MSW management in India

First results within the scope of the project

"**Climate protection potentials in the waste management sector**"

on behalf of the German Federal Environment Agency

Workshop "**Waste and climate change**"

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Agenda

- **MSW Management in India**
  - Waste amount
  - Waste treatment
  - Results GHG accounting
- **Outlook: Scenarios 2030**
  - Low-tech scenario
  - High-tech scenario
  - Results GHG accounting
- **Questions for discussion**

MSW management in India – current situation

- MSW generated
  - According to (WBI 2008) in 2005 about 42 Million tons waste was generated in **urban** India (1/3 of total population)
  - In a recent study (Annepu 2012) waste generated in **urban** India is estimated to be about 70 Million tons in year 2011
  - The per capita waste generation is estimated to be 0.376 kg per day or about 166 Million tons waste generated in total in India

- MSW collection
  - Collection rate in **urban areas** ranges from 50 to 90%, in some cities as low as 25% (MoUD/CPHEEO 2005)

MSW management in India – current situation

- Informal sector for recycling
  - Around 4 million tons retrieved for recycling in 2005 - roughly **10% of generated waste** (WBI 2008)

Estimate used in current calculations

Other informal recycling estimates (Annepu 2012)

- Collection of recyclables **after** formal collection estimated to be 20%
- Collection of paper, glass, metals at households **prior to formal collection** is estimated to be 4 times higher than recyclables picked up **after** formal collection; roughly 80%
- Total recyclables collection percentage **20% of generated waste**

MSW management in India – current situation

- MSW composition – different data sources and years

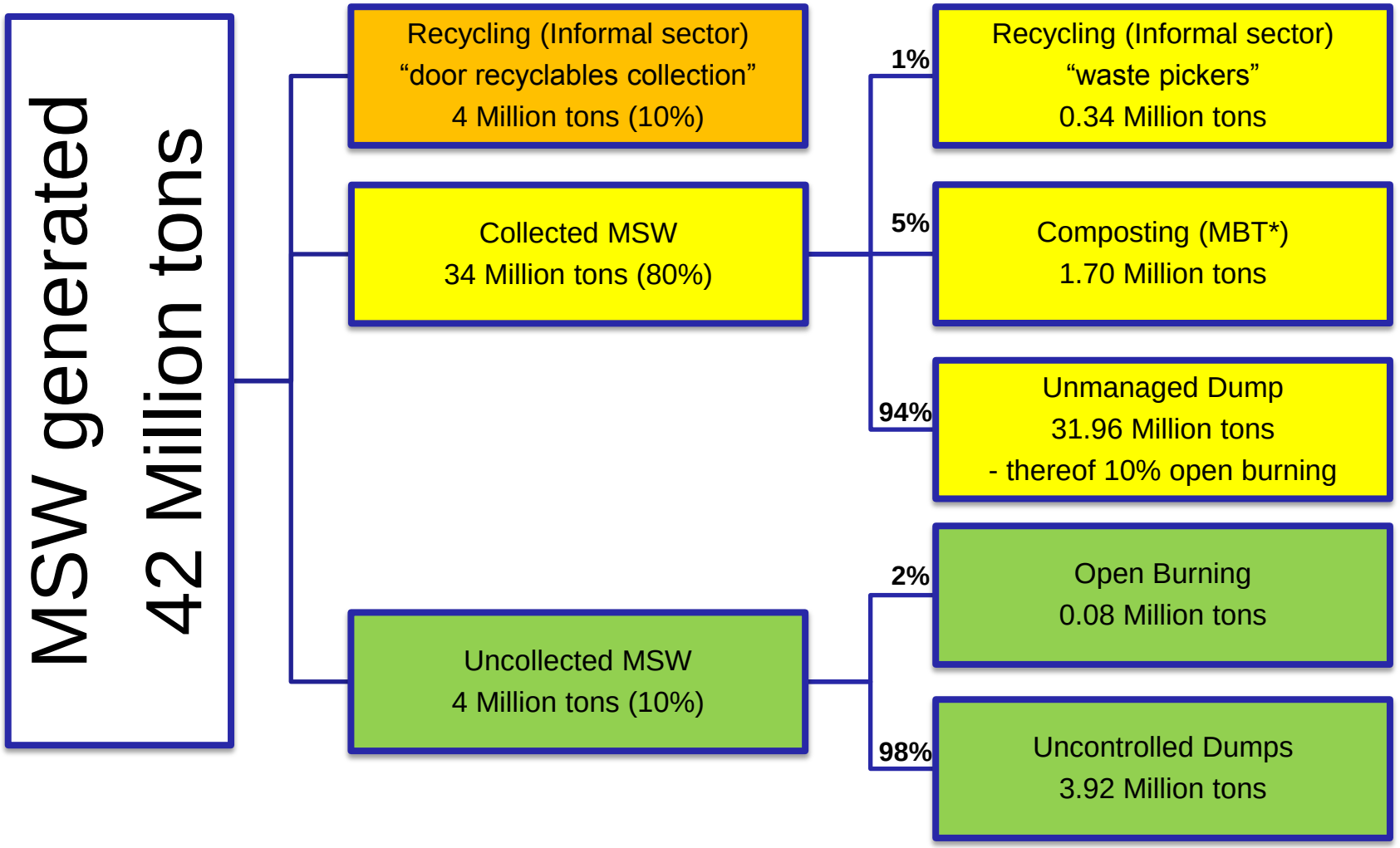
Share in %	(WBI 2008) for 2005		(Annepu 2012) for 2011 (for collected waste)	(Sharholy et al 2008) CPCB 2000 for metrocities	
Biodegradables	47		51	42	
Paper	8	23	17	4	19
Plastic, rubber	9			5	
Metals	1			2	
Glass	1			2	
Textiles	4			6	
Inert Material	25		31	40	
Others	4		NE	NE	
Water content	-		47	30	
LHV (MJ/kg)	-		7.3	7.433	

