

»» Role and potentials of CDM, sectoral approaches and NAMAs in solid waste management

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Solid Waste Management

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»» Outline of presentation

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Introduction

2

Methodology

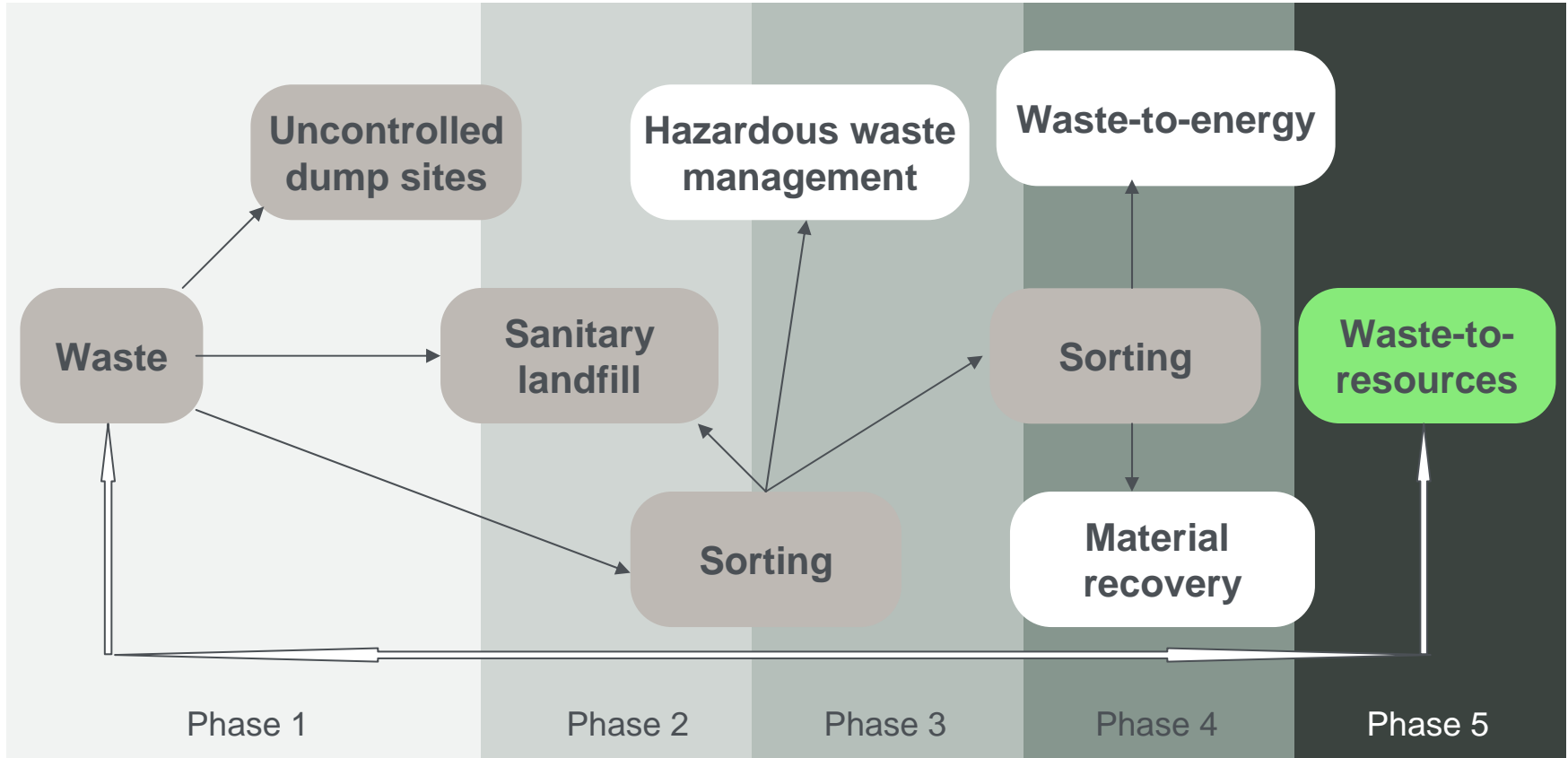
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Cost and cost coverage

