



Waste management – essential elements, business development and PPPs

Training series for the PPP Center of the Philippines, Module 1

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NL Netherlands

Introducing myself



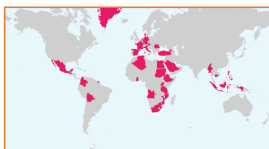
Hans Breukelman



- Chemical and environmental engineer (MSc)
- Business Administration
- PhD ('19-ongoing)



- 18 years at several waste management companies ('82-'00)
- 11 years CEO own company on recycling and soil sanitation ('00-'11)
- 7 years CEO company sustainable energy development ('16-ongoing)



- 14 years CEO of own consulting company ('08-ongoing)
- Waste management in developing countries
- Clients: World Bank, UNDP, UNCDF, EBRD, embassies, ministries
- Beneficiaries: countries, provinces, cities



NL Netherlands

Structure of the training

Waste management Essential elements, business development and PPPs

This training series will provide the participants with an overview of history, essential elements, global practices and available solutions on waste management. It will use these insights to enable building business cases and PPPs in this field.

1. SWM essential elements

This module will elaborate the value chain of SWM and will put in a historical, environmental and global context

2. Elaboration of SWM solutions

This module will provide technical and financial essentials of all links in the value chain

3. Environmental, legal, social and economic

Cross-sectional insights on environmental, social, legal and economic aspects will be handled in this module

4. PPPs, strategic positioning, governance

Module 4 will zoom in on aspects of positioning SWM services and infrastructure in a public/private context

5. BC development, DCF, fees and financing

SWM project and business development principles and tools will be handled in this module 5

6. Preparing for financial close

The legal, market and financing aspects of bringing a business case to financial close will be handled here



Program of the training

1. SWM essential elements

- Historical perspectives
- Global perspectives
- Economic perspectives
- Waste types and composition
- Value chain of SWM
- Principles
- Waste hierarchy
- Policy and planning for SWM
- GHG and marine pollution

2. Elaboration of SWM solutions

- City cleaning
- Waste collection
- Transfer and transport
- Disposal: landfills
- Disposal: incineration
- Recycling: composting/digestion
- Recycling: RDF
- Recycling: plastics/paper/metals
- Recycling: specialties

3. Environmental, Social, Legal, Economic

- Product and emission standards
- EPR and bans
- Participation and obligations
- Awareness and communication
- Compliance and enforcement
- Informal sector
- WTP and affordability
- International benchmarks
- Costs of inaction

4. PPPs, strategic positioning, governance

- Position Philippines
- Position of public authorities
- Competition and monopolies
- Service levels
- Principles for SWM finances
- PPP opportunities and obstacles
- Analysis and positioning
- Public governance
- Political aspects

5. BC development, DCF, Fees, Financing

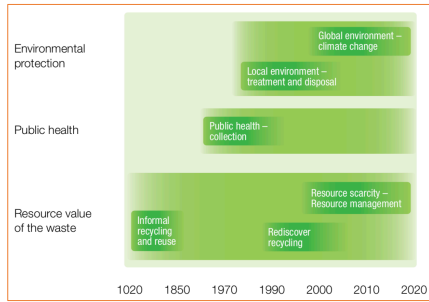
- General principles
- Capex, opex and CoO
- Value chain elaboration
- Project pipelines
- SWM cashflows
- Markets for SWM products
- SWM fees: collection methods
- SWM fees: setting
- DCFs as leading tools

