



THE SECOND EGYPTIAN SOLID
WASTE MANAGEMENT FORUM 2014

24th and 25th November 2014
Cairo

المنتدى المصري الثاني
لإدارة المخلفات الصلبة ٢٠١٤

٢٤ - ٢٥ نوفمبر ٢٠١٤
القاهرة



Umwelt
Bundesamt

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Greenhouse gas emissions from MSW management in Egypt

Results of the project

„Climate protection potentials in the waste management sector“

funded by the German Federal Environment Agency

Egyptian Solid Waste Management Forum 2014

November 25, 2014

Cairo

Dr.-Ing. Georg Mehlhart, Cornelia Merz

Agenda

- **Introduction to the project**
- Data
 - Waste generation
 - Waste composition
 - Waste treatment
- Waste flows in Status Quo and Scenarios
- Greenhouse gas emissions

Project

- The project is sponsored by the German Federal Environment Agency (UBA) with the aim:
 - To apply the LCA approach for the calculation of GHG for the waste sector for Germany, OECD, India and Egypt.
 - To establish harmonised methodologies.
 - Illustration of GHG mitigation potentials in the waste sector
 - Utilization of the findings in waste technology transfer
- Lifecycle Assessment (LCA) approach:
 - Follows MSW flows from their origin to final utilization or disposal
 - GHG emissions from MSW treatment = debits
 - GHG savings from useful products from MSW treatment = credits

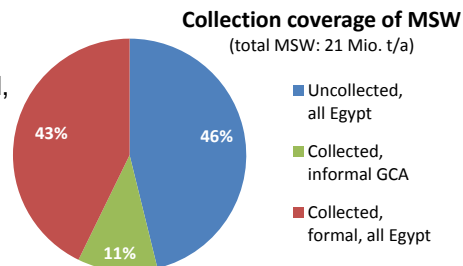
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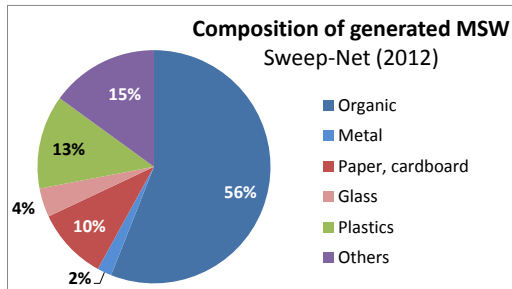
MSW generation

- Underlying data
 - Total about 21 Mio. t/a in 2010 (approx. 75% urban, 25% rural)
 - Urban population 43% (CAPMAS 2011)
 - Distribution by governorate from Ministry of Industry and Trade-study (2008) for 2006, scaled up to 2010

- NSWMP 2013:
 approx. 40% of MSW uncollected,
 less than 10% recycled,
 „rest is dumped on open“

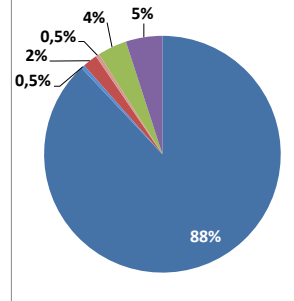


MSW composition



- Used for waste collected by Zabbaleen in GCA (at doors)

at formal collection
GIZ/I+U (2006), Kafr El-Sheikh



- Used for formally collected (by companies, municipalities, civil society) & uncollected waste

MSW treatment options

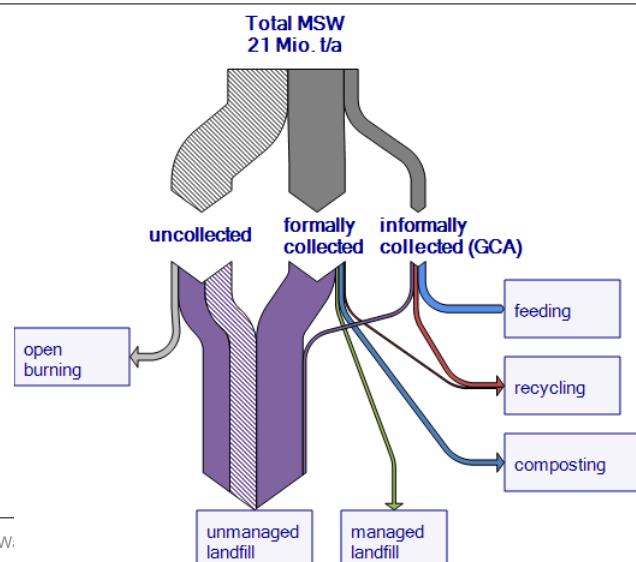
- Main sources for Status Quo (SQ)
 - Informal (GCA, Zabbaleen): CID (2008), Zaki (2013)
 - Formal: Metap/EEAA (2005), Sweep-Net (2010, 2012), Zaki (2013)
 - Uncollected: El-Messery et al. (2009), Zaki (2013)
- Assumptions Scenario 1 (Sc 1)
 - Complete coverage
 - Source segregation dry/wet
- Assumptions Scenario 2 (Sc 2)
 - Complete coverage
 - Source segregation dry/wet (+ biogas)
 - Dry fraction 100% treated by MBT