4

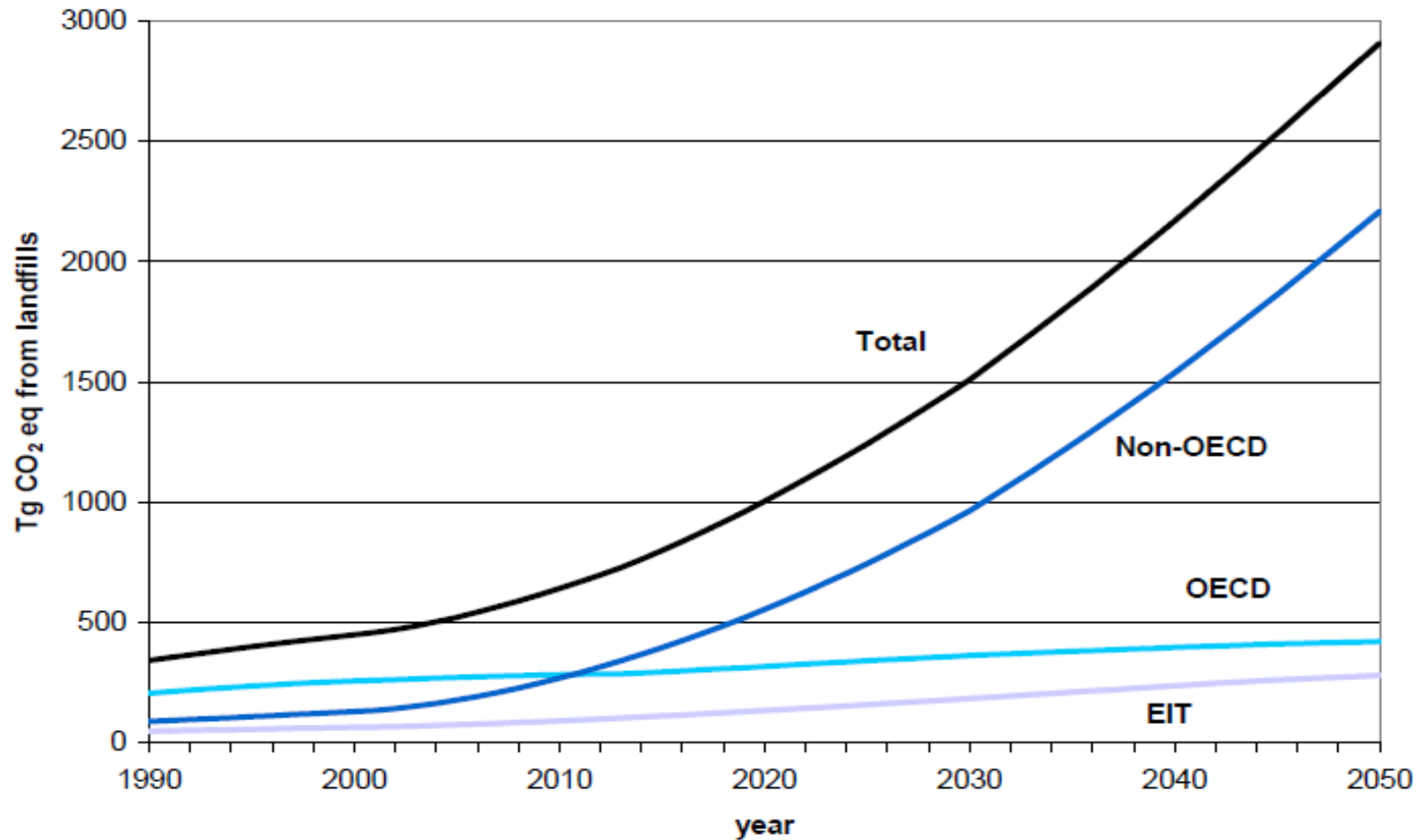
Conclusions

»» Development stages in solid waste management



Source: BMZ Strategiepapier ‚Ressource Abfall‘, Bonn 2012

»» Forecast of GHG emissions from landfills



Source: Monni et al.

»» GHG reduction potential by SWM in selected countries



Klimaschutzpotenziale der Abfallwirtschaft

Am Beispiel von Siedlungsabfällen und Altholz

FKZ 3708 31 302

Auftraggeber:



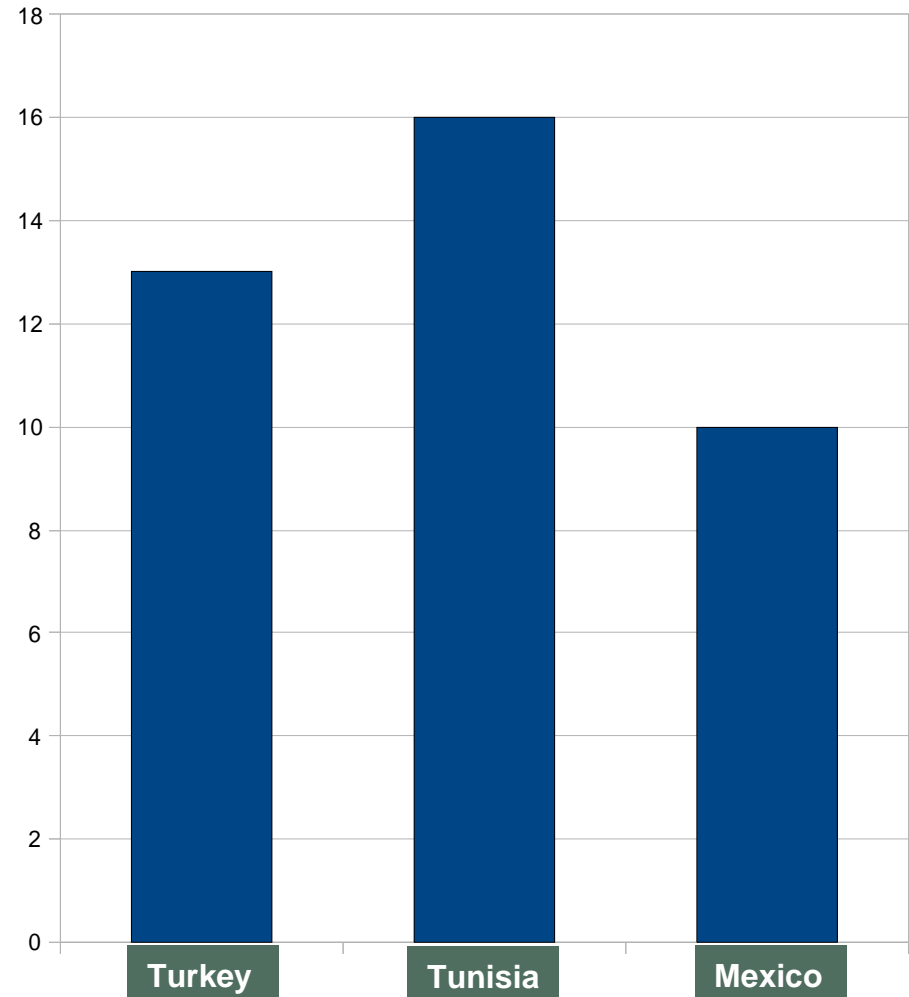
Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit



