

Waste Management in German Financial Cooperation

An introduction

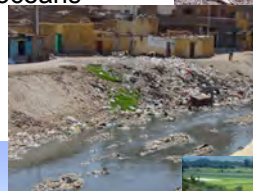
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Aspects of waste management (1)

- **Environmental protection**

Hazards to

- groundwater
- water bodies, coastlines, oceans
- air
- soil
- nature and landscape
- flora, fauna



Aspects of waste management (2)



- **Public health, urban and residential hygiene**
 - Prevention of infections, pandemics and epidemics
 - breeding ground for disease vectors (Malaria, Dengue fever)
 - food source for rats, vermin, pests
 - environment for proliferation of pathogens (Cholera, Pest...)
 - direct contact with infectious waste
 - airborne and waterborne pollutants
 - purification of drinking water, air, foodstuffs
 - accidents, injuries, intoxications (scavengers, in particular), direct infection from durch stings and cuts (Hepatitis, AIDS, BSE...)
 - release/prevention ("sinks") of POPs, bio-accumulating, carcinogenic, mutagenic substances and by-products
 - incidents (fire, explosions, slips)

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Aspects of waste management (3)



- **Climate protection**
 - Prevention of methane formation (CH₄)
 - Climate-killer methane / carbon dioxide CH₄ / CO₂ : 22
 - Waste management contributes to greenhouse gas potential: 5% – 15%
- **Waste as a resource**
 - (Secondary) raw materials extraction
 - Energy conservation through recycling
 - Biomass use
 - (Secondary) fuel
 - Co-processing
 - "Recycling economy"
 - Vision 2020: Zero Waste

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Aspects of waste management (4)



- **Functioning infrastructure systems**
 - Groundwater / drinking water resources
 - Drainage facilities
 - Irrigation channels
 - Canal and ARA residues, sewage sludge
 - Filter dust, residue from exhaust purification
- **Precondition for economic development**
 - “No sustainable production without orderly waste disposal”
 - Contamination of production facilities
 - Hazard to employees' health
 - Image loss → loss of competitiveness
 - DIN ISO 14.000 and following: business partners (must) demand compliance with environmental standards
 - Barcelona process: alignment of environmental standards in EU neighbour states
 - Tourism development
 - Resource and energy efficiency

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Aspects of waste management (5)



- **Poverty relevance in waste management**
 - poor quarters usually have no waste disposal → health hazard
 - poor quarters are often near waste dumps
 - Sorting of recyclable materials is often the only income source for scavengers
 - Child labour in the sorting of materials
- **Good governance**
 - Waste collection is municipal task:
 - decentralisation
 - strengthening of municipal self-administration
 - Treatment / depositing: requires municipal cooperation:
 - orderly landfill: > 150,000 (300,000) inhabitants
 - Administrative level above municipality is lacking
 - Information, communication with population, enterprises
 - Involvement of the private sector
 - Involvement / coordination of the informal sector

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Waste Management Projects in German Financial Cooperation



Total number of projects (since 1999): 32

Number of project countries: 13

Project types: Residential waste management 28

Hazardous waste 4

Financing commitments: EUR 284 mn

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Waste management projects in FC since 1999