6. Preparing for FC

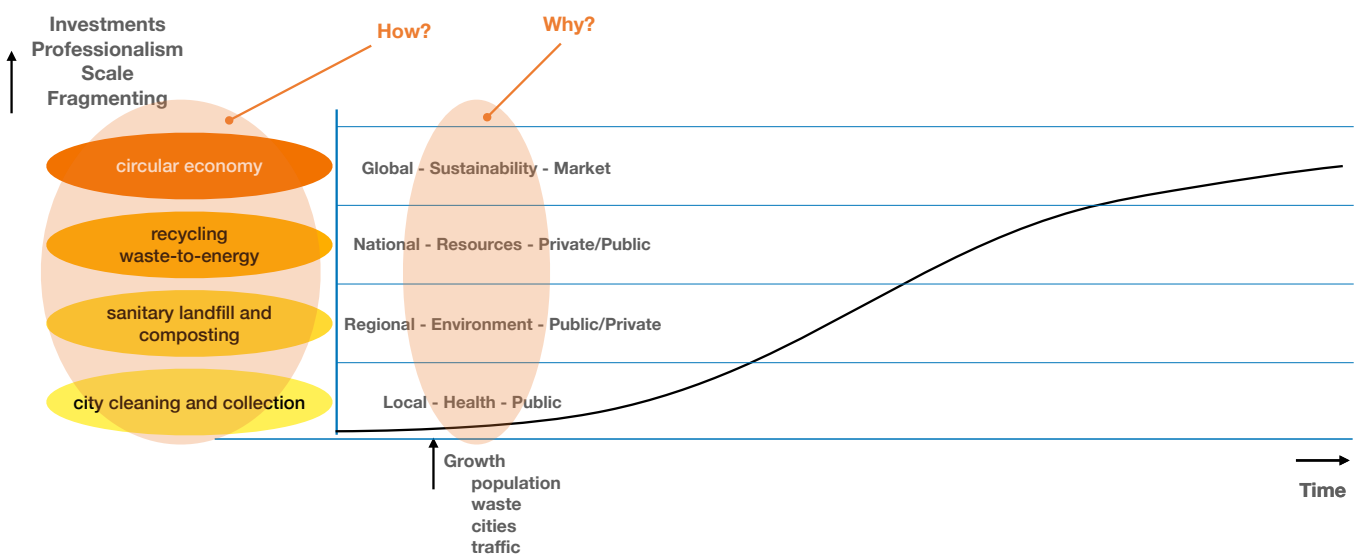
- Permits
- Market evaluations
- Tendering
- Contracting
- Financing



