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Potentials and barriers to recycling in the current CDM framework

Bonn, 9 June 2011

Bernhard Gerstmayr

Tobias Koch

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Potentials of sustainable waste management

Barriers to sustainable waste management within the current CDM and approaches to improvements

- AMS III.AJ (recycling methodology)
- The FOD model
- AM 0025

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- Founded in 1991
- Long-standing expertise in waste management

- Shareholders:

Federal State of Bavaria

City of Augsburg

Chamber of Industry and Commerce of Swabia

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Engineering

Process engineering (mechanical, biological, thermal, chemical)

(Specialized) Analytics and test procedures

Machinery & plant design

Consultation

Management

Political consultation

Communication

System analysis

IT

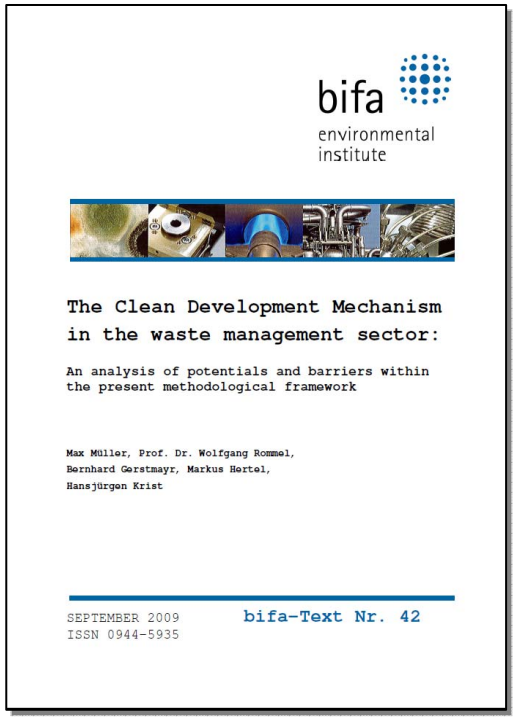
Information systems

Databases

Internet applications

References: How does bifa support modern MSW management in the context of UNFCCC?

Guide for waste management companies on behalf of the German Ministry for the Environment



Scientific publication

NAMA proposal **Methane prevention through sustainable biowaste treatment in Tunisia** (on the internet: http://www.jiko-bmu.de/service/download/doc/994.php)

on behalf of the German Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

in cooperation with Tobias Koch

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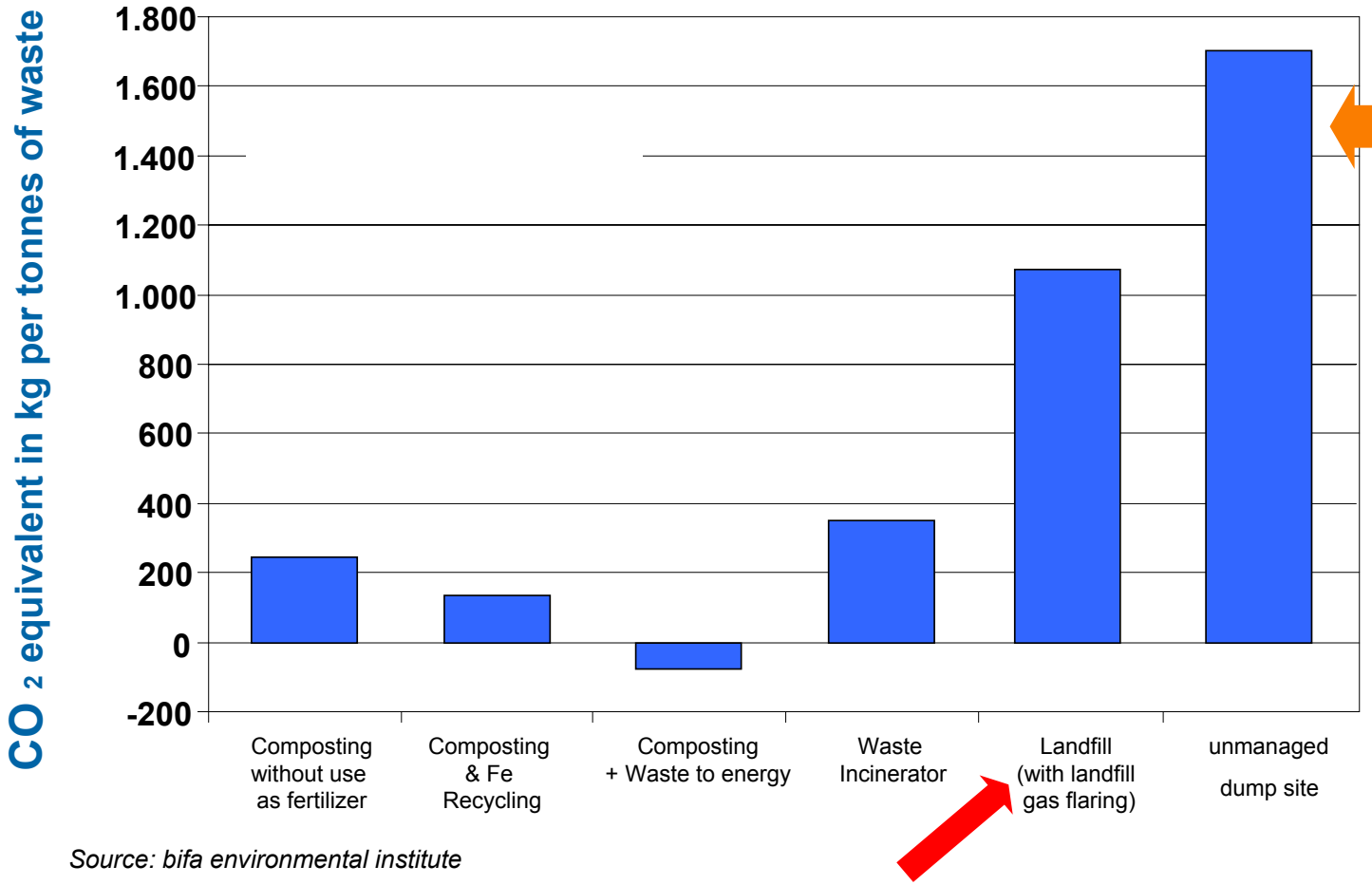
- within AM 0025