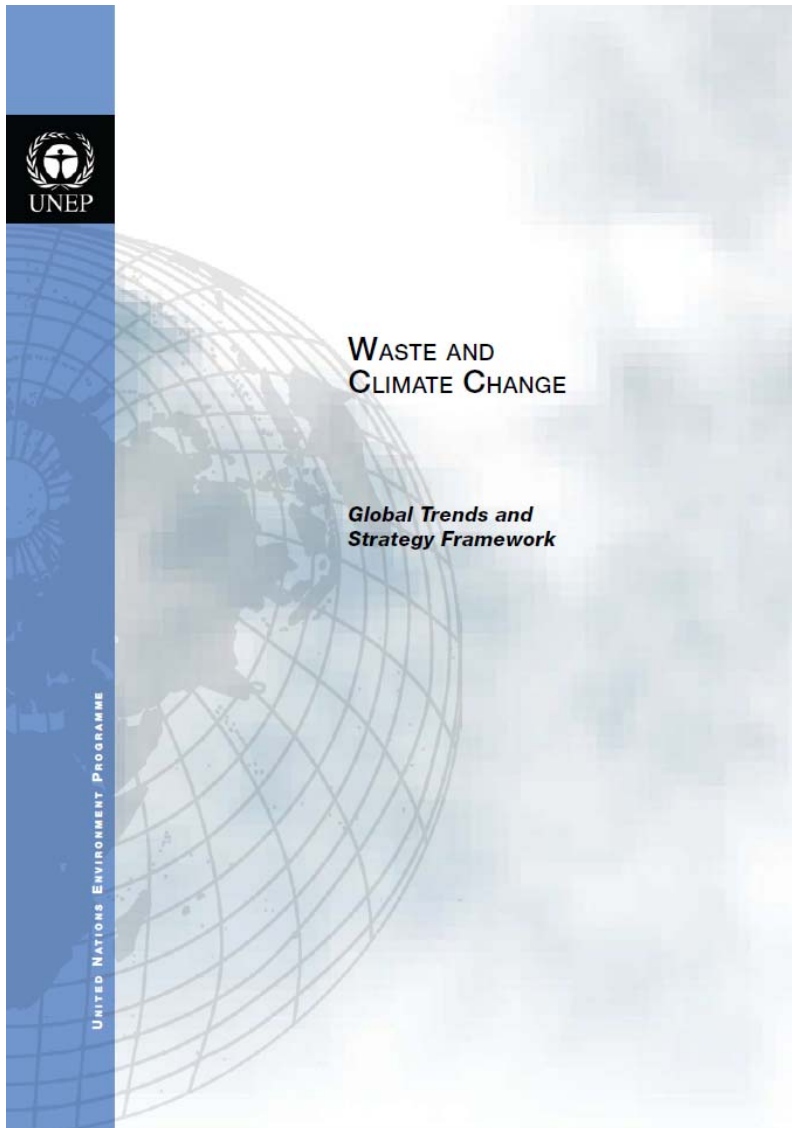
BUNDESVERBAND DER DEUTSCHEN ENTSORGUNGS-, WASSER- UND ROHSTOFFWIRTSCHAFT E.V. WIRTSCHAFTS- UND ARBEITGEBERVERBAND

Darmstadt/Heidelberg/Berlin, Januar 2010

% of total GHG emissions



»» Waste and Climate Change



„At a global scale, the waste management sector makes a relatively minor contribution to greenhouse gas (GHG) emissions, estimated at approximately 3 - 5% of total anthropogenic emissions in 2005.

However, the waste sector is in a unique position to move from being a minor source of global emissions to becoming a major saver of emissions.

Although minor levels of emissions are released through waste treatment and disposal, the prevention and recovery of wastes (i.e. as secondary materials or energy) avoids emissions in all other sectors of the economy.

A holistic approach to waste management has positive consequences for GHG emissions from the energy, forestry, agriculture, mining, transport, and manufacturing sectors.“

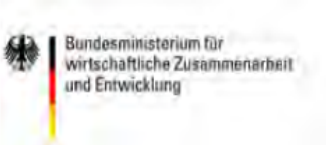
SWM-GHG Calculator



TOOL FOR CALCULATING GREENHOUSE GASES (GHG) IN SOLID WASTE MANAGEMENT (SWM)

Developed by

Sponsored and financed by



»» “Standard solution” sanitary landfill?

- Economic framework conditions \Rightarrow low-cost solutions
- Compromise of environmental soundness \Leftrightarrow economic viability
- Leachate and landfill gas emissions pose a latent environmental risk
- Methane emissions can only partly (30 – 40%) be captured
- Financing of cost of aftercare is uncertain

➔ Advanced SWM concepts highly desirable !

