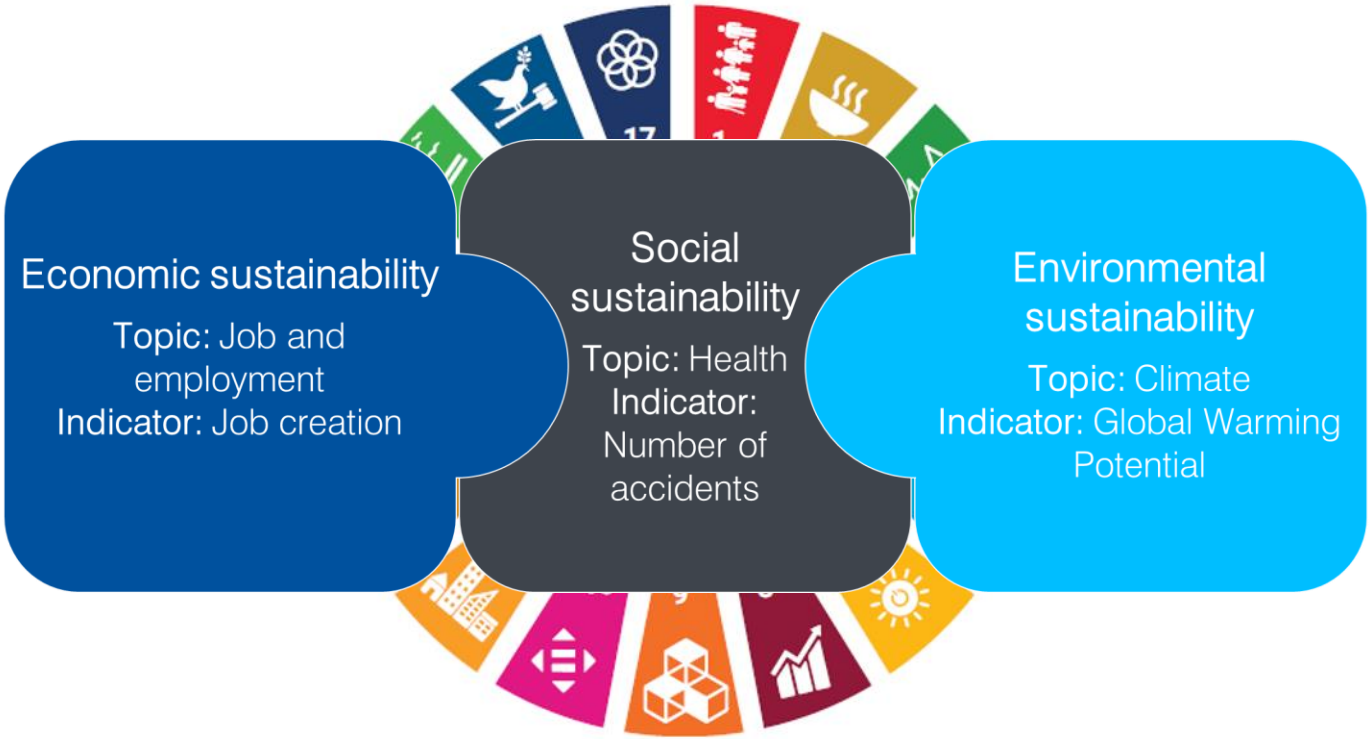

Image: https://unhabitat.org/wwc-tool

Indicators from Wang et al. (2018) and Maier et al. (2016)

SDG-based sustainability assessment system

Example: Comparison of status quo and possible future innovation

Is the **innovation**/the **product sustainable**?