LCAs for different ways of disposal

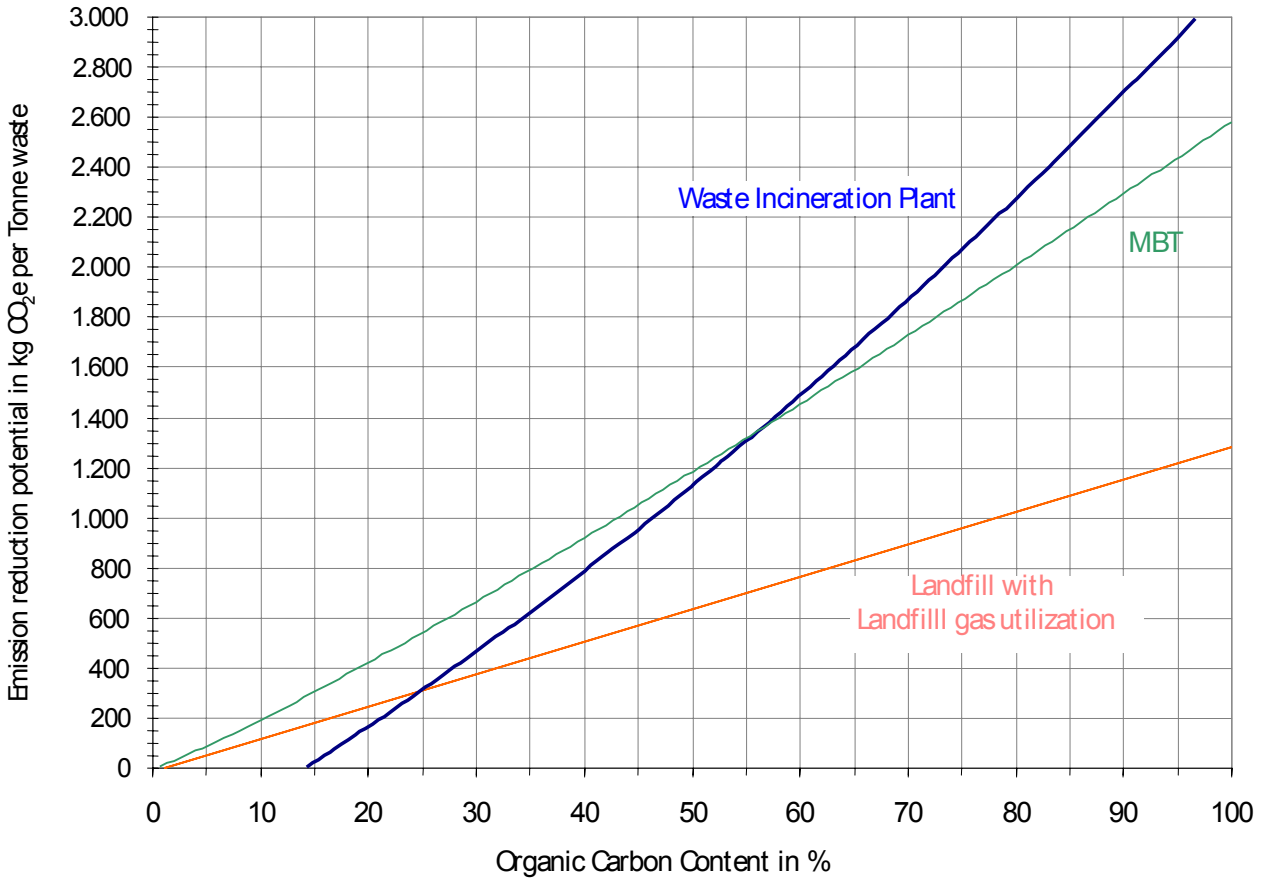
Greenhousegas emissions of waste management systems



Source: bifa environmental institute

- Landfillgas CDM can only avoid less then 50% of GHG emissions

It‘s the organic content



Emissions of waste worldwide (cf. UNEP study „Waste and Climate Change. *Global Trends and Strategy Framework")*

- waste sector „in a strong position to move from being an emissions source to being a major emissions saver"
- average annual per capita waste generation in developing countries is rising in response to economic and population growth
- levels of uncertainty can be as high as 10-30 per cent for developed countries (with good data sets) to more than 60 per cent for developing countries that do not have annual data.

Source:
www.unep.or.jp/letc/Publications/spc/Waste&ClimateChange/Waste&ClimateChange.pdf

Carbon finance essential for making waste treatment feasible

"…composting has the distinction of being the waste management system with **the largest number of failed facilities worldwide**. In cities of developing countries, most large mixed-waste compost plants, often designed by foreign consultants and paid for by aid from their home countries, have **failed or operate at less than 30% of capacity**. The problems most often cited for the failures of composting include: high operation and management costs, high transportation costs, poor quality product as a result of poor pre-sorting (especially of plastic and glass fragments), poor understanding of the composting process, and **competition from chemical fertilizers** (which are often subsidized)"
Sound Practices Composting,1.4.1,
www.unep.or.jp/ietc/estdir/pub/msw/sp/sp4/sp4_1.asp

→ **MSW treatment projects highly additional**

→ **Landfills are least cost alternative**

Study „Climate protection potentials in waste management“ of IFEU and Öko-Institut 2010 on behalf of BMU, UBA and BDE

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- By abandoning landfilling and initiating recycling management the national GHG emissions could be reduced in 2020 by:
  - up to 10 % (Mexico) *
  - up to 13 % (Turkey)
  - **up to 16 % (Tunisia)**

Enormous potential of waste treatment !