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Conclusions

I. Simple organisation, no separate collection

- Sorting out of dry recyclables and high calorific value materials
- Mechanic-biological pre-treatment of residual waste (MBT)

II. Recycling and energetic utilisation

- Separate collection of dry recyclables
- Sorting out of residual waste, high calorific value materials
- MBT

III. Recycling, biological and energetic utilisation

- Separate collection of recyclables and bio-waste
- Sorting out of recyclable materials, high calorific value materials
- MBT

IV. Thermal waste treatment

- Thermal treatment / waste-to-energy
- Concepts with and without upstream separate collection / material and biological recycling

Analysed waste management concepts

System-element		Collection		Sorting		Biological recycling		Mechanical-biological treatment			Energetic Recycling	
		Separate Collection of potential Recyclables	Separate collection of Organic Waste	Sorting of Recyclables	Sorting of high caloric Fractions	Compost Segregation of simple Organic Waste	Intensive Rot/Fermentation of Organic Waste	MBT simple	MBS / MPS	MBT intensive Rot / MBT Fermentation	EBS-HKW	Thermal Waste Treatment
Group I	AWK Ia			●				●				
	AWK Ib			○	●			●				
	AWK Ic			○					●			
	AWK Id			○	●					●		
Group II	AWK IIa	●		●				●				
	AWK IIb	●		○	●			●				
	AWK IIc	●		○					●			
	AWK IId	●		○	●					●		
Group III	AWK IIIa	●	●	●		●		●				
	AWK IIIb	●	●	○	●		●	●				
	AWK IIIc	●	●	○	●	●				●		
	AWK IIId	●	●	○			●		●			
Group IV	AWK IVa			○								●
	AWK IVb	●		○								●
	AWK IVc	●	●	○		●						●
	AWK IVd	●	●	○			●					●

Group A: GDP < 2.000 EUR/cap/a - lower-middle income

Waste type A1: Tropical and semi-tropical climate, urban areas

Waste type A2: Arid and semiarid climate, urban areas

Waste type A3: Tropical and semi-tropical climate, rural areas

Waste type A4: Arid and semiarid climate, rural areas

Group B: GDP 2.000 – 4.000 EUR/cap/a - middle income

Waste type B1: Tropic and semi-tropical climate, urbane and rural areas

Waste type B2: Arid and semiarid climate, urban and rural areas

Group A: GDP 4.000 – 6.000 EUR/cap/a - higher-middle income

Waste type C1: Tropical and semi-tropical climate, urban and rural areas

Waste type C2: Arid and semiarid climate, urban und rural areas

Properties of model waste types

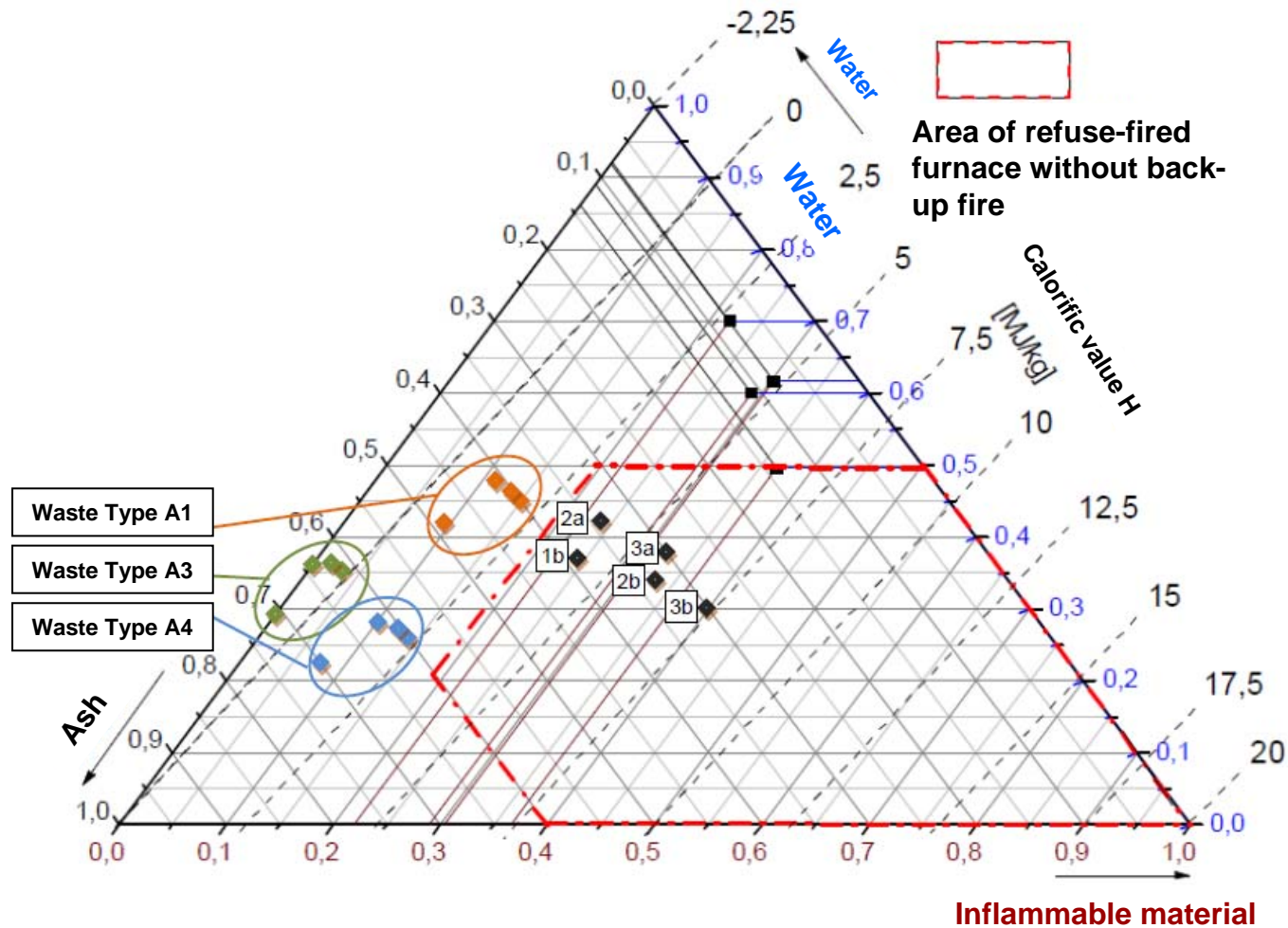
	Organic waste*	Inert Material/ Others	Recyclable Material**	Water Content	Lower Calorific Value H_u [MJ/kg]	GHG-Potential*** [Mg CO ₂ -äqu./Mg Waste]
Waste Type A1	≥ 65%	15 – 25%	≤ 15%	≥ 40%	3 – 4	0,8 – 1,3
Waste Type A2	≥ 65%	15 – 25%	≤ 15%	≤ 40%	4 – 5	0,8 – 1,3
Waste Type A3	≤ 45%	≥ 40%	≤ 15%	≥ 30%	2 – 3	0,5 – 0,8
Waste Type A4	≤ 45%	≥ 40%	≤ 15%	≤ 30%	3 – 4	0,5 – 0,8
Waste Type B1	50 - 65%	≤ 20 %	15 – 25%	≥ 40%	4 – 5	0,9 – 1,4
Waste Type B2	50 - 65%	≤ 20 %	15 – 25%	≤ 40%	5 – 6	0,9 – 1,4
Waste Type C1	≤ 50%	≤ 20 %	≥ 25%	≥ 40%	5 – 6	0,9 – 1,4
Waste Type C2	≤ 50%	≤ 20 %	≥ 25%	≤ 40%	6 – 7	0,9 – 1,4