Country	Region/City	Population/ beneficiaries	Type of project ¹⁾	Status	Project Duration ²⁾	COM relevance	Remarks	Investment		GFC contribution	
								Investment	Project/TA	Investment	Project/TA ³⁾
Albania	Korça/Posadeq Region	255,000	MSW project	Feasibility Study	nyd	yes		€ 7.1 Mio	not yet det.	nyd	nyd
FYR Macedonia	South-West Macedonia	420,000	MSW project	Appraisal Phase-on hold	nyd	yes		€ 22.2 Mio	€ 7.7 Mio	€ 1.0 Mio	
Turkey	Denizli	330,000	MSW project	in operation	2000-2004	no		€ 11.0 Mio	€ 8.4 Mio	€ 0.7 Mio	
	Dalyan / Köyceğiz Otca	80,000	Component Environment	in operation	1994-2005	no	Turkey has not signed the	€ 3.5 Mio	€ 2.1 Mio	€ 0.7 Mio	
	Samsun Met. Municip.	400,000	MSW project	Construction phase	2002-2006	no	Kyob Protocol	€ 17.5 Mio	€ 9.2 Mio	€ 0.7 Mio	
	Estuzum Met. Municip.	330,000	MSW project	Construction phase	2003-2007	no		€ 14.2 Mio	€ 8.8 Mio	GTZ	
	nyd	n.a.	HWMS	Project Identification	nyd	no		nyd	PL nyd		
Pakistani Territories	Ramallah/Beh District	230,000	MSW project	Feasibility Study	2007-2011	yes		€ 12.0 Mio	€ 10.0 Mio	€ 1.0 Mio	
Egypt	Kat El Sheikh Governorate	nyd	MSW project	Feasibility Study	nyd	yes		nyd	€ 6.0 Mio	nyd	
	Quena Governorate	nyd	MSW project	Feasibility Study	nyd	yes		nyd	€ 6.0 Mio	nyd	
Tunisia	Bzerte Governorate	350,000	Facilities Equipment	Construction finalized	2001-2007	yes	WBPCF	€ 5.1 Mio	€ 3.4 Mio	GTZ	
	Kairouan Governorate	190,000	Facilities Equipment	Construction finalized	2001-2007	yes	WBPCF	€ 3.5 Mio	€ 2.4 Mio	GTZ	
	Sousse Governorate	460,000	Facilities Equipment	Construction finalized	2001-2007	yes	WBPCF	€ 6.4 Mio	€ 4.2 Mio	GTZ	
	Tunis	2200,000	MSW project	Feasibility Study	nyd	yes		nyd	€ 15.0 Mio	nyd	
	Tunisia	n.a.	HWMS	Construction phase	2001-2008	no	Hazardous waste project	€ 19.7 Mio	€ 11.7 Mio	€ 1.1 Mio	
	Tunisia	n.a.	HWMS-Collection points	Implementation	2004-2008	no	Hazardous waste project	€ 7.8 Mio	€ 4.8 Mio	-	
	Medjedta Valley	160,000	Component Environment	in operation	1986-1998	no	to small	€ 4.2 Mio	€ 2.5 Mio	-	
	Region Medjedta	610,000	MSW project	Feasibility Study	nyd	yes		nyd	€ 10.0 Mio	€ 0.7 Mio	
Morocco	Morocco	n.a.	HWMS	Preparation of FS	nyd	maybe	Co-processing in cement industry envisaged	nyd	€ 10.0 Mio	nyd	
South Africa	nyd	nyd	MSW project	Project identification	nyd	yes		nyd	PL nyd	nyd	
China	Peiling	2000,000	Facilities Equipment	in operation	1994-2002	yes	ADB actively	€ 48.8 Mio	€ 19.9 Mio		
	Peiling/Nangong	5000,000	Facilities Equipment	Feasibility Study	2007-2010	yes		€ 80.0 Mio	€ 55.0 Mio	€ 2.0 Mio	
Vietnam	Winh	300,000	ISWM	Feasibility Study	2003-2008	yes		nyd	€ 4.2 Mio	€ 0.8 Mio (DANIDA)	
	Northern Provinces	600,000	Facilities Equipment	Feasibility Study	2007-2011	maybe	not yet determined	€ 12.0 Mio	€ 8.0 Mio	€ 1.5 Mio	
Philippines	Philippines	n.a.	MSW Loan Facility	Implementation	2004-2008	no	minor investments	min. € 16.8 Mio	€ 15.0 Mio	€ 1.34 Mio	
Chile	X Region	1000,000	ISWM-3 projects	Appraisal phase	2007-2009	yes		€ 40.0 Mio	€ 28.8 Mio	€ 1.0 Mio	
Tanzania	Sarabari	210,000	Component Environment	Feasibility Study	2004-2009	no	to small	€ 4.2 Mio	€ 2.5 Mio	-	

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Waste Management Projects in German Financial Cooperation