NE = not estimated

- Waste composition is important for GHG accounting:
  - determines lower heating value (LHV) as well as fossil and biogenic carbon content which are the basis for methane and fossil CO_2-emissions calculated

MSW management in India – used data

- MSW generated and fate according to (WBI 2008)



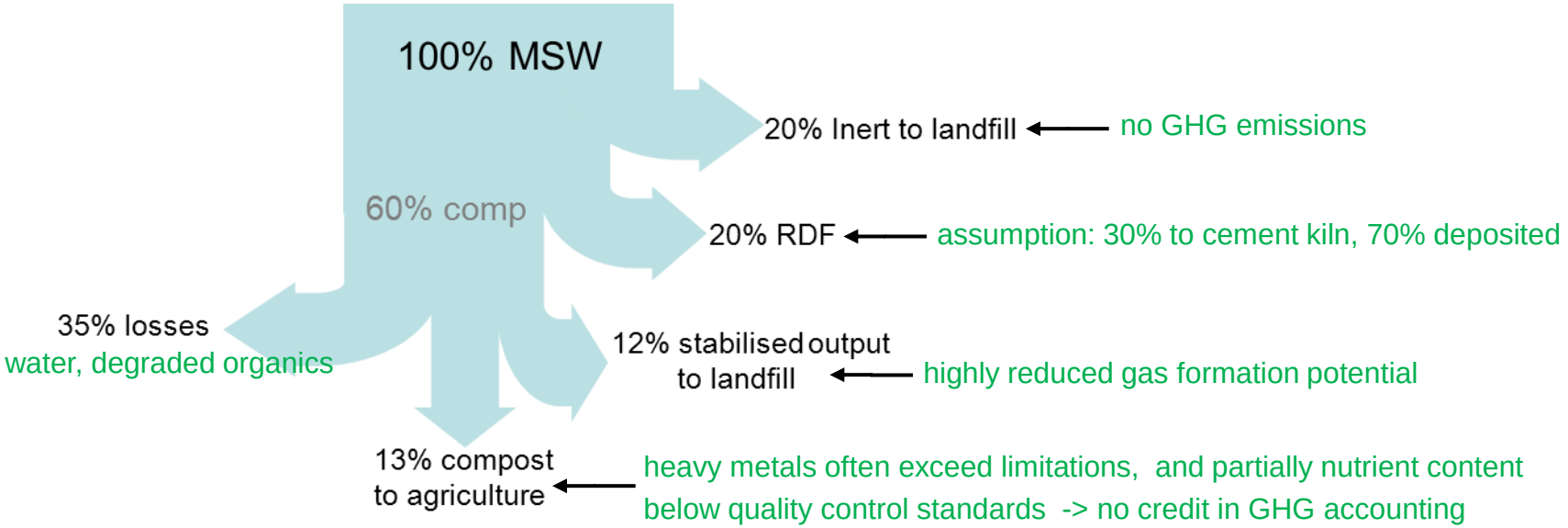
*mixed waste composting facilities, referred to as simple mechanical-biological treatment plants (MBT)