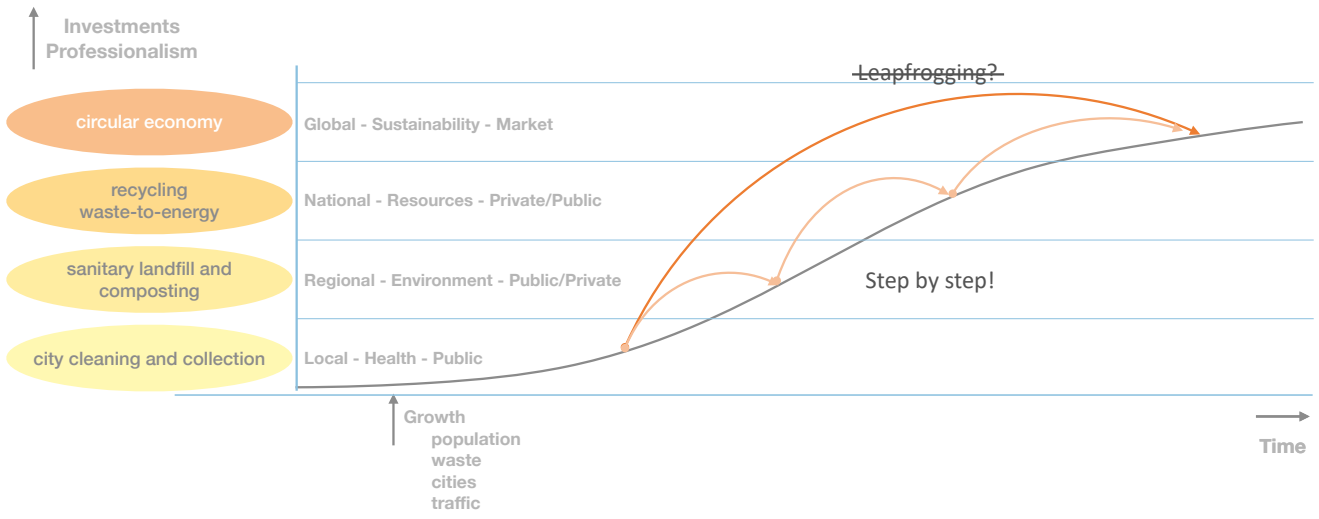
Historical perspectives



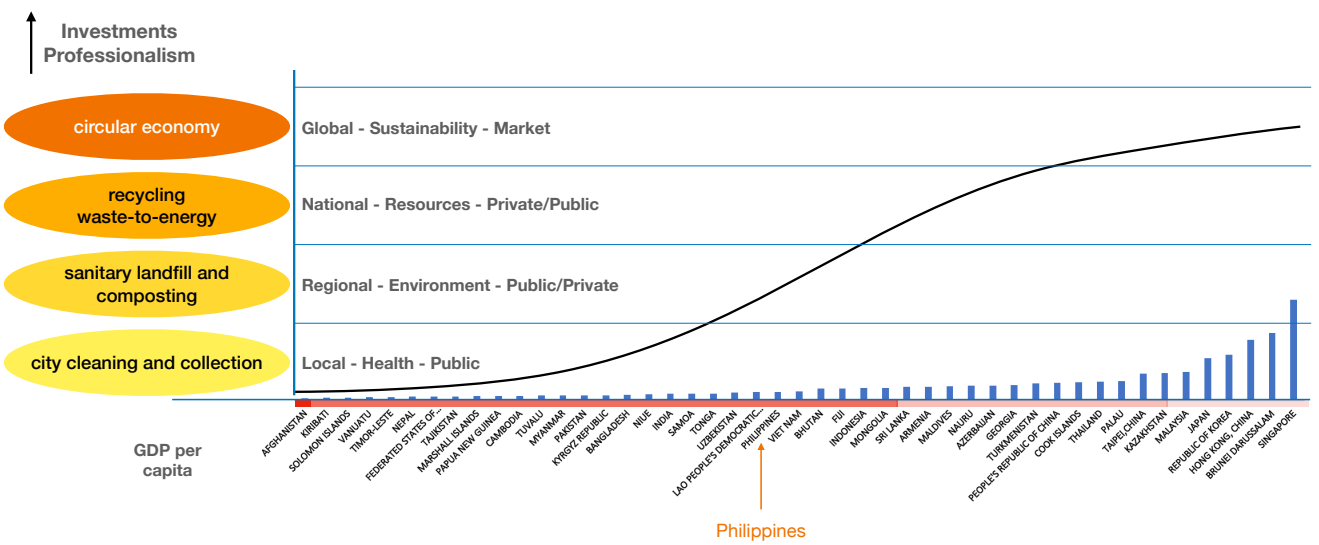
Historical perspectives



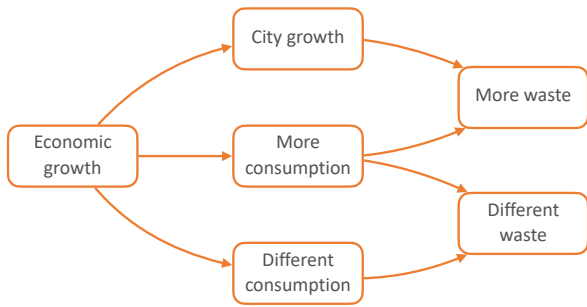
Historical perspectives



Economic perspectives



Economic perspectives



Philippines projections

(Constant 2017 international \$)

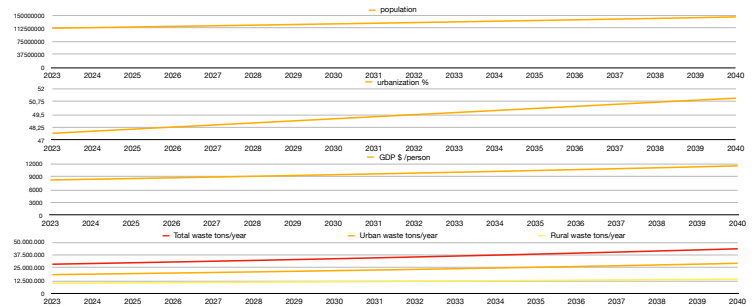
World Bank:
Waste generation per capita per year = $136.41 + 0.014 \times (\text{GDP per capita}) - (8.3 \times 10^{-8}) \times (\text{GDP per capita})^2$

Philippines:
GDP is \$8200 so average generation would be at almost 0.7 kg per capita per day