- For comparison, the proportion of waste and sewage on the GHG inventory compared to UNFCCC:
  - 10 % (Mexico, 2002) *
  - 8,6 % (Turkey, 2007)
  - **3,6 % (Tunisia, 1994)**

*) The reason for these values being equal is not clearly described in the study.

The study can be downloaded from:
www.bmu.de/abfallwirtschaft/abfallpolitik/abfall_und_klimaschutz/doc/45515.php

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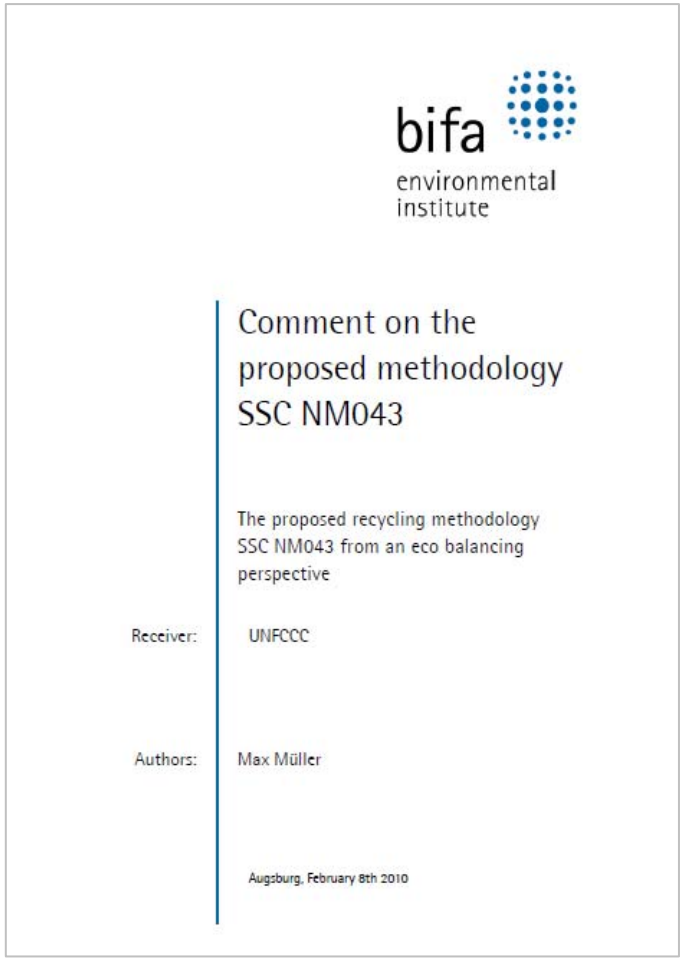
The Polyethylene recycling methodology AMS III.AJ

- Approved in 26. March 2010
- Restricted to HDPE and LDPE only, other materials to be included
- bifa the only stakeholder to comment the proposed methodology in early 2010
- Version 02 of the Methodology picks up some of the remaining critics after approval of version 01 (*e.g. max. 200 km distance*)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Comment on the
proposed methodology
SSC NM043

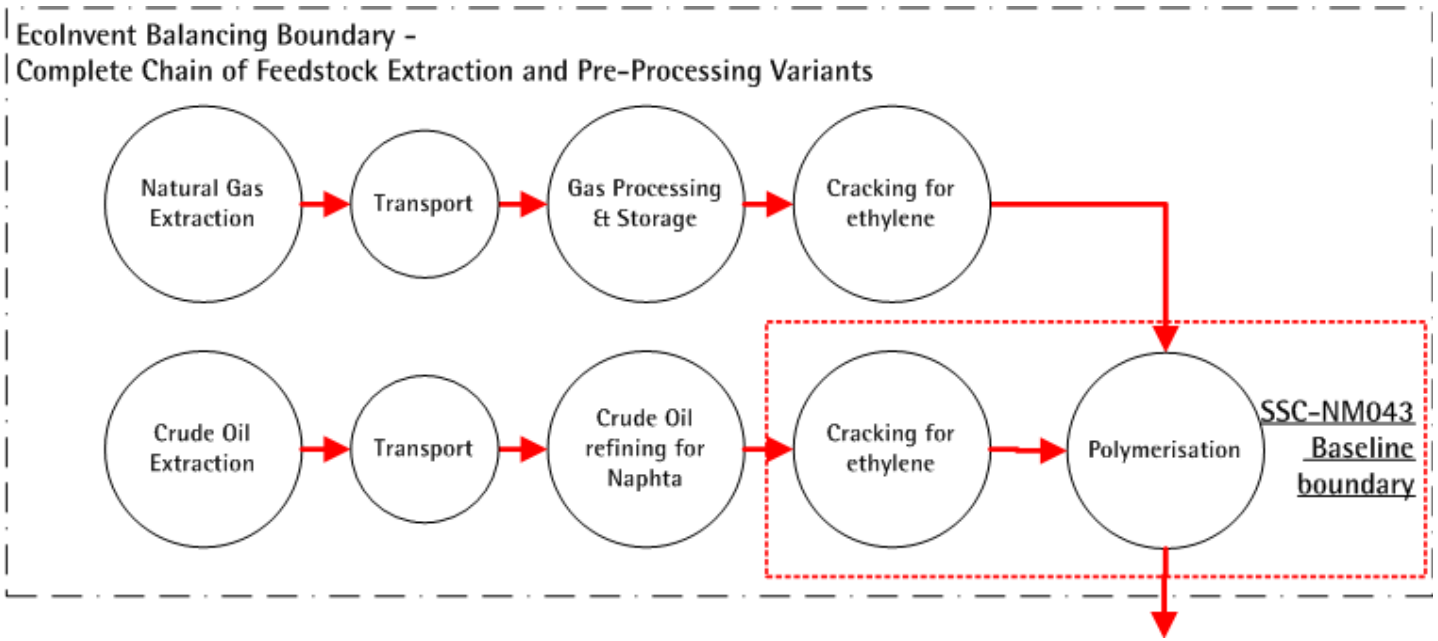
The proposed recycling methodology SSC NM043 from an eco balancing perspective