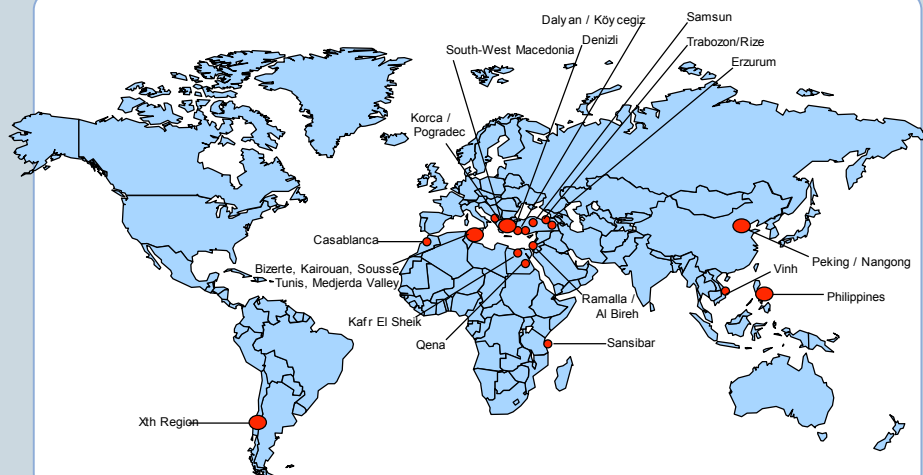


Status of project implementation:

in operation:	7 projects
under construction:	6 projects
in bidding phase:	2 projects
preparatory / appraisal phase:	17 projects

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Project locations / regions of FC-financed waste management projects



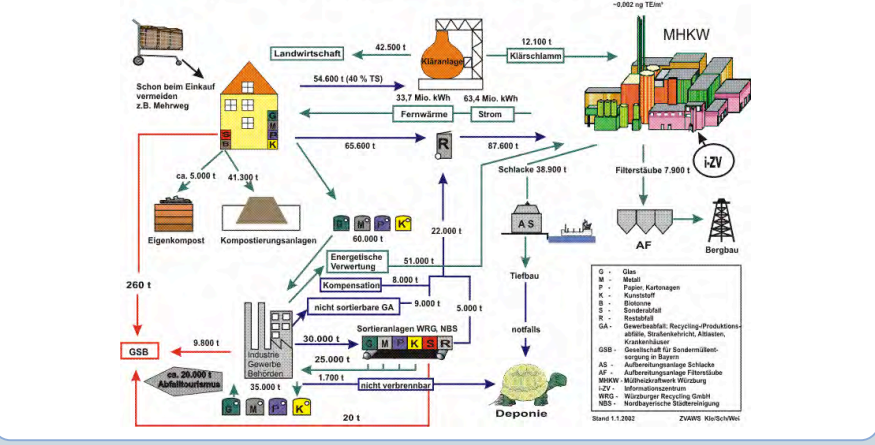
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Modern waste management concept



Abfallwirtschaftskonzept Zweckverband Abfallwirtschaft Raum Würzburg

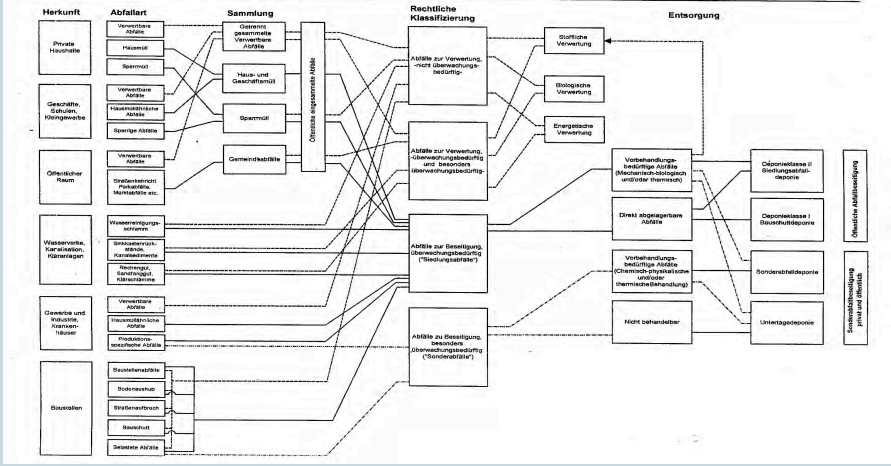
Mitgliedskörperschaften Stadt Würzburg, Landkreis Würzburg und Kitzingen; 380 000 Einwohner