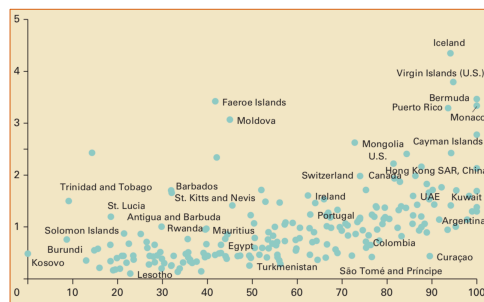
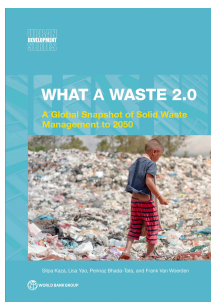
But:
World Bank data mostly based on actually collected waste

Rural/Urban:
Rural citizens generate half the waste when compared to Urban citizens

Composition:
Growth leads to more packaging waste and waste from appliances, furniture and construction

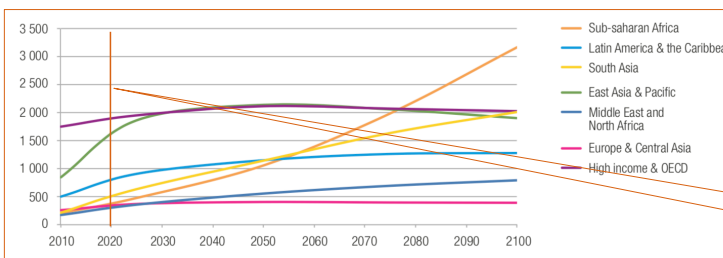


Global perspectives



Waste generation rates vs. urbanisation percentage

• kg/capita.day



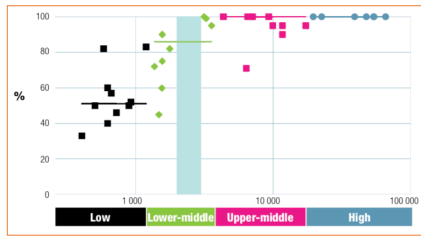
Waste production

• tons.day

2020
2.2 billion
tons/year

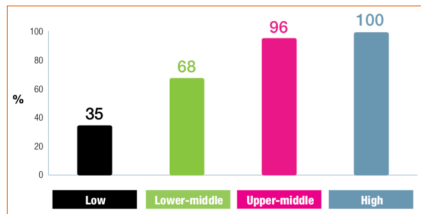


Global perspectives



Collection coverage

- 2 billion people without access to waste collection

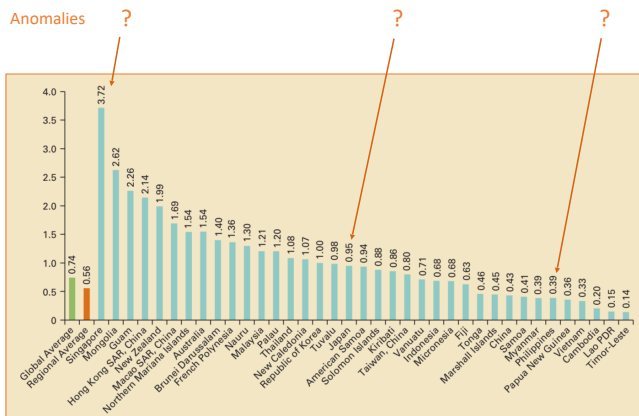


Controlled waste disposal

- 3 billion people without access to controlled disposal



Global perspectives



Waste generation rates 2016

- kg/capita.day

Poor data:

Lower income means lower availability of data

Definitions:

What is included in municipal waste

Self management 1:

At-home burying, burning and littering not accounted for

Self management 2:

At-home recycling is stronger in lower income countries

Category shifts:

From home-made to supermarket-bought

Policy side effects:

EPR systems shift household waste to commercial waste

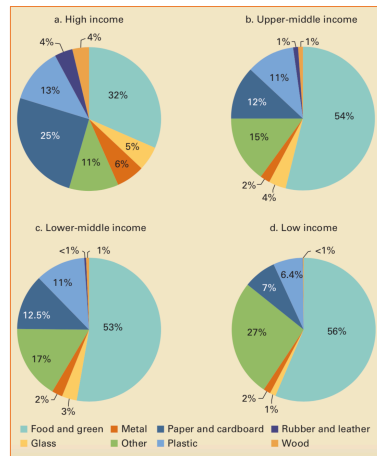
Offshoring:

From manufacturing-based economies to services-based economies



Global perspectives

Composition municipal waste



Organics:

Percentage goes down but kilo's stay the same

Other:

Go down strongly due to ashes, sweepings

Plastics/Paper/Metals/Wood:

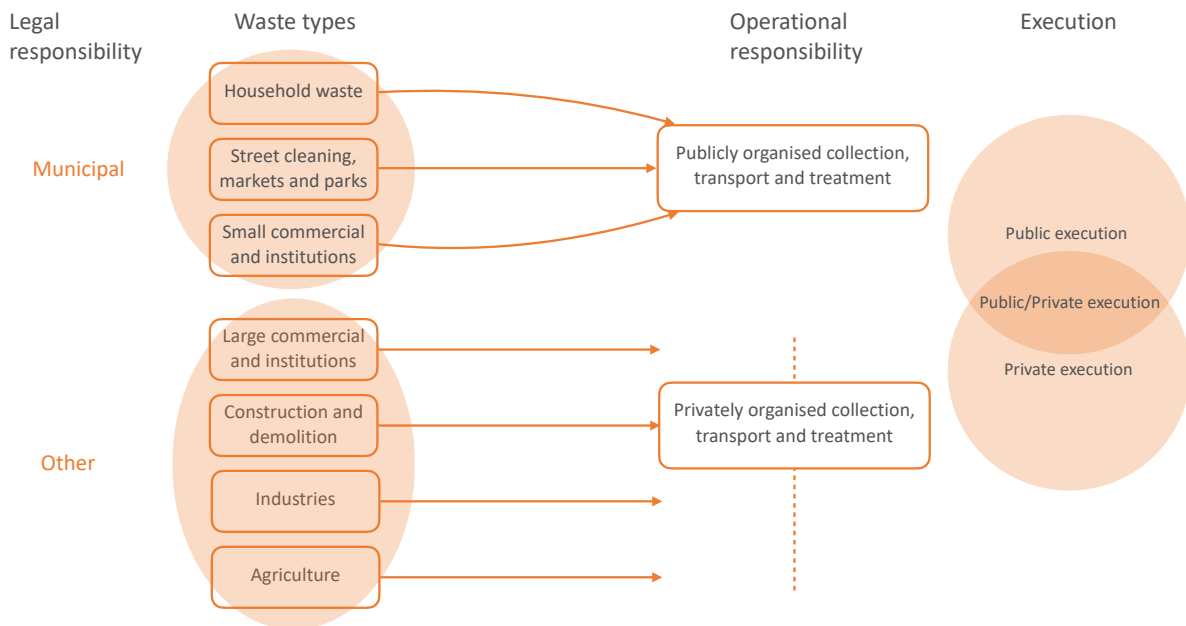
Goes up strongly due to packaging/furniture/appliances

But:

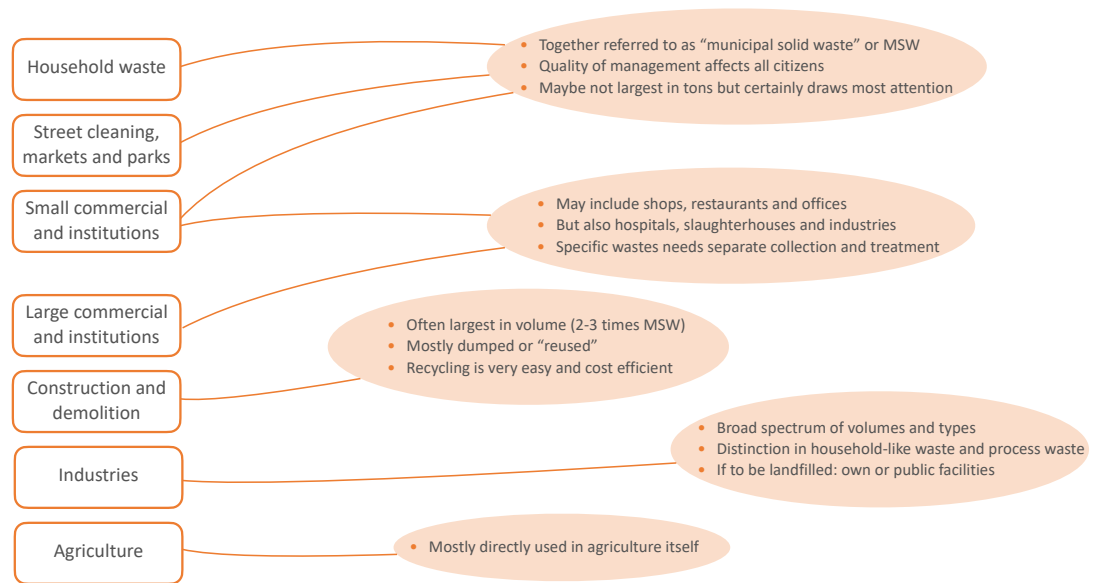
In-home recycling is stronger in lower income countries