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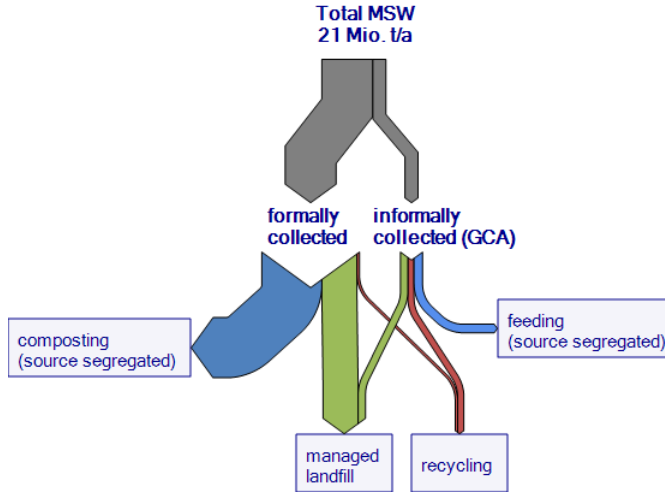
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Waste flows – Status Quo (SQ)



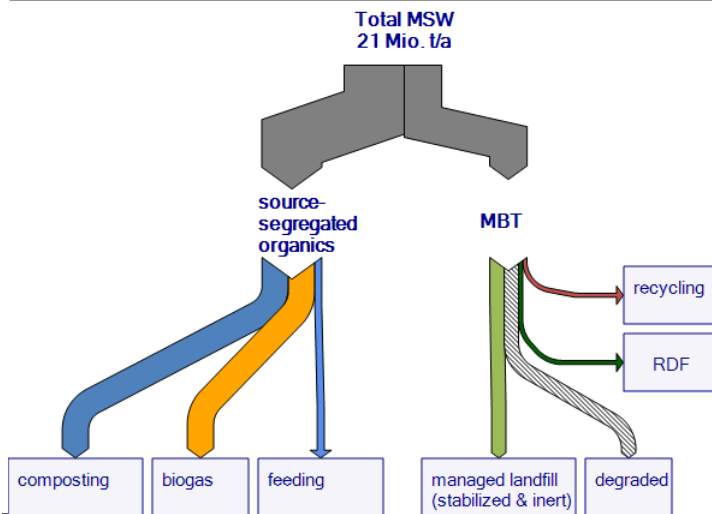
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Waste flows – Scenario 1 (Sc 1)



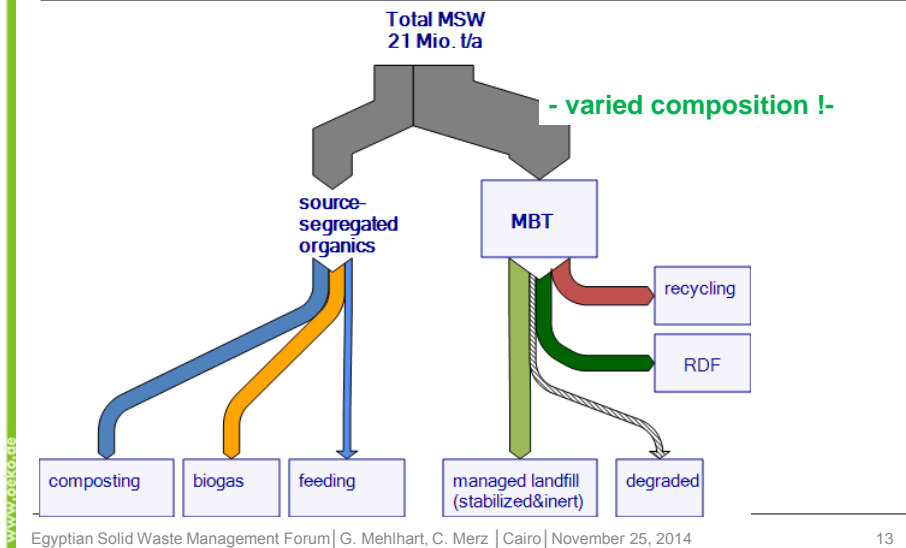
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Waste flows – Scenario 2 (Sc 2)