MSW management in India – GHG accounting

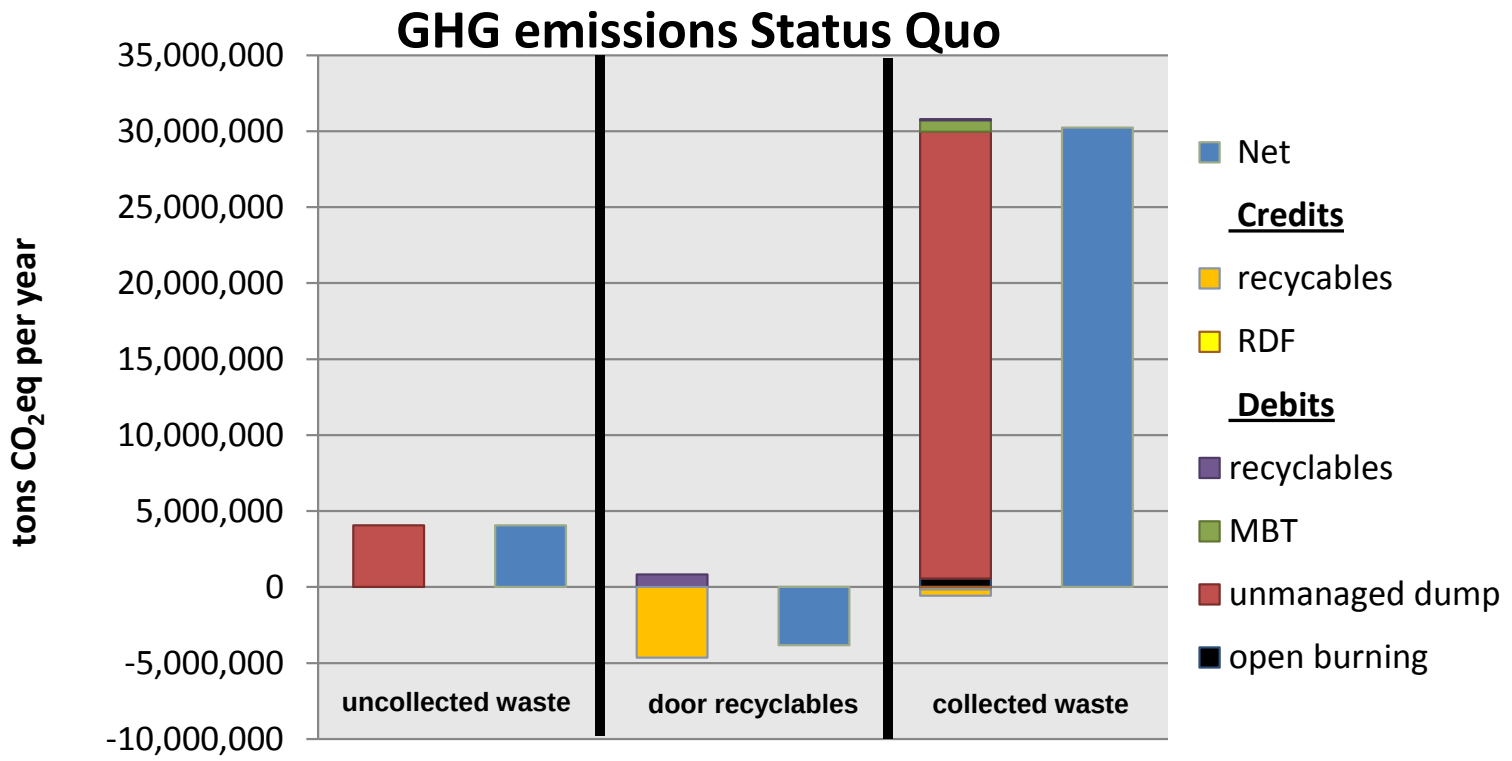
same accounting in ADM Tool presented in the afternoon