Material flows in residential waste management



Abfallwirtschaft in Deutschland - Vereinfachte Schemadarstellung



“Standard design” of waste management projects



● Objectives

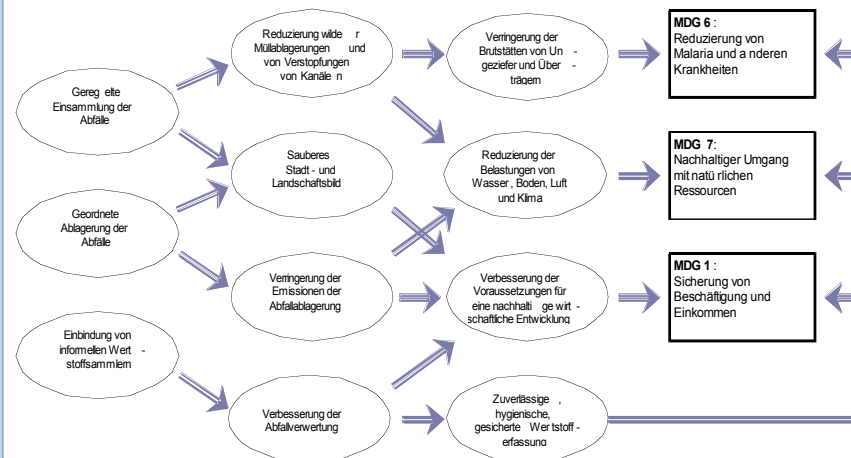
- Implementation of integrated disposal systems
- environmentally sound, sustainable
- avoidance – recycling – environmentally sound elimination

● Components

- Set up / develop independent project implementing agencies (-- > TC component where appropriate)
- Set up / develop tariff system and administration
- Optimise collection and transport system
- Optimise / systematise separate collection – informal sector
- Public relations, information, promote awareness
- Orderly landfill
- Disposal of hospital waste, small quantities of hazardous waste, construction waste, sewage sludge...
- Rehabilitation of waste tips

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MDG and chains of impacts



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Composition and properties of waste - domestic waste



Income group	Low-income countries	Middle-income countries	Upper-income countries
Organic components			
Food wastes / leftovers	50 - 70%	30 - 60%	25 - 40%
Garden waste	5 - 15%	10 - 20%	10 - 30%
Subtotal:	50 - 80%	40 - 70%	30 - 60%
Dry Recyclables			
Paper, Cardboard	2 - 6%	8 - 12%	20 - (40) %
Plastics	1 - 5%	4 - 10%	2 - 8%
Glass	0,5 - 2%	1 - 3%	4 - 12%
Metals	1 - 2%	1 - 3%	2 - 8%
Textiles	1 - 2%	2 - 5%	2 - 6%
Rubber, Leather	1 - 2%	1 - 3%	1 - 3%
Subtotal:	5 - 15%	12 - 25%	30 - 50%
Others			
Fine fraction (< 8mm)*	10 - 30%	15 - 30%	5 - 10%
Miscellaneous	1 - 5%	2 - 10	10 - 15%
Subtotal:	50 - 90%	40 - 70%	30 - 60%
Physical Properties			
Water content	50 - 70%	40 - 60%	30 - 40%
Dry Solid Matter	30 - 50%	40 - 60%	60 - 70%
Dry organic matter**	50 - 80%	35 - 50%	50 - 60%
Dry anorganic matter	20 - 50%	50 - 65%	40 - 50%
Calorific value***	3 - 6 MJ/kg	4 - 7 MJ/kg	8 - 12 MJ/kg

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* Sand, ash, sweepings, dust, coffee and tea grounds etc.
 ** in % of dry substance
 *** Minimum required for self sustaining combustion: > 6 MJ / kg