→ **Communicating results** and **putting forward recommendations**

* Exemplary results from Henzler et al. (2020)

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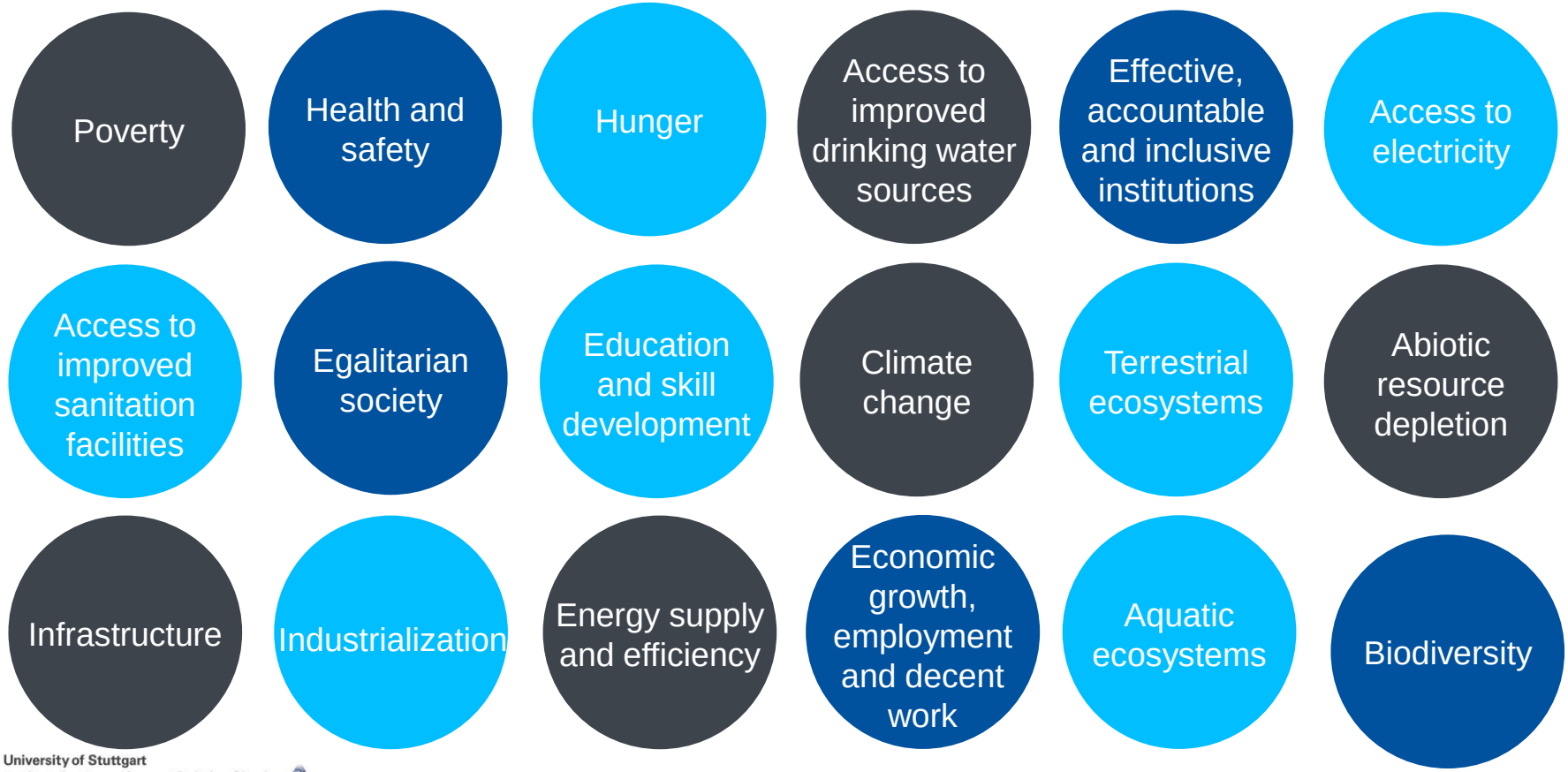
Getting started

Sustainability topics



Definition of relevance in this workshop:

A sustainability topic can be relevant to your stakeholder group as it …

1) … can **act effectively** in the field

Example: Recycling plastic bottles to reduce waste and resource consumption

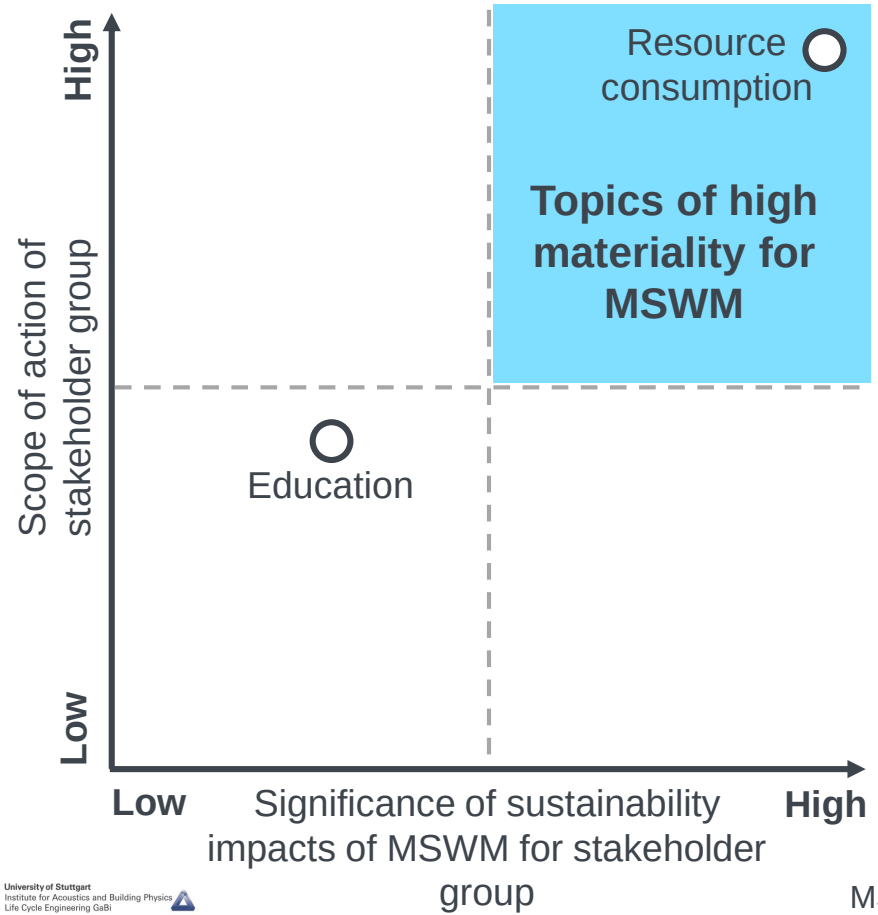
or

2) … is **affected** by the economic/ social/environmental **sustainability impacts** of municipal solid waste management

Example: Polluted drinking water due to leachate from landfills

Please keep in mind to take the perspective of your stakeholder group!

Materiality matrix



Relevance of a sustainability topic:

1) Stakeholder group can act effectively in the field
2) Stakeholder group is affected by the sustainability impacts of MSWM

Color code for stickers:

- Informal waste sector and NGOs
- Academia and science
- Formal waste sector and municipality

\+ for positive impact
\- for negative impact

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MSWM: Municipal Solid Waste Management

Working steps

Work session 1: Discussing sustainability topics and where to place them on the materiality matrix - within your stakeholder group