- Recyclables
  GHG emission factors based on data for Germany / Europe
- Unmanaged / uncontrolled dumping
  - (IPCC 2006): 50% of biogenic carbon is degraded forming landfill gas with 55% methane by volume
  - characterization factor methane = 25 kg CO_2eq/kg (IPCC 2007)

- composting (MBT) assumption mass flow in average



Results GHG accounting Status Quo



- total net GHG emissions about 30 Million tons CO_2eq
- no difference between landfilling of uncollected and collected waste
- credits only from recycling and co-incineration of RDF (no compost GHG credit)
- GHG mitigation possible with sanitary landfill and/or alternative treatment options

Outlook: Scenarios 2030

"low-tech" scenario

- no change in informal recycling sector
- all MSW is collected
- 50% remaining MSW deposited on **sanitary landfill**, 20% gas collection efficiency, collected landfill gas flared
- 50% remaining MSW treated via **MBT**, 20% of input RDF-fraction co-incinerated in cement kiln, no change on benefit of compost

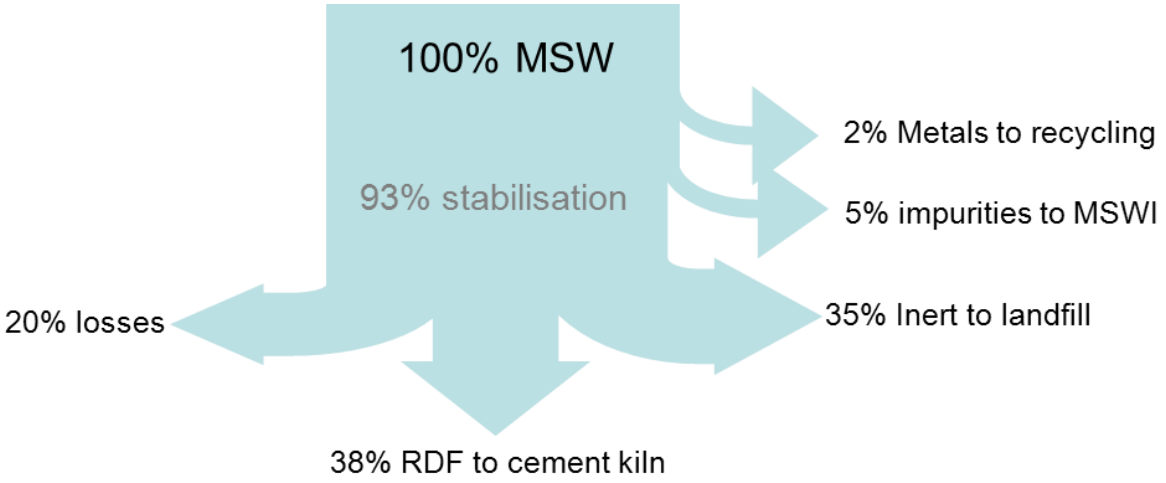
"high-tech" scenario

- no change in informal recycling sector
- all MSW is collected
- 50% remaining MSW treated via **MBS**, 38% of input RDF-fraction co-incineration in cement kiln, no compost
- 50% remaining MSW treated via **MSWI**, plastics removed and recycled prior to incineration