* Only Bio-Waste; PPK sub-summarized under Recyclable Material

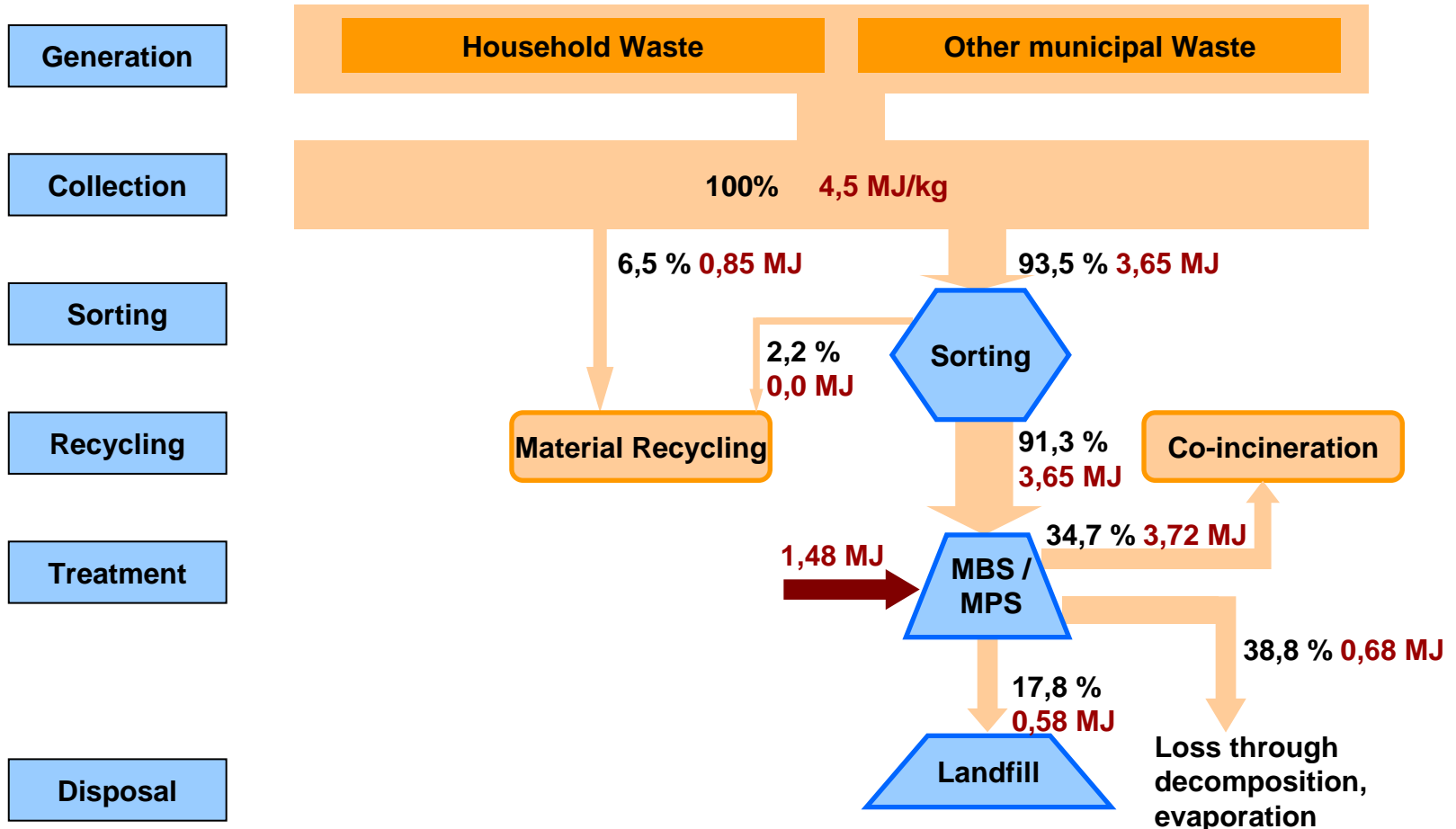
** Dry Recyclables: paper, cardboard, metal, glass, plastics, textiles, packaging