Cost structures in waste management in DC, industrialising and industrialised countries



	Low income countries	Medium income countries	Industrialised countries
Waste quantity [t / cap / a]	0.15 - 0,3 t	0.25 - 0,4 t	0.3 - 0,6 t
Average income [€ / cap / a]	< 100 - 500	1.500 - 4.000	12.000 - 18.000
Costs in € per t for			
o waste collection	15 - 30	25 - 50	40 - 80
o waste transport	3 - 5	5 - 10	10 - 15
o landfill	0 - 3	12 - 25	60 - 120
o composting	-	5 - 25	40 - 90
o incineration	-	40 - 100	100 - 200
Total cost per capita per year [€ / a]	4 - 8	35 - 80	50 - 120
in % of available per capita income	1,5 - > 5	0,8 - 1,5 %	0,3 - 0,8 %

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Waste avoidance / collection of reusable materials / recycling



Current situation

- Pronounced “culture of avoidance”
- Widespread collection of reusable materials by informal sector (“scavengers”) but very unreliable
- Unhygienic, unhealthy employment conditions (particularly on waste tips)
- Population has limited environmental awareness



➔ **Recycling potential not exhausted**

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Waste avoidance / collection of reusable materials / recycling



Measures

- Where possible: cooperation with the informal sector
- Legalisation / formalisation of the activities of the informal sector
- Systematisation of separate collection
- Public relations, promotion of environmental awareness
- In exceptional cases: composting facilities



➔ **Increase the share of re-used waste**

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Orderly landfill



Current situation

- Waste is disposed of on wild dumps
- Inappropriate sites
- Serious environmental problems for water, soil, air, climate
- Damage to health of nearby inhabitants and persons working on the waste dump



Intolerable disposal practice

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Orderly landfill



Measures

- Construction of central, orderly landfills
- Site-adapted standards where possible
 - Dispense with combination basis sealing / mineral sealing with bituminous protective layer or asphalt sealing
 - Dispense with seepage water purification/ seepage water refeeding ("reactor landfill")
 - Installation of gas treatment after 2–3 years
 - Dispense with pretreatment of hospital waste
- Train operating personnel



Most cost-effective, environmentally sound form of disposal

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Key economic data of selected projects



Country	Region / town	Population	Investment		Dyn. Production costs €/t	Cost per household in % of avail. income.
			€ mn	€/l		
Albania	Korca/Pogradec	265,000	9.9	37	32	0.6% / 1.2%
Macedonia	Region South-West	421,000	23.2	55	31	0.5% / 1.1%
Turkey	Denizli	330,000	11.0	33	24	0.6% / 1.1%
	Samsun	380,000	17.6	46	26	0.6% / 1.1%
	Erzurum	330,000	14.2	43	32	1.0% / 2.0%
	Trabzon/Rize	601,000	27.1	45	36	0.8% / 1.5%
Tunisia	Bizerte	350,000	5.1	15	12	1.9% / 2.9%
Chile	Xth Region	900,000	37.3	41	34	1.0% / 2.0%
Germany					150 – 180 (estim.)	0.3% / 1.0%

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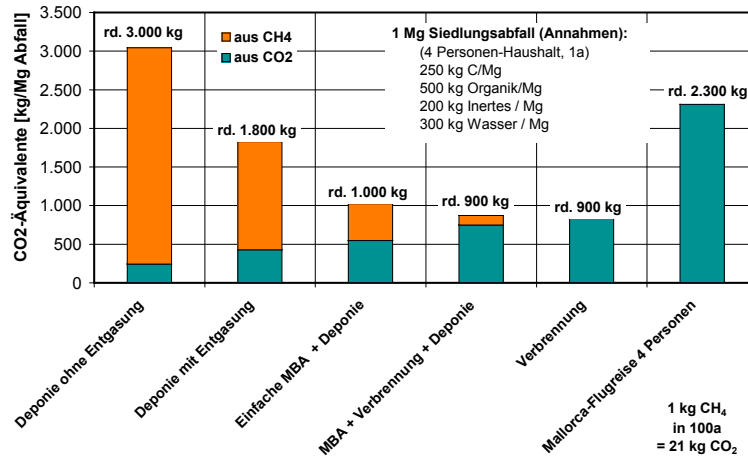
“Standard solution” orderly landfill?