Waste types



Waste types



Actors and roles

Global lessons learned for municipal waste

Nothing without laws, regulations and incentives

Municipalities are the anchors and linking pins

No hardware, recycling and progress without companies

Producers are enabled, educated, enforced and rewarded



National government

Municipalities

Service providers

Beneficiaries



Actors and roles

Rolling out the value chain for municipal waste



Value chain

Value chain for municipal waste



- Not a part of the value chain
- Can be influenced by governments
- Through prices, taxes, bans, EPR
- Beware of side effects



- Often neglected
- Integral part of waste management
- Strong influence on marine plastics



- Strong influence on health, safety and attractively
- Strong influence on rest of value chain



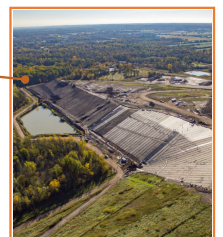
- Facilitates economies of scale
- Decoupling collection from transport
- Distribution center to multiple destinations



- Aims at recovery of material value
- And reduction of landfill



- Aims at recovery of energy value
- And reduction of landfill



- Safeguarding final storage
- Recovery of residual value in gas
- Serves as backstop

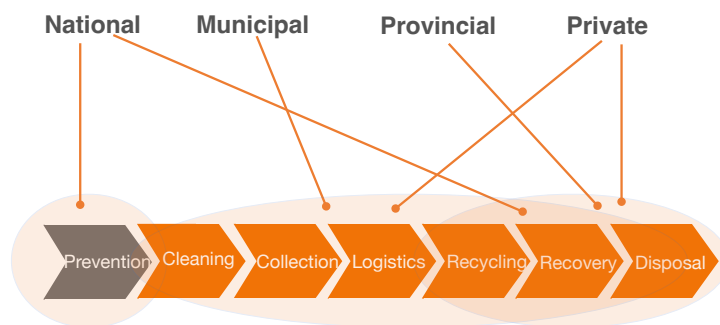


Value chain



Value chain

Entry points for public and private actors



General principles of waste management

General principles

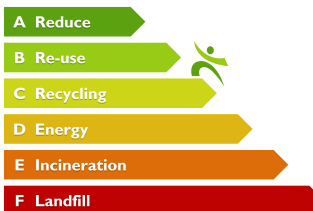


- Waste hierarchy
- Producer responsibility
- Polluter pays
- Proximity
- Self sufficiency
- Precautionary
- Public dominance
- Access for all
- Always think integral
- Don't shift the burden
- Stay rational
- Learn from global
- Adapt to local
- Take care of continuity



General principles of waste management

Waste hierarchy



Sustainability



- Other concepts: 3R, Cradle to Cradle, doughnut economics, ...

But

- A clash of competing concepts
- Sometimes counterproductive
- Sometimes forgotten: energy, biodiversity, land-use, water, food
- Often abused by marketing

Circular economy



General principles of waste management

Producer Responsibility

- Everybody should take care of its own waste
- It's a responsibility within boundaries set by public authorities

But

- Not everybody for itself
- That's contradictory to needed economy of scale
- Public authorities may/must provide services and infrastructure

Polluter pays

- Polluters cover all cost of their own waste
- Including all cost inflicted on society
- This holds also for consumers/citizens
- This principle may incentivise prevention and recycling

But

- Affordability may be an issue
- Only works with control and enforcement



General principles of waste management

Proximity

- Treatment close to source
- Prevent cost and emissions of transport

But

- Unclear why this has become an important item
- Not used for other branches of industry
- Contradictory to needed economy of scale

Self Sufficiency

- Take care of your own waste
- Can make you less vulnerable

But

- Where to draw the borders
- Can also make you more vulnerable
- Also contradictory to needed economy of scale