***lower value: with methane correction factor 0,65, higher value: long-term emission potential

Incineration properties of model waste types



Model II c



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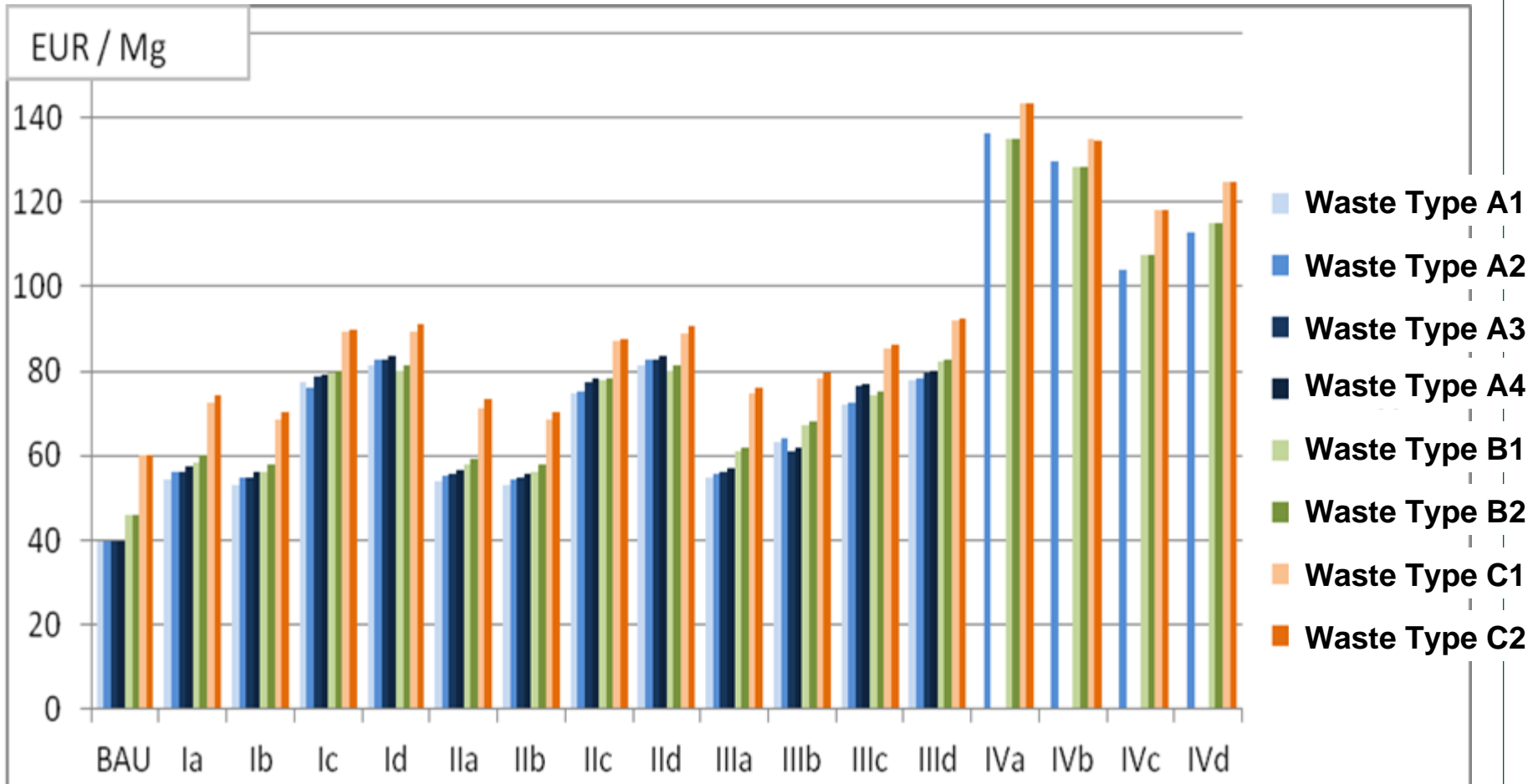
Cost and cost structures