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Waste flows – Scenario 2 (Sc 2)



13

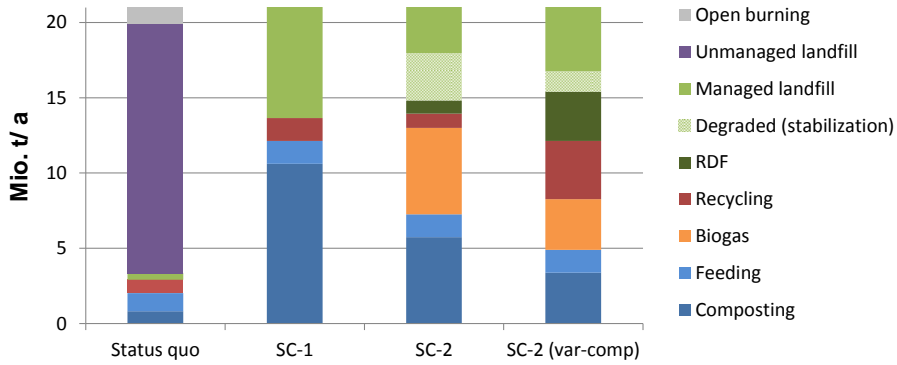
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- **Greenhouse gas emissions**

14

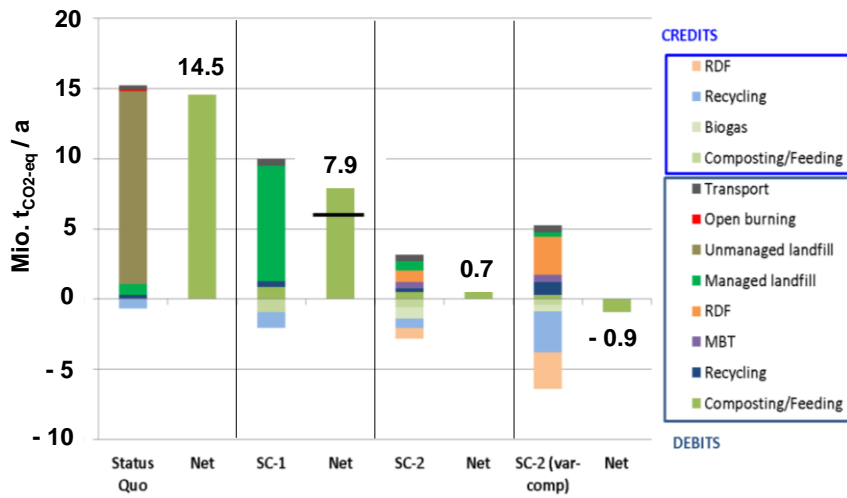
Waste treatment – Comparison

Waste treatment options - status quo vs. scenarios



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GHG emissions – Comparison



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Conclusions

- Current emissions related to MSW management are relevant (approx 5%) of the reported GHG emissions
- They can be significantly reduced by collecting & treating all waste with adequate technology
- Source segregation of organic fraction is crucial (for waste management, climate & hygienic issues)
- Recycling contributes significantly to CO₂-mitigation, activities underestimated in this study; recycling sector should be supported
- Biogas should be considered as an option
- Managed landfill has limited effects to reduce GHG emissions

Project Publications

The full report is published soon in German including an English summary at:

<http://www.resourcefever.org/publications.html>

English presentations on the findings for OECD and India, held during IFAT in Munich are published at:

<http://www.umweltbundesamt.de/service/termine/konferenz-abfall-klimaschutz-auf-der-ifat-2014>

Thank you for your attention!

Reserve

Collection coverage

- Collection coverage
 - Sweep-Net 2012: 40-85% urban, 0-35% rural
 - El Messery et al. 2009: 27% rural
 - Specific values from Min. I+T (2008) available for some governorates
 - For modelling
 - Default values: 60% urban, 27% rural
 - Specific values where available
- No source segregation

„Players“ in collection

- Collection by
 - Formal sector
 - Informal sector (mainly Greater Cairo Area, GCA)
 - For modelling: only considered for GCA (30% of MSW generated)
 - Door-to-door recyclables collection (purchase) takes place, but not quantifiable
 - Assumption: not included in generated MSW amounts
 - Waste picking takes place, but not quantifiable
 - Included in so far as formally collected waste contains low quantities of recyclables
 - Especially no PET bottles in waste / plastics recycling
 - ⇒ Composition analysed by GIZ/I+U 2006
 - ⇒ Underestimation of actual recycling practices in Egypt!