Receiver: UNFCCC

Authors: Max Müller

Augsburg, February 8th 2010

AMS III.AJ – issues that require a better solution
B*oundaries*



→ Neglects a big share of the GHG reduction potential of PE recycling for reasons of conservativeness:

- transportation
- raw feedstock extraction of the primary resource

AMS III.AJ – issues that require a better solution
Monitoring

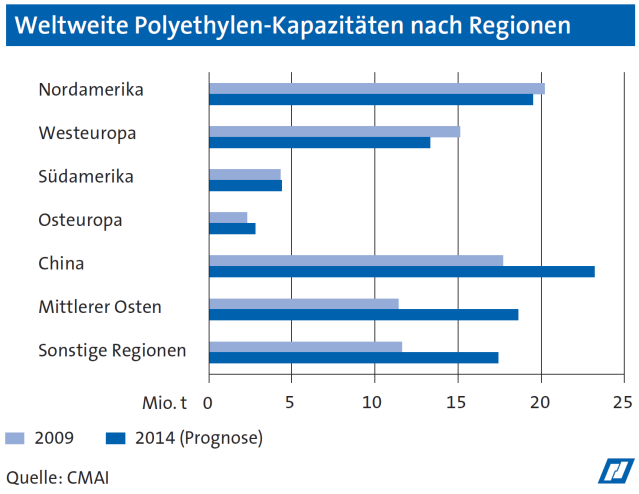
To avoid double-counting the methodology requires to observe the PE market three years in advance of the activity:

- PE from Annex I countries
  ➔ no CER (since it is then an Annex I reduction)
- „ ----------“ from Non-Annex I countries
  ➔ CER

➔Yet there is no practical guidance available on how to conduct such a monitoring

➔Especially in LDC‘s it will proof very difficult

Proposal: Referring to world market statistics for HDPE production:



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Waste Management: AM0025

- 54 projects using AM 0025 under validation (partly already for several years)
- 41 of these are composting projects
- 17 are registered (some 4 years ago)
- 0 CERs issued so far