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Conclusions

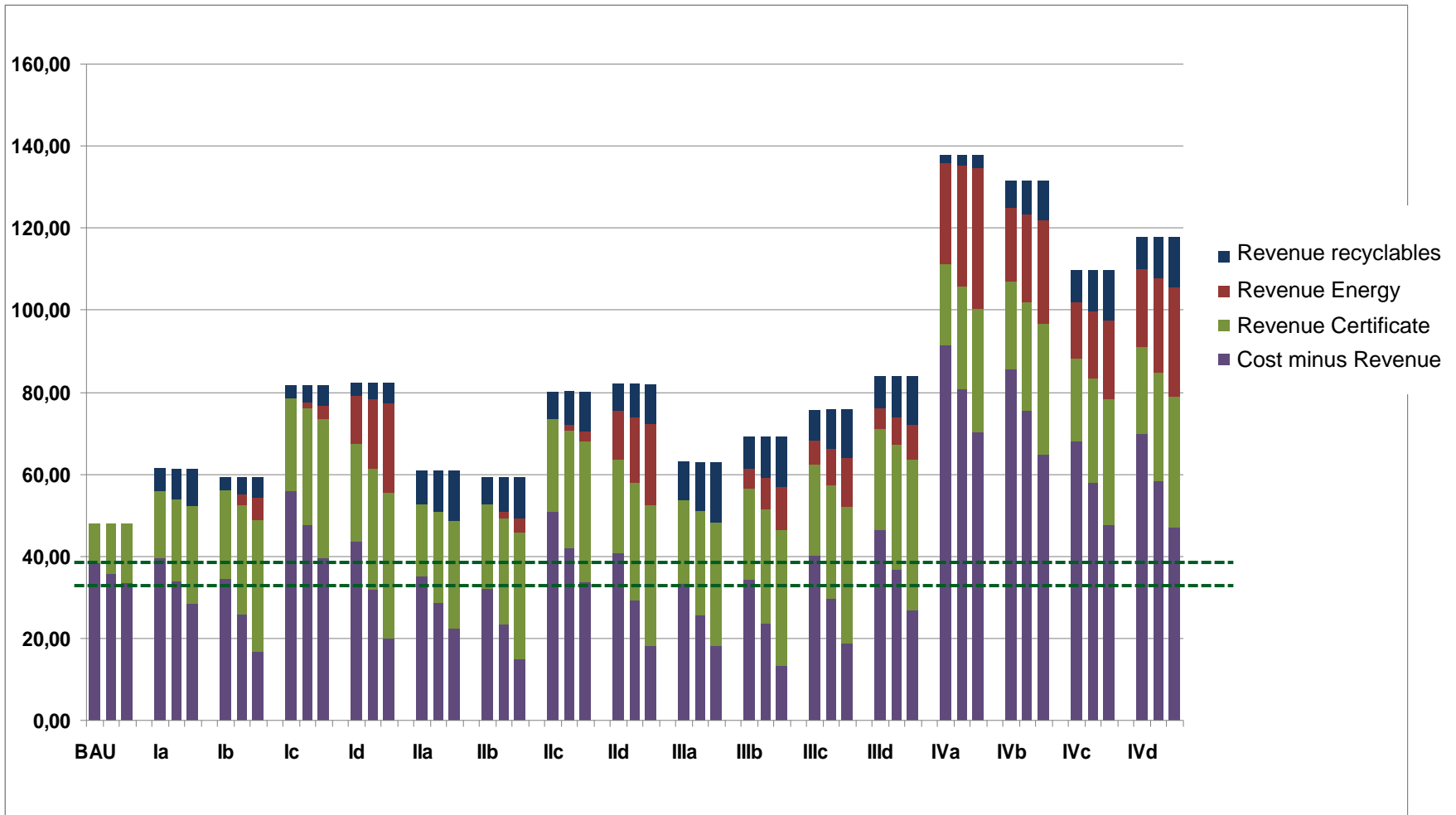
»» Cost of SWM technologies as a function of GDP

GDP [EUR /cap/year]	< 2.000 [EUR/Mg]	2.000 – 4.000 [EUR/Mg]	4.000 – 6.000 [EUR/Mg]	25.000 – 30.000 [EUR/Mg]
Method / Technology				
Source Separation of dry Recyclables	20 - 30	25 - 35	35 - 45	60 - 70
Sorting of high caloric Fractions / RDF	15 - 25	20 - 30	25 - 35	50 - 60
Composting of separately collected Bio-waste	20 - 30	20 - 30	20 - 30	35 – 50
Intensive Rotting / Fermentation of Bio-waste	50 - 60	50 - 60	50 - 60	70 - 90
Simple MBT	15 - 25	20 - 30	20 - 30	35 - 50
MBT intensive Rotting or Fermentation	40 - 50	40 - 50	45 - 55	75 - 90
MBS / MPS	40 - 50	40 - 50	45 - 55	65 - 80
Waste to Energy Plant	60 - 80	60 - 80	65 - 85	90 - 120
Thermal Waste Treatment	70 - 90	70 - 90	75 - 95	110 - 140
Sanitary Landfill	10 - 20	12 - 22	15 - 25	40 - 60



Type of Waste Management Concept

Waste Type B1



Cost minus revenues compared to BAU-model

Abfall-typ	AWK	Gruppe I				Gruppe II				Gruppe III				Gruppe IV			
		Ia	Ib	Ic	Id	IIa	IIb	IIc	II d	IIIa	IIIb	IIIc	IIId	IVa	IVb	IVc	IVd
A1	Basisszenario													nicht anwendbar			
	Szenario 1																
	Szenario 2																
A2	Basisszenario																
	Szenario 1																
	Szenario 2																
A3	Basisszenario													nicht anwendbar			
	Szenario 1																
	Szenario 2																
A4	Basisszenario													nicht anwendbar			
	Szenario 1																
	Szenario 2																
B1	Basisszenario																
	Szenario 1																
	Szenario 2																
B2	Basisszenario																
	Szenario 1																
	Szenario 2																
C1	Basisszenario																
	Szenario 1																
	Szenario 2																
C2	Basisszenario																
	Szenario 1																
	Szenario 2																

- Legende:
- Kosten ohne I mit Diskontierung geringer als BAU-Modell
 - Kosten ohne I mit Diskontierung etwa gleich wie BAU-Modell
 - Kosten ohne I mit Diskontierung höher als BAU-Modell