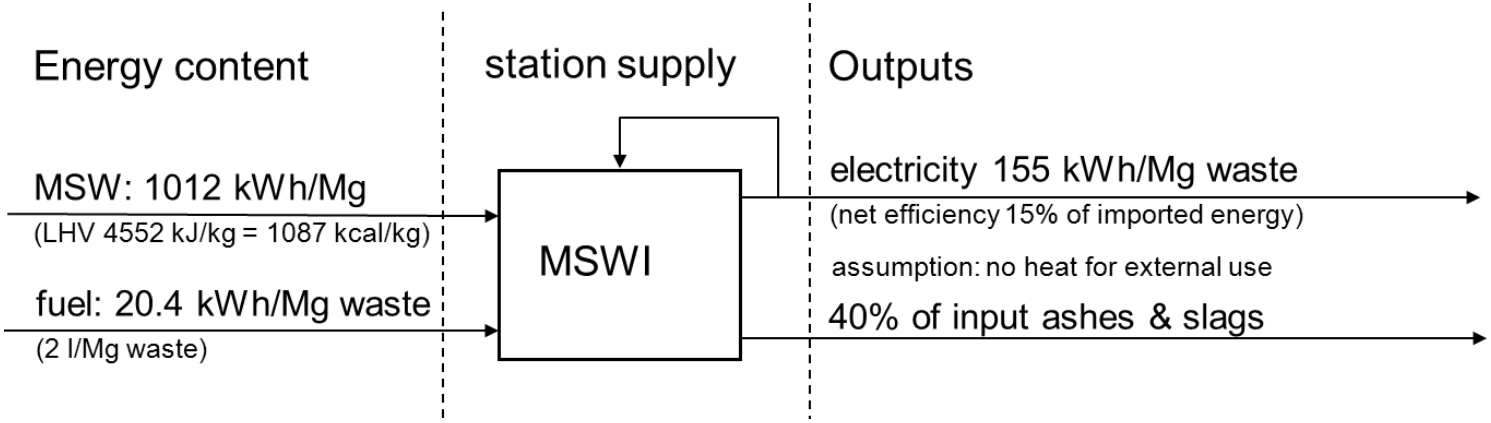
Outlook: scenarios 2030 – "high-tech" plants