Work session 2: Awarding stickers - one stakeholder group after the other

Presentation and discussion of **results, outlook**

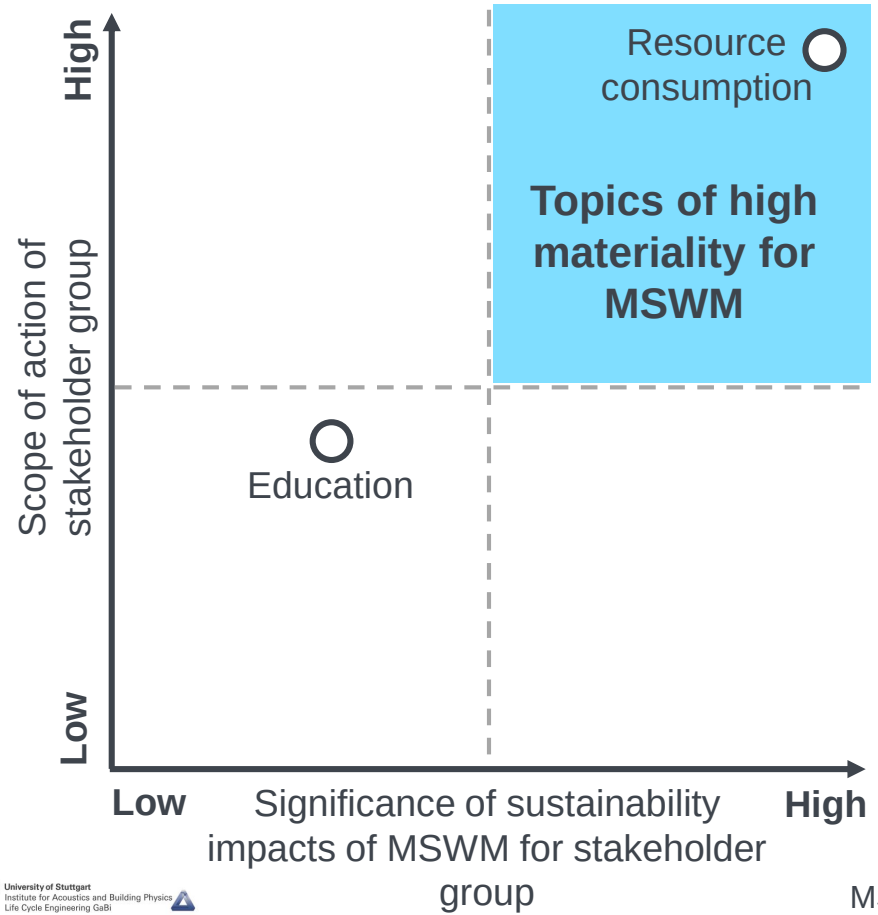
Formation of stakeholder groups

Photo: https://pixabay.com/images/id-2499619/

https://pixabay.com/images/id-2426623/

Recap work sessions

Materiality matrix



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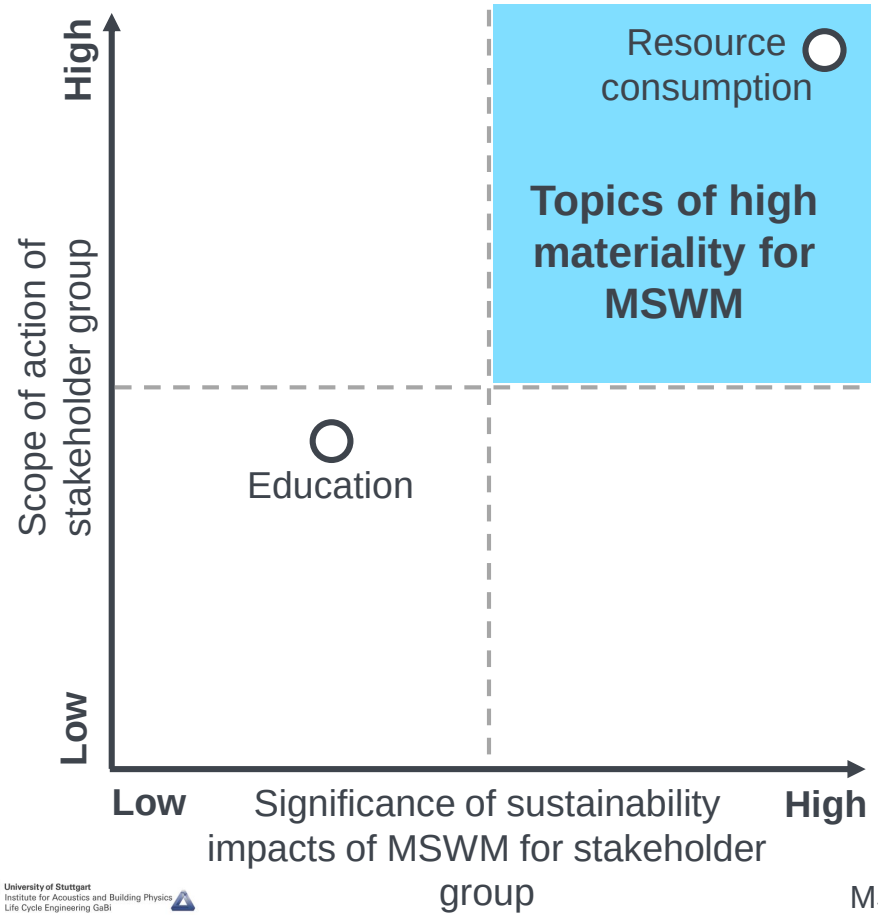
MSWM: Municipal Solid Waste Management