»» Conclusions

Financial sustainability requires steady and reliable revenues

- › 60 – 70% of the total costs of advanced SWM are operating/running cost
- › Low-interest credits or grants alone can not ensure financial sustainability

Compensations for GHG reductions could cover 30 – 50% of total cost

- › Annex'1 states have to set ambitious GHG reduction targets
 - ➔ energizing carbon markets
- › Revenues for recyclables and energy could cover 20 – 30% of cost
- › Developing, emerging and transition countries (DETC) should use 0.3 – 0.5% of their GDP for financing SWM

Advanced (municipal) SWM requires national regulations and institutions

- › DETC should develop and adopt a clear swm policy
- › DETC should develop financial instruments beyond user fees, in particular taxes/charges on certain products (extended producer responsibility)
- › DETC should develop institutional structures
- › NAMA / Sectoral approach to establish the 'enabling environment'

Framework conditions and infrastructure development

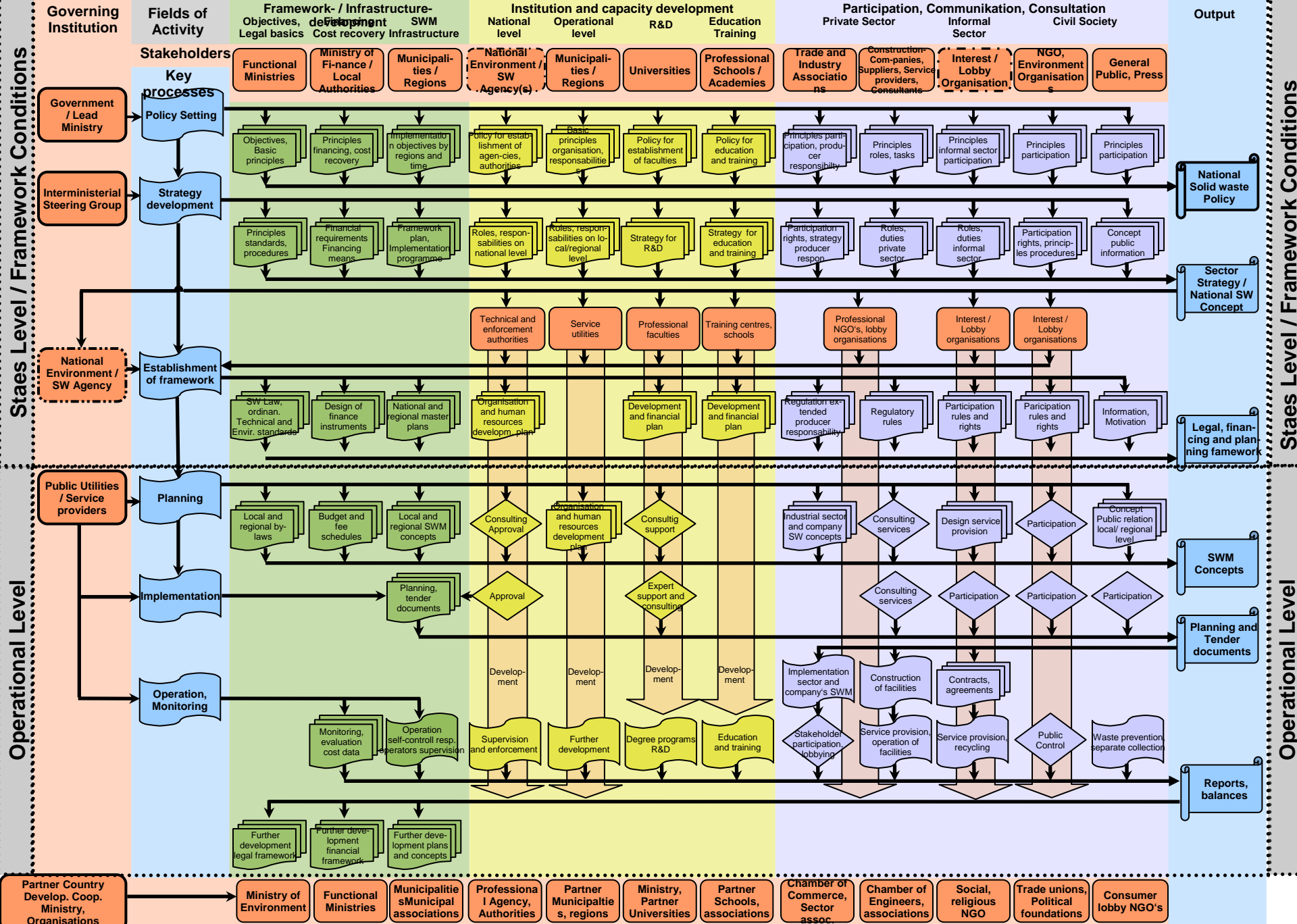
- Definition of objectives and legal framework
- Financing and cost recovery
- Planning and implementation of disposal plants

Institution building and capacity development

- Authorities for regulation, permission, supervision and enforcement
- Efficient project-executing agencies
- Research, development, scientific education
- Professional education and training

Participation of civil society

- Industrial and commercial associations, inter-trade organizations
- Supplier, service providers
(Consultants, SWM disposal and construction companies)
- Informal sector
- NGOs, environment organizations
- The public, press



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Dissertation (German):

<http://rosdok.uni-rostock.de/resolve?urn=urn:nbn:de:gbv:28-diss2013-0028-8&pdf>

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