same accounting in ADM Tool presented in the afternoon

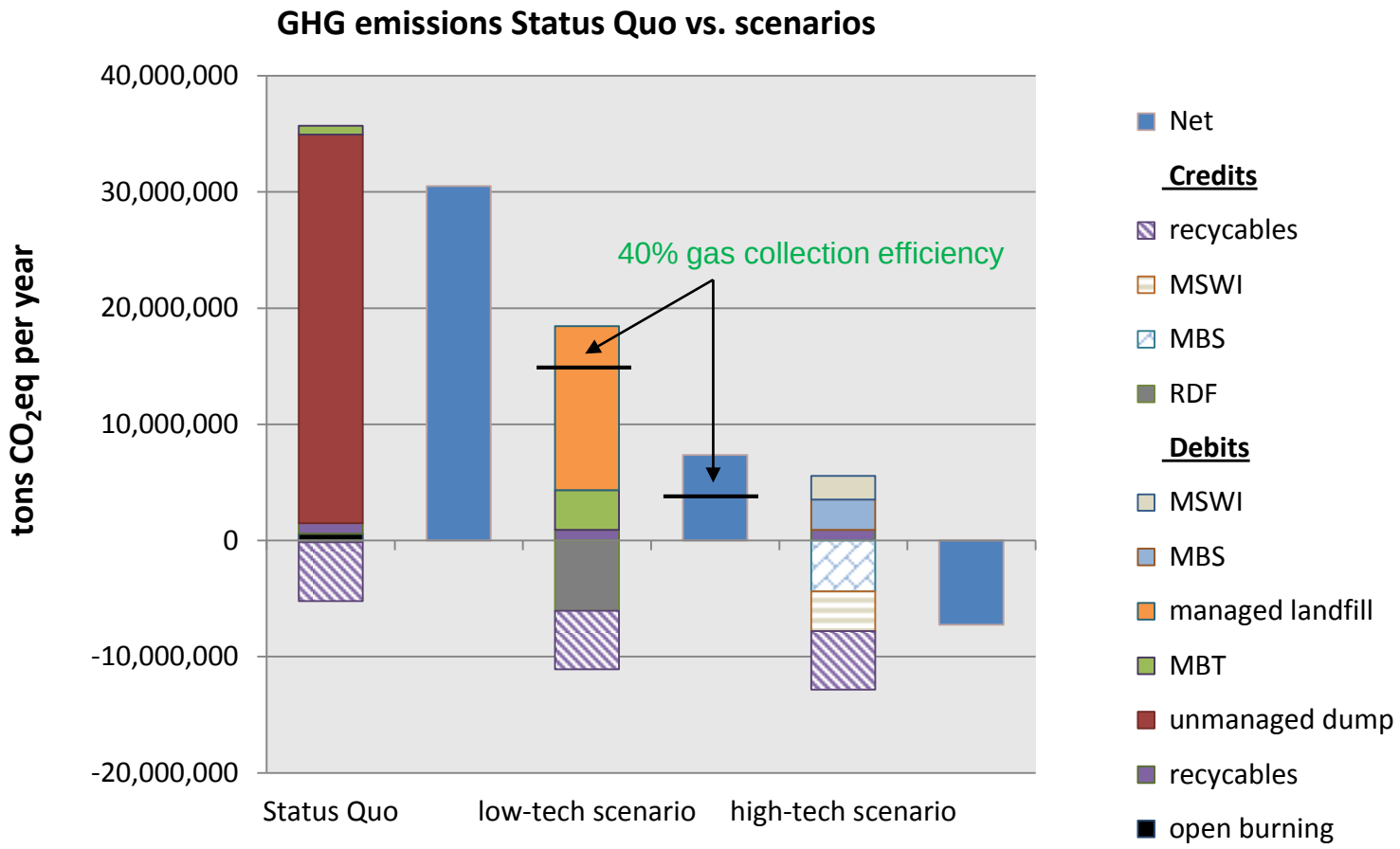
- MBS mass flow, main product RDF



- MSWI mass/energy flow



Results GHG accounting scenarios 2030



- total net GHG emissions "low-tech" scenario reduced to about 7 Million tons CO_2eq
- total net GHG results "high-tech" changes is about -7 Million tons CO_2eq

➔ both scenarios present a significant co-benefit to GHG mitigation

Summary

- Data
  - different data for total MSW generated and MSW composition
  - only estimates for recyclables collected by informal sector – assumptions necessary
  - no data for rural area
  - assumptions necessary for MBT regarding mass flow and RDF use
- Draft results of GHG accounting
  - Results should be considered preliminary due to data uncertainty
  - However, there is significant GHG mitigation with alternative treatment

Conclusion

Integrated waste management not only helps to prevent water, soil, air pollution and to minimize grave health risks for inhabitants and people working in informal sector but also gives a significant co-benefit to GHG mitigation

Questions for discussion

- Current situation
  - recommendations for data used: MSW amounts, fate, composition?
  - better information available on rural vs. urban waste generation?
  - are assumptions for composting (MBT) realistic?
  - further information for treatment of recyclables?

- Future development in the next 20 years
  - what are possible future trends for MSW management in India?
  - what are the main goals for the development of MSW management?
  - how should MSW in India be treated in the future?
  - is source separated collection of organic waste an option?
  - could collection of recyclables be increased/improved in cooperation between formal - informal sector?
  - are there preferred technologies or others which seem not to be suitable for India?
  - are there differences to be considered for different regions in India?

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Thank you very much for your attention!