General principles of waste management

Precautionary

- Study possible effects
- And take actions also when risks are not fully proven

But

- Don't let it block progress
- Abused by NIMBY, NIMTOO and BANANA

Not In My Back Yard
 Not In My Term Of Office
 Build Absolutely Nothing Near Anything

Public dominance

- No public rules, no waste management
- No public roles, no waste services
- Primary responsibility for local authorities

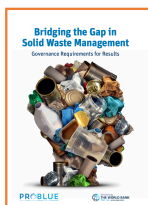
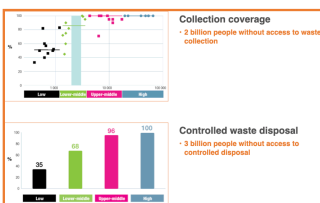
But

- Distancing needed between politics and operations
- Involvement private sector is crucial

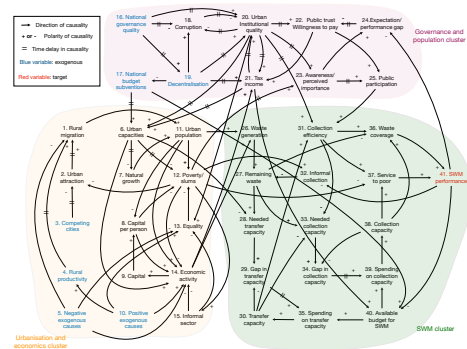


General principles of waste management

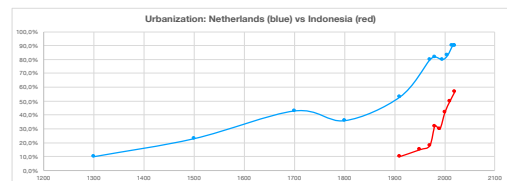
Access for all?



World Bank: Cause lies in institutional weaknesses



But: It's much more complex



A renewed interest in waste management

New impulses

-  • The SDGs
-  • Global warming
-  • Marine plastics
-  • Resource scarcity
-  • Food waste
-  • Food-Energy-Water nexus
-  • Covid pandemic



SWM and the Sustainable Development Goals



Importance for the SDGs

- 10 out of 17
- SWM is a perfect entry-point for local and national actions

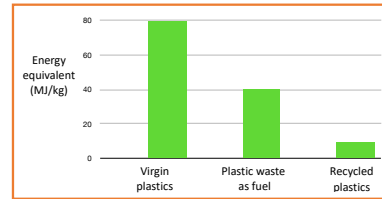
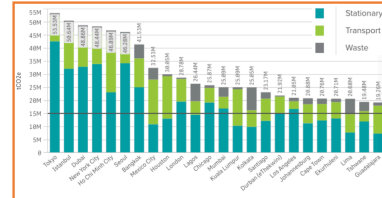
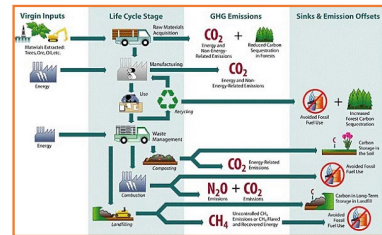


SWM and Global Warming



Global warming

- COP 27
- 1.6 gigaton equivalent of CO₂ emission from solid waste
- 5-10% of overall emissions
- Mostly from unmanaged waste and open dumps
- Cities in low and middle income countries: 20-40% of their emissions



Needed actions

- 100% service coverage to prevent littering/burning
- Replace open dumping by sanitary landfills with gas extraction
- Prevent food waste
- Recycle plastics, metals and paper/cardboard



SWM and Marine Plastics



Marine Plastics

- 1 million tons of plastics emitted in oceans
- Philippines said to be largest contributor (?)
- 80% comes from unmanaged municipal waste
 - 60% from uncollected waste
 - 20% from dumps

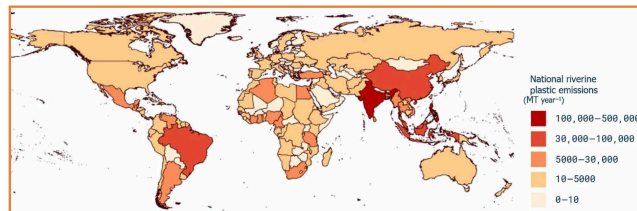
ENVIRONMENTAL PROGRESS
More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean
 Laurence J. B. Miles¹, Thea van Horemals², Karol van den Bergh³, Christian Schmitt⁴ | *Current Biology* 2022

Plastic waste increasingly accumulates in the largest river networks, but little is known about the distribution and magnitude of plastic emissions to the ocean from these rivers. We used a global river network model to estimate the magnitude of plastic emissions to the ocean from rivers. We found that 1000 rivers account for 80% of global riverine plastic emissions into the ocean. The largest contributors are the Amazon, Congo, and Ganges-Brahmaputra river networks. Our findings highlight the need for improved waste management in these river basins to reduce plastic emissions to the ocean.