Source: IGES CDM database 5 -2011

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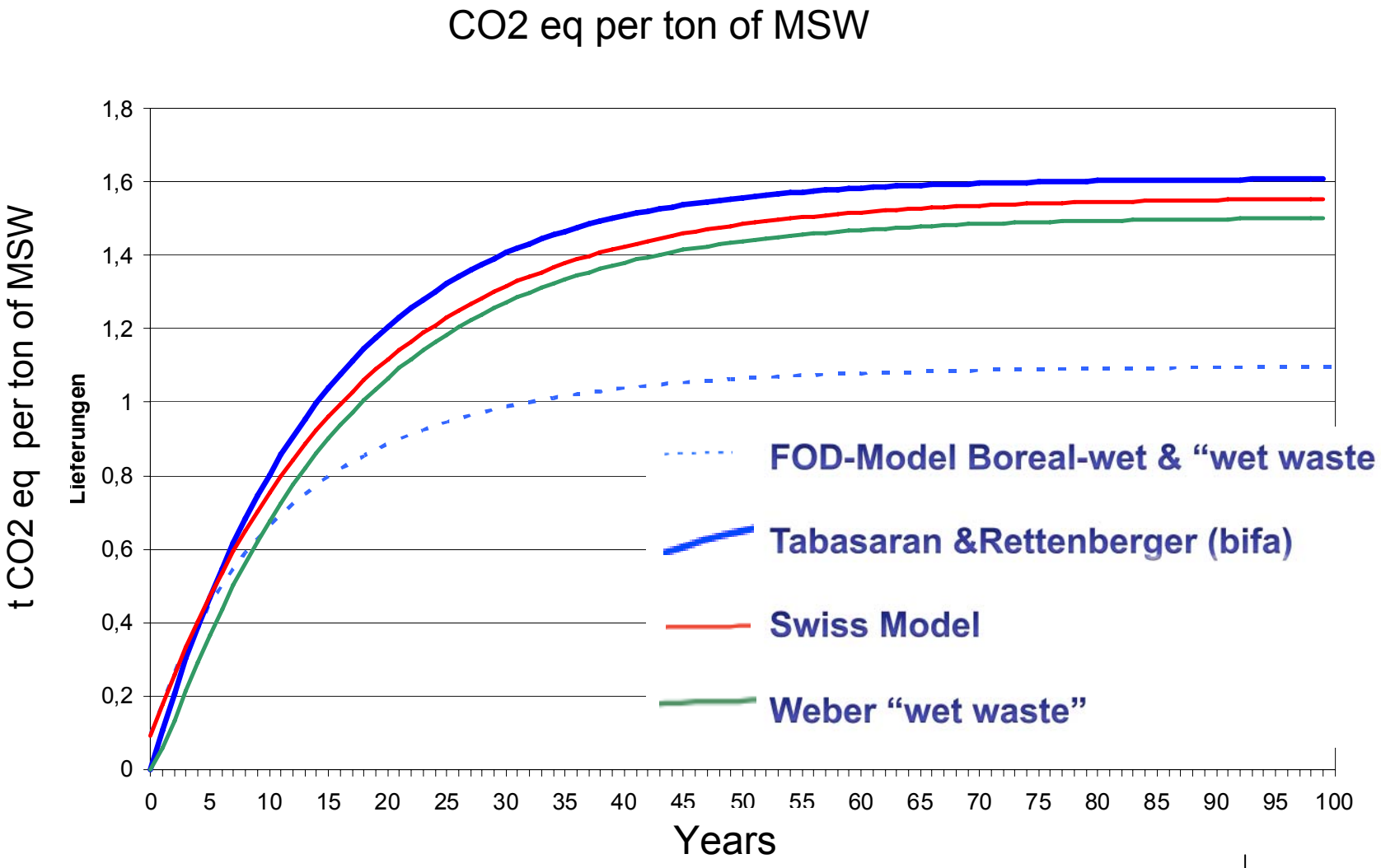
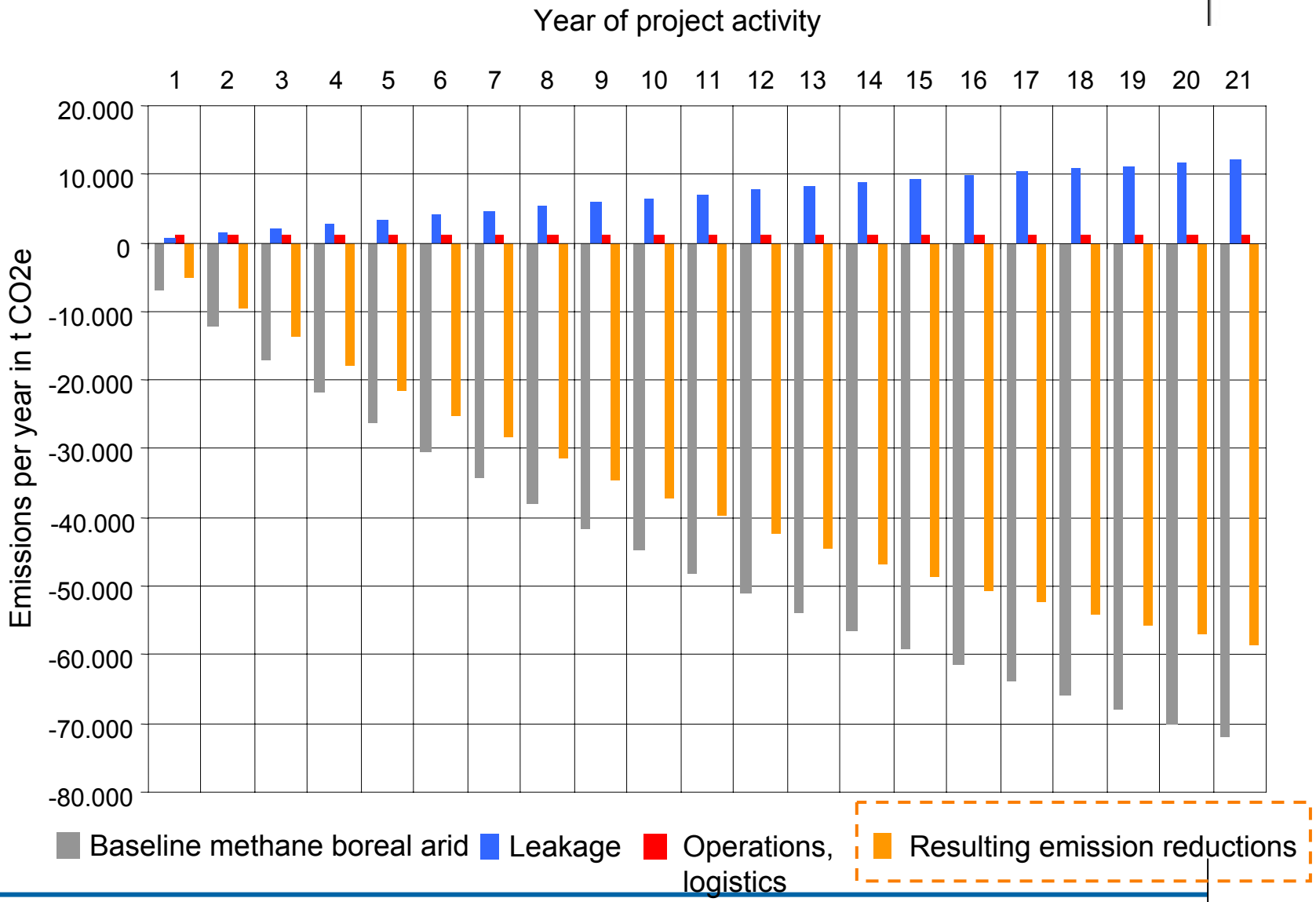
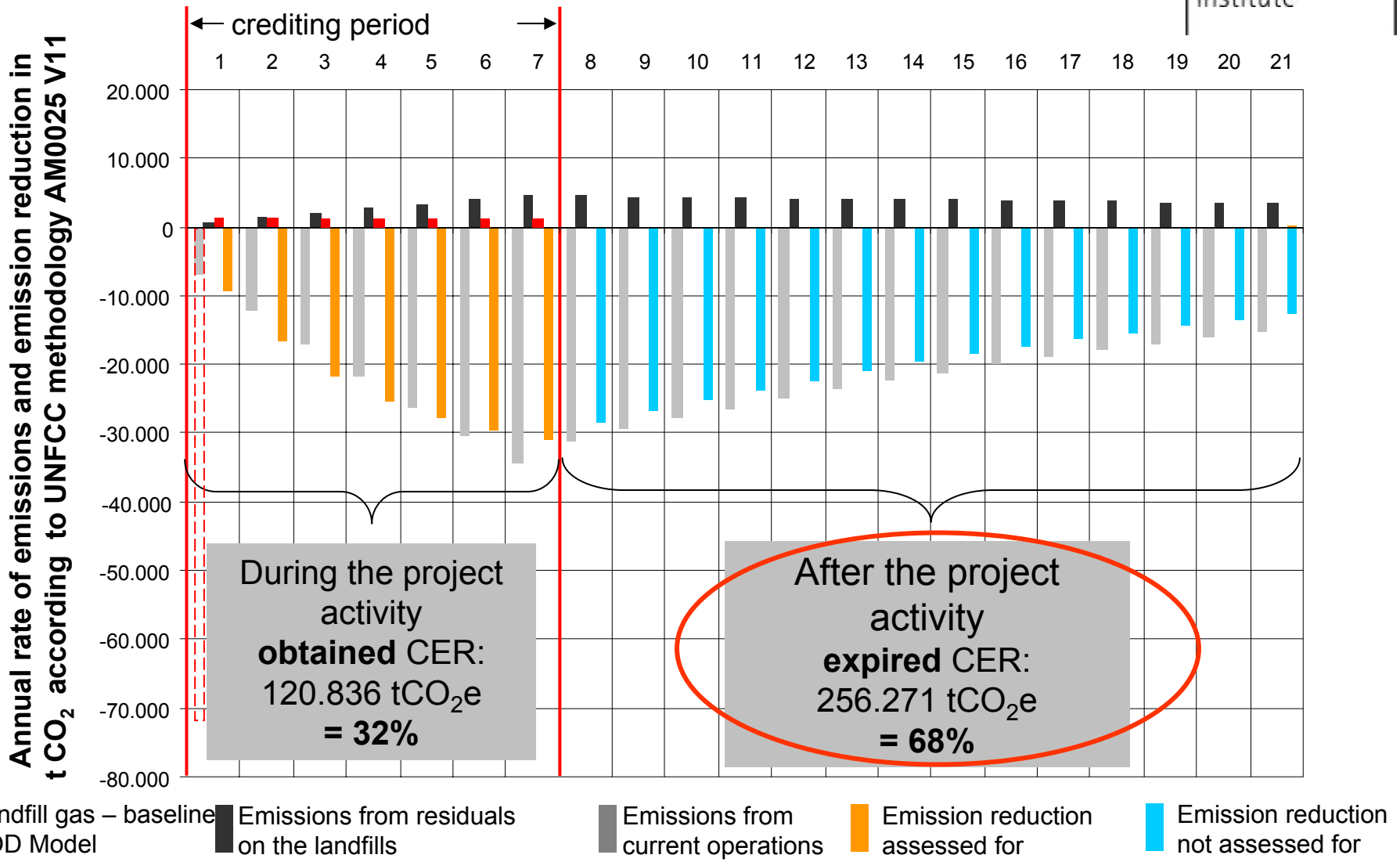
Comparison of scientific models for Methan generation