- ❖ Economic framework → low-cost solutions
- ❖ Compromise of environmental soundness ↔ economic viability
- ❖ Seepage water and landfill gas emissions are a latent environmental risk
- ❖ Financing of cost of aftercare is uncertain
- ❖ Methane emissions only partly capturable → climate protection
- ➡ Waste pretreatment is desirable!
- ➡ Can emissions trading contribute to covering the costs?

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Greenhouse gas potential of diverse disposal strategies (source: J. Dach)



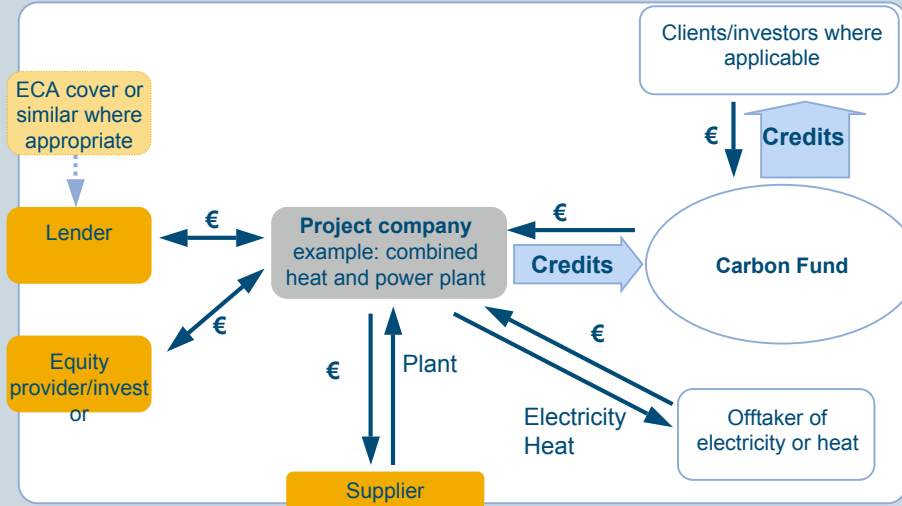
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Example: Trabzon-Rize / Turkey

	Alternative I: Direct dumping	Alternative II-1: MBT + orderly landfill	Alt II-2: MBt + further processing+ orderly landfill
Overall invest (20 a)	EUR 31 mn	EUR 37 mn	EUR 42 mn
Invest 1st section	EUR 16 mn	EUR 27 mn	EUR 27 mn
Dynamic production costs	EUR 38/t	EUR 51/t	EUR 50/t
Cost of operation	EUR 27/t	EUR 36/t	EUR 36/t

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Certificates and project finance Exemplary project structure



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Outlook (1)



● Mechanical-biological waste treatment ("biostabilisation")

- preferred process given composition and properties of waste
- reduction of landfill volume requirement, landfill emissions, aftercare
- management of material flows/ preventive waste management
- contribution to climate protection
- additional costs are objectively manageable (€ 2 – € 3 / inhabitant / year) (in technologically simple processes)

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Outlook



- **Mechanical-biological waste treatment (“biostabilisation”)**

- Preferred process given composition and properties of waste
- Reduction of landfill volume requirements, landfill emissions, aftercare expenditure
- Management of material flows/ preventive waste management
- Contribution to climate protection
- Additional costs are objectively acceptable (EUR 2–3/inhabitant/year) (for technologically simple processes)
- Revenue from emissions trading can cover as much as 30% of the costs of the waste management system

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Outlook



- **Thermal waste treatment**

- Only suitable in special cases for the time being (megacities, industrial zones, hazardous waste)
- Composition and properties of waste usually do not permit autonomous combustion (high water content, high content of inert material)
- Additional costs acceptable only in exceptional cases (EUR 20–30/inhabitant/year)
- Co-incineration/ co-processing offer greater opportunities but pose higher environmental risks

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Thank you.

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