Country	Mt (MT year ⁻¹)	MPW (MT year ⁻¹)	Ratio of MPW to ocean (Mt per MPW)
Global	1.0 × 10 ⁶	6.8 × 10 ⁷	1.5%
Philippines	3.6 × 10 ⁵	4.0 × 10 ⁶	8.9%
India	1.3 × 10 ⁵	1.3 × 10 ⁶	1.0%
Malaysia	7.3 × 10 ⁴	8.1 × 10 ⁵	9.0%
China	7.1 × 10 ⁴	1.2 × 10 ⁶	0.6%
Indonesia	5.6 × 10 ⁴	8.2 × 10 ⁵	6.8%
Myanmar	4.0 × 10 ⁴	9.9 × 10 ⁵	4.0%
Brazil	3.8 × 10 ⁴	3.3 × 10 ⁵	1.1%
Vietnam	2.8 × 10 ⁴	1.1 × 10 ⁶	2.5%
Bangladesh	2.5 × 10 ⁴	1.0 × 10 ⁶	2.4%
Thailand	2.3 × 10 ⁴	1.4 × 10 ⁶	1.7%
Nigeria	1.9 × 10 ⁴	1.9 × 10 ⁵	1.0%
Turkey	1.4 × 10 ⁴	1.7 × 10 ⁵	0.9%
Cameroon	1.1 × 10 ⁴	5.8 × 10 ⁵	1.8%
Sri Lanka	9.7 × 10 ³	1.6 × 10 ⁵	6.2%
Guatemala	7.1 × 10 ³	3.1 × 10 ⁵	2.3%
Haiti	6.9 × 10 ³	2.4 × 10 ⁵	2.9%
Dominican Republic	6.3 × 10 ³	1.9 × 10 ⁵	3.2%
Venezuela	6.0 × 10 ³	6.7 × 10 ⁵	0.9%
Tanzania	5.8 × 10 ³	1.7 × 10 ⁵	0.3%
Algeria	5.8 × 10 ³	7.6 × 10 ⁵	0.8%

Needed actions

- 100% collection coverage to prevent littering and burning
- City/street cleaning deserves more attention
- Replace open dumping by sanitary landfills
- Bans on single use plastics
- EPR



SWM and Food Waste

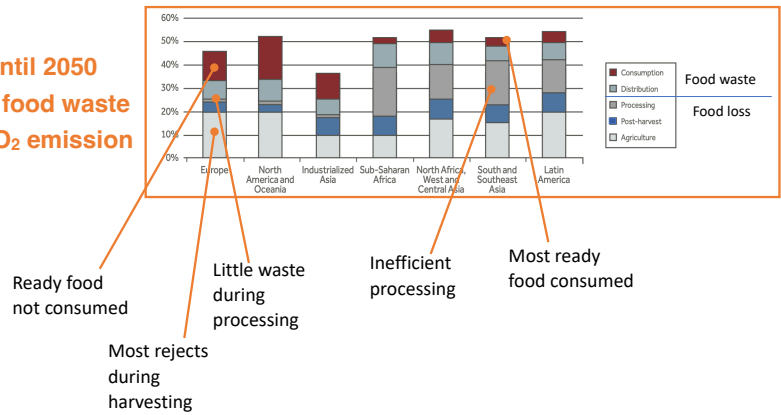


Food Loss and Food Waste

- Food availability needs 70% increase until 2050
- 1 trillion US\$/yr worth of food loss and food waste
- equivalent to 4.4 gigaton (10⁹ ton) of CO₂ emission
- 30-55% in municipal waste

Needed actions

- For the global north: harvest all and empty your plate
- For the global south: invest in processing



End of Module 1