Treatment options, formal

- Treatment options, formal
 - Underlying composition: GIZ/I+U KES 2006
 - Split according to Sweep-Net 2012
 - Composted 9% (assumption: 100% organics)
 - Recycled 2.5% (assumption: equal distribution across all recyclables)
 - Landfilled 5%
 - Open-dumped 83.5%
 - Composition for landfill and open-dump corrected by removed organics (composting) and recyclables (recycling)
 - RDF neglected in status quo

Treatment options, informal

- Treatment options, informal
 - Underlying composition: Sweep-Net 2012 (no picking, as door-to-door collection)
 - 80% of collected MSW recycled (e.g. GIZ/CID 2008)
 - Organics used for feed
 - Recyclables traded
 - Remaining 20% equally distributed across all fractions
 - Finally transferred to dump/landfill

Treatment options, uncollected

- Treatment options, uncollected
 - Underlying composition: GIZ/I+U KES 2006
 - Rural (estimated 39%), based on El Messery et al. 2009
 - Combustibles partly used as fuel in kitchen ovens (=> modelled as only organics)
 - Feeding and composting of part of organic fraction
 - Some open burning
 - Rest: open dumped (partly in drainage canals)
 - No Recycling
„very limited informal recycling activities take place in rural areas (low recyclable constituents content)”
 - Urban (estimated 61%)
 - Open dump
 - Open burning neglected („very limited in some slums“)
 - Recycling neglected, waste picking not quantifiable

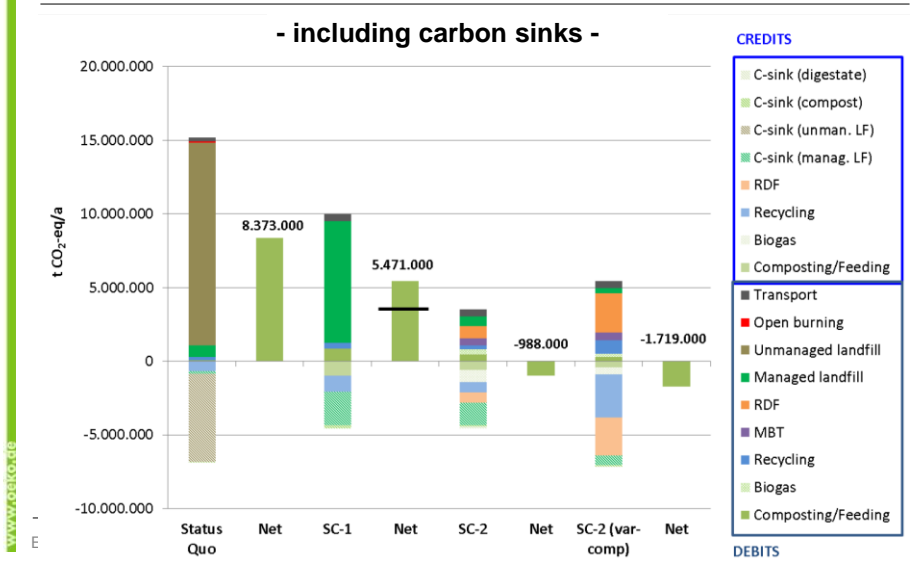
Emission factors I

- Feed
 - No debit
 - Credit approx. with dedicated fodder crops (e.g. beets, soy beans)
 $\approx 0.02 \text{ kg-CO}_2\text{-eq/MJ}$
- Composting
 - Debit: av. CH_4 - and N_2O -emissions (Gewitra 2009, as for India),
 for formal composting transport considered
 - Credit: for formal composting only 10% considered (mixed waste)
- Fuel in kitchen ovens
 - No debits, no credits
- Open burning
 - Plastics and textiles contribute to fossil CO_2 -emissions

Emission factors II

- Recycling
 - Harmonized global values
 - For metals 87% Fe, 13% Al
- Disposal on land
 - According to IPCC 2006
 - $\text{DOC}_f = 0.5$
 - Methane correction factor (MCF)
 - Landfill: $\text{MCF} = 1$ (no correction)
 - Open dump: $\text{MCF} = 0.4$ (less CH_4 due to dry, shallow disposal)
 - For uncollected waste: 50% disposal in drainage canals etc.: $\text{MCF} = 1$
- Transport (lump-sum value)
 - All MSW, 100 km distance, emissions for DE-1980ies LCV (as for India)

GHG emissions – Comparison



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