Work session 1

Task: Discussing sustainability topics and where to place them on the materiality matrix - within your stakeholder group

Materiality matrix



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\- for negative impact

MSWM: Municipal Solid Waste Management

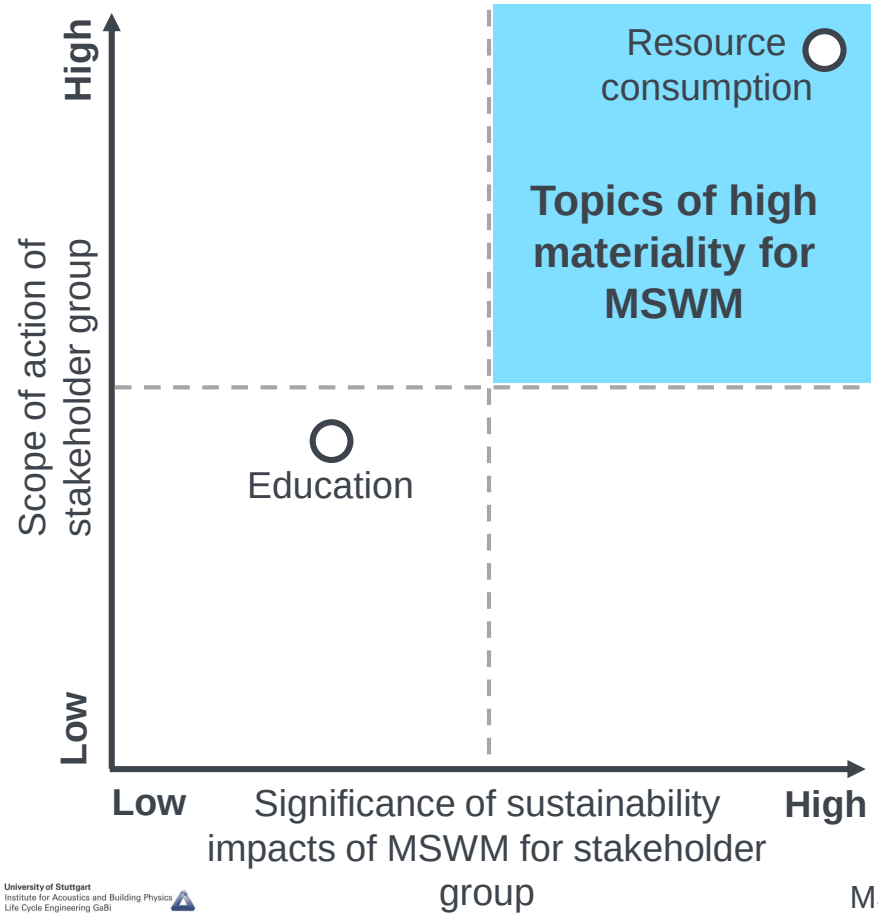
Dr. Shimelis Kebede

Waste management practice in Addis Ababa City: An overview

Work session 2

Task: Awarding stickers - one stakeholder group after the other

Materiality matrix



Relevance of a sustainability topic:

1) Stakeholder group can act effectively in the field
2) Stakeholder group is affected by the sustainability impacts of MSWM