CER issuance over time



Composting and the "post-mortem" problem – here: project ending after 7 years with no more waste being disposed afterwards



Waste composting facility with 50,000 tonnes of municipal waste per year

Emission avoidance of MSW management in comparison to energy saving lamps

	MSW treatment	Energy Efficiency
Investment	Upfront	Upfront
Activity of project operator	Upfront	Usage of the lamp for several years
Deemed Emission avoidance	At time of waste being processed	During usage
Potential for loss	None (as emission is avoided instantly)	When equipment malfunctions or ceases to exist
Monitoring when?	Moment of MSW elimination	During lifetime of the lamp

→ **Sustainable waste treatment eliminates the source of emissions at one! No later leakage etc.!**

Sustainability factors could represent the positive list

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Table 1: Possible sustainability factors for diverse types of waste management techniques reducing landfill gas emissions

waste management techniques	effective emission reductions performed in t CO_2e	sustainability factor	CER's allocated
landfill gas flaring	100	< 1	<100
landfill gas utilization	100	< 1	<100
waste incineration incl. energy generation	100	1,1	110
MSW digestion	100	1.7	170
MSW composting	100	1.5	150

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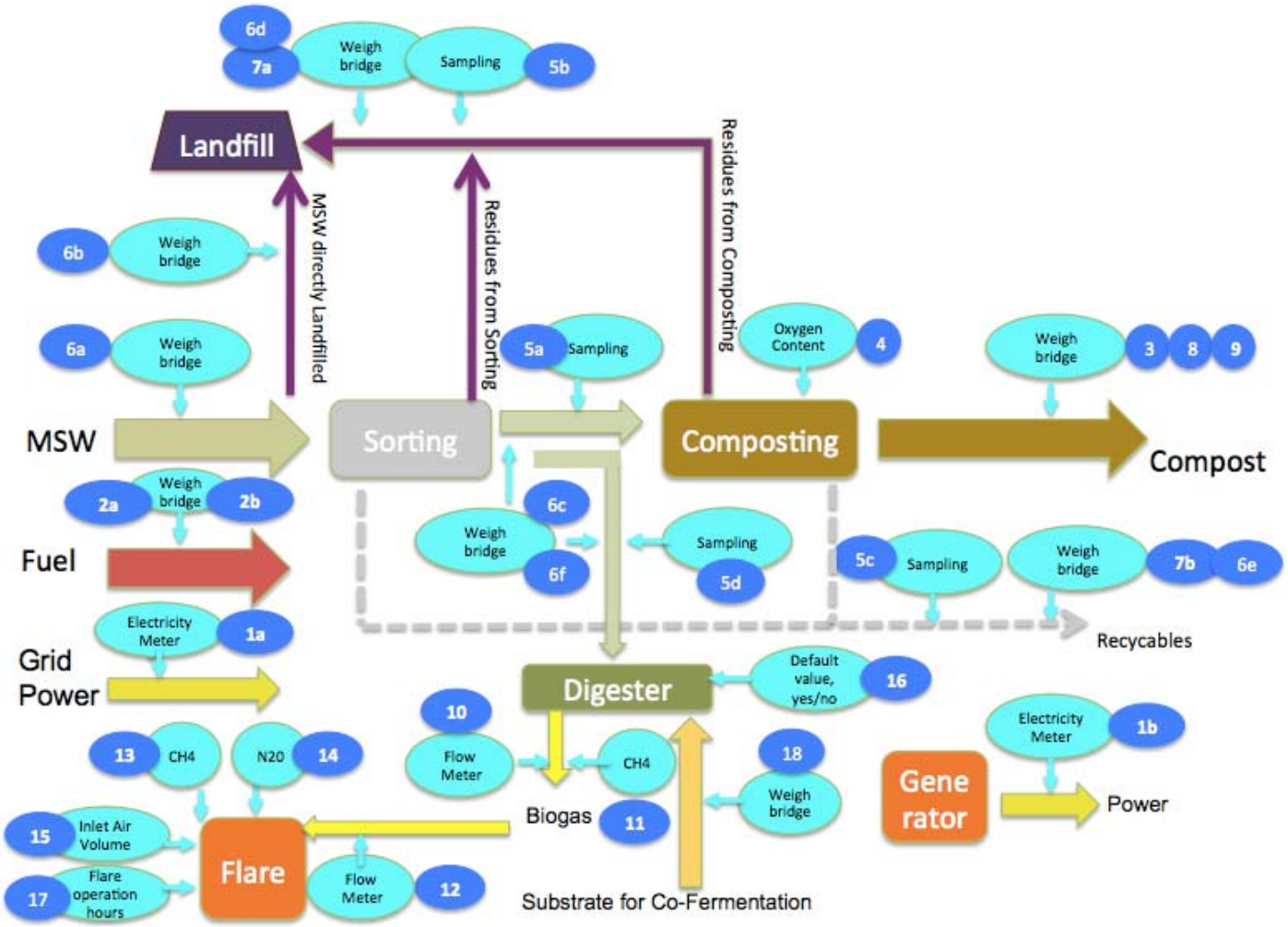
Barriers to successful Implementation of waste treatment