Color code for stickers:

- Informal waste sector and NGOs
- Academia and science
- Formal waste sector and municipality

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Photo: https://pixabay.com/images/id-3129995/

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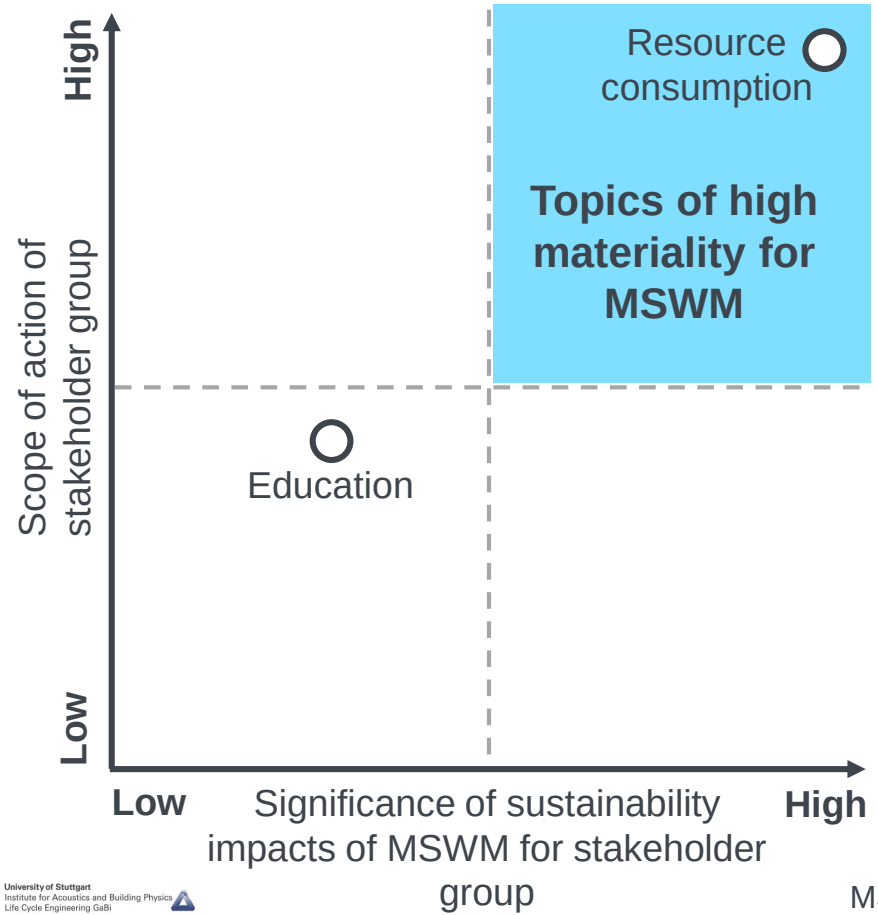

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Results and outlook

Wrap-up: Results of the 3 stakeholder groups – Top priorities

Formal waste sector:

1. Industrialization
2. Infrastructure
3. Access to electricity
4. Energy supply and efficiency
5. Education and skill development
6. Health and safety
7. Effective, accountable and inclusive institutions
8. Access to improved sanitation facilities
9. Egalitarian society

Informal waste sector and NGOs:

1. Access to improved sanitation facilities
2. Effective, accountable and inclusive institutions
3. Poverty
4. Education and skill development
5. Health and safety

Academia and science:

1. Education and skill development
2. Climate change
3. Health and safety
4. Effective, accountable and inclusive institutions
5. Infrastructure

Outlook

SuCCESS 24
Sustainable Cities
Circular Economy
Sub-Saharan Africa

Next steps in the project:

Relevant sustainability topics → **Development of indicator set** → **Application and analysis of transferability of results to Ethiopia**

To receive the final SDG-based indicator set, please send an e-mail to:
success24@iswa.uni-stuttgart.de

To follow the project, please visit the project website:
https://www.project.uni-stuttgart.de/success24/

University of Stuttgart
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Life Cycle Engineering GaBi