- Complexity of Methodology
- Multiphase approach deprives investors of earnings in the first years and creates windfall profits in later years
- Required data difficult to obtain
- Methodology incomplete & more than 20 errors and mistakes
- Involvement of municipalities early in the project cycle – contractual problems
- Very difficult to validate /difficult to find DOE
- Nearly impossible to be verified
- Very risky technology –no market for products

→ **Sustainable waste treatment projects are not bankable!**

Monitoring of AM 0025 – high degree of complexity



Picture shows monitoring plan only for option composting with biogas for auto generation of power.

→46 Parameters have to be monitored

Problems with monitoring of AM 0025 from practice

- Sampling of waste consistency requires **250** samples per year
- Oxygen deficit measurement in compost can be manipulated limitless without trace
- Emissions from compost transport by informal sector can not be monitored
- Potential emissions from recyclables outside project boundary can not be controlled
- “Safety Flare” monitoring totally out of scale

→ **Monitoring requirements surpass by far abilities of project participants in developing countries**

AM 0025 now – Summary

- 12 Versions – Still more than 20 errors
- Baseline model error up to 60% (literature!)
- Multiphase model unjust (cf. part Gerstmayr)
- Perverse incentives to increase emissions
- Emission reductions form recycling and compost usage not accounted
- Penalties for utilization of recyclables or compost
- Complexity overstrains projects developers, DOEs, etc.
- More than 50% calculation error in registered projects
- Validation takes years, verification is nearly impossible.
- Projects are hardly bankable.

→ Simple degassing is far more attractive within the CDM

Reform of AM0025 - Target

- Create simplified methodology for composting and waste sorting/recycling
- Provide default values for fast validation and allow real life ex-post measurement
- No desincentive of for usage of recyclables
- Limit excess sampling
- Remove excess parameters
- Create simple monitoring plan
- Enable DOE to validate and verify quickly

→Enhance environmental integrity

Proposed changes in baseline calculation

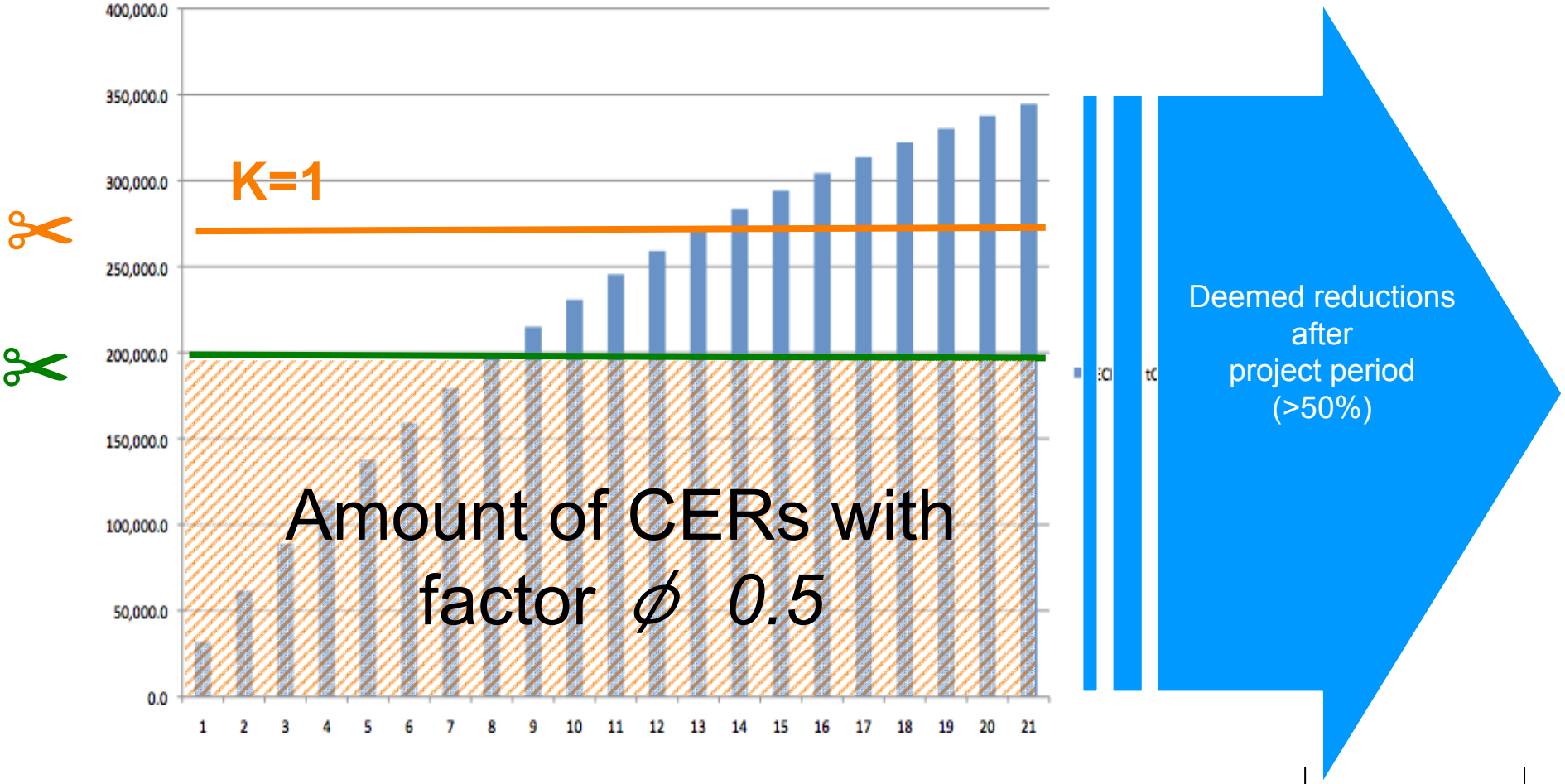
Factor for humidity missing

$$\varphi \cdot (1-f) \cdot GWP_{CH_4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1 - e^{-k_j}\right)$$

- Increase conservativeness of correction factor ϕ *from 0.9 to 0.5 .*
- *OX =1 (always)*
- MCF =1 (future development - not past)
- Include missing discount for water content of waste for using DOCj "dry" values.
- k = 1 (no shifting of CER into the future)

Fixing the Baseline without multiphase approach

Effect of changing factor ∅ *from 0.9 to 0.5*



Proposed changes in monitoring of AM 0025 (1)

- General deduction of 50 % for baseline error would cover all possible changes in the future as well as leakages and small emission sources.
- Demand humidity measurement with DOCj= dry to reduce model error

  Ex-Post measurement of dry weight of waste fractions is not problematic and allows adjustment to all climatic zones and waste collection systems
- MCF has to look into the future and not at past for waste management to avoid perverse incentives

Proposed changes in monitoring of AM 0025 (2)

- Reduce number of waste samples to max 12 per year.
- Allow sampling of waste streams after sorting.
- No leakage for transport of waste or recycables
- No monitoring of safety flares (only gas volume)
- For windrow oxygen deficit and waste water just let DOE monitor good practice
- Encourage recycling! No emission penalties for offsite usage
- Allow participation of informal sector

Revision of AM0025 – some final wishes

- Please start revision right now and have stakeholders included within the revision process
- Putting methodology on hold would hit those hard that are have been in the process of project appraisal for several years
- Putting methodology on hold would stop waste disposal in many cities – danger for pubic health!
- Terminate multiphase approach!
- Allow ex-post adjustment for existing projects to avoid failure during verification

→ **Please mind DEC 2012 deadline!**

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Thank you very much!

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Annex: DOC_j values in the methane tool

Data / Parameter:	DOC_j
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Values to be applied:	Apply the following values for the different waste types *j*:

Waste type *j*	**DOC_j (% wet waste)**	**DOC_j (% dry waste)**
Wood and wood products	43	50
Pulp, paper and cardboard (other than sludge)	40	44
Food, food waste, beverages and tobacco (other than sludge)	15	38
Textiles	24	30
Garden, yard and park waste	20	49
Glass, plastic, metal, other inert waste	0	0

→ "% dry waste" is misleading language – "dry weight of waste" would be correct

Annex: DOC_j values stated in IPCC

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TABLE 2.4
DEFAULT DRY MATTER CONTENT, DOC CONTENT, TOTAL CARBON CONTENT AND FOSSIL CARBON FRACTION OF DIFFERENT MSW COMPONENTS

MSW component	Dry matter content in % of wet weight [1]	DOC content in % of wet waste		DOC content in % of dry waste		Total carbon content in % of dry weight		Fossil carbon fraction in % of total carbon	
	Default	Default	Range	Default	Range [2]	Default	Range	Default	Range
Paper/cardboard	90	40	36 - 45	44	40 - 50	46	42 - 50	1	0 - 5
Textiles [3]	80	24	20 - 40	30	25 - 50	50	25 - 50	20	0 - 50
Food waste	40	15	8 - 20	38	20 - 50	38	20 - 50	-	-
Wood	85 [4]	43	39 - 46	50	46 - 54	50	46 - 54	-	-
Garden and Park waste	40	20	18 - 22	49	45 - 55	49	45 - 55	0	0
Nappies	40	24	18 - 32	60	44 - 80	70	54 - 90	10	10
Rubber and Leather	84	(39) [5]	(39) [5]	(47) [5]	(47) [5]	67	67	20	20
Plastics	100	-	-	-	-	75	67 - 85	100	95 - 100
Metal [6]	100	-	-	-	-	NA	NA	NA	NA
Glass [6]	100	-	-	-	-	NA	NA	NA	NA
Other, inert waste	90	-	-	-	-	3	0 - 5	100	50 - 100

[1] The moisture content given here applies to the specific waste types before they enter the collection and treatment. In samples taken from collected waste or from e.g., SWDS the moisture content of each waste type will vary by moisture of co-existing waste and weather during handling.

[2] The range refers to the minimum and maximum data reported by Dehoust *et al.*, 2002; Gangdonggu, 1997; Guendehou, 2004; JESC, 2001; Jager and Blok, 1993; Würdinger *et al.*, 1997; and Zeschmar-Lahl, 2002.

[3] 40 percent of textile are assumed to be synthetic (default). Expert judgement by the authors.

[4] This value is for wood products at the end of life. Typical dry matter content of wood at the time of harvest (that is for garden and park waste) is 40 percent. Expert judgement by the authors.

[5] Natural rubbers would likely not degrade under anaerobic condition at SWDS (Tsuchii et al., 1985; Rose and Steinbüchel, 2005).

[6] Metal and glass contain some carbon of fossil origin. Combustion of significant amounts of glass or metal is not common.

→DOC_j dry values have to be adjusted with % of waste humidity at disposal site