Climate MRV for Africa – Phase 2
Development of National GHG Inventory
Overview of Waste Data

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Agenda

- Municipal Solid Waste
- Industrial Waste
- Sludge
- Other Waste
- MSW Generation
- MSW composition
- Estimating Historical Values

Municipal Solid Waste (MSW)

- **MSW includes:**
  - Household waste;
  - Garden (yard) and park waste
  - Commercial/institutional waste

Industrial Waste

- Some industries generate significant amounts of organic waste
- In many countries, data on industrial waste is not covered by general waste statistics
- In most developing countries, industrial waste is disposed of with MSW and therefore it is not possible to obtain statistics separately
- Only data for industrial waste that are expected to contain DOC or fossil carbon are important to collect

Sludge

- In some countries, sludge is disposed of with MSW
- Sludge applied on agricultural land is treated in AFOLU sector
- Emissions from sludge treatment in wastewater treatment plants is treated with emissions from wastewater
- Amount of sludge removed from WWTP to be disposed of in SWDS, composted, or anaerobically digested should be consistent
- Default DOC is 5% on wet basis for Domestic sludge (assuming dry matter content of 10%) while a value of 9% for industrial sludge (assuming dry matter content of 35%)

Other Waste

- **Clinical waste**
  - Usually incinerated
  - Emissions of CO2 of fossil origin, CH4 and N2O

- **Hazardous waste**
  - Waste oil, waste solvents, and other wastes with hazardous nature, such as flammability, explosiveness, and toxicity
  - If disposed in special landfills, emissions are minor

- **Agricultural waste**
  - Emissions from manure and open burning of agricultural waste treated in AFOLU sector
  - If disposed of with MSW, emissions are accounted in waste sector

Solid Waste Generation

- Solid waste generation rates and composition vary from country to country depending on
  - Economic situation
  - Industrial structure
  - Waste management regulations and
  - life style

MSW Generation per capita

- These data are based on weight of wet waste and can be assumed to be applicable for the year 2000.

TABLE 2.1
MSW GENERATION AND TREATMENT DATA - REGIONAL DEFAULTS

Region	MSW Generation Rate[1, 2, 3] (tonnes/cap/yr)	Fraction of MSW disposed to SWDS	Fraction of MSW incinerated	Fraction of MSW composted	Fraction of other MSW management, unspecified[4]
Asia					
Eastern Asia	0.37	0.55	0.26	0.01	0.18
South-Central Asia	0.21	0.74	-	0.05	0.21
South-East Asia	0.27	0.59	0.09	0.05	0.27
Africa[5]	0.29	0.69	-	-	0.31
Europe					
Eastern Europe	0.38	0.90	0.04	0.01	0.02
Northern Europe	0.64	0.47	0.24	0.08	0.20
Southern Europe	0.52	0.85	0.05	0.05	0.05
Western Europe	0.56	0.47	0.22	0.15	0.15

Source: V5_CH2_Waste_Data IPCC 2006 Guidelines

Waste Composition

- Different waste types contain different amount of degradable organic carbon (DOC) and fossil carbon.
- Default data on waste composition in MSW are provided for the following waste types:

- (1) food waste
- (2) garden (yard) and park waste
- (3) paper and cardboard
- (4) wood
- (5) textiles
- (6) nappies (disposable diapers)
- (7) rubber and leather
- (8) plastics
- (9) metal
- (10) glass (and pottery and china)
- (11) other (e.g., ash, dirt, dust, soil, electronic waste)

Waste Composition – Default Values

Table 2.3 MSW COMPOSITION DATA BY PERCENT – REGIONAL DEFAULT									
Region	Food Waste	Paper/ cardb oard	Wood	Textile	Rubber/ leather	Plastic	Metal	Glass	Other
Africa									
Eastern Africa	53.9	7.7	7.0	1.7	1.1	5.5	1.8	2.3	11.6
Middle Africa	43.4	16.8	6.5	2.5		4.5	3.5	2	1.5
Northern Africa	51.1	16.5	2	2.5		4.5	3.5	2	1.5
Southern Africa	23	25	15						
Western Africa	24.2	27.5	11						

DOC and Fossil Carbon Content

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

Fossil Carbon Content in Other Waste

TABLE 2.6
DEFAULT DOC AND FOSSIL CARBON CONTENTS IN OTHER WASTE (PERCENTAGE IN WET WASTE PRODUCED)

Waste type	DOC	Fossil carbon	Total carbon	Water Content
Hazardous waste	NA	5 - 50 [1]	NA	10 - 90 [1]
Clinical waste	15	25	40	35

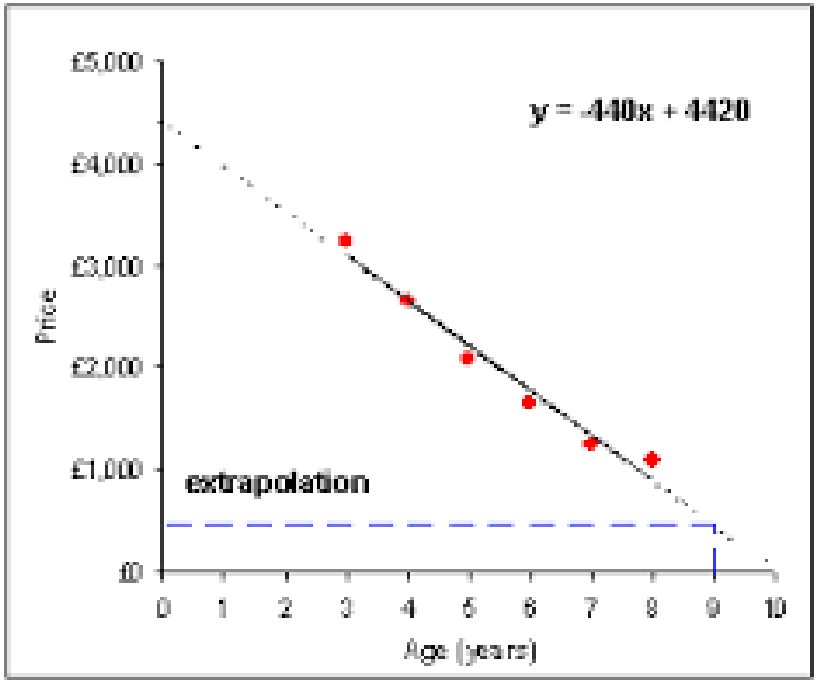
NA = not available

Sources: Expert Judgement; IPCC 2000

[1] The higher fossil carbon value is for waste with lower water content. When no data on the water content are available, the mean value of the range should be used.

Extrapolation of Waste Activity Data

- Population only
- GDP only
- Population and GDP



Examples – Population

- **Greece**
  - The quantities of municipal solid wastes for the period 1960-2000 was estimated on the basis of **population figures**
  - MSW generation rates **assumed 0.8 – 1.1 kg/ capita per day** depending on the region (rural, semi-urban, urban, large urban regions) in 1997
  - Based on population only, MSW rates were extrapolated backwards

- **Germany**
  - Waste quantities for the period from 1950 to 1975 were extrapolated on the basis of **population data**

Examples - GDP

- **Italy**
  - A correlation function between **GDP** and **waste production** has been derived from 1975 onwards
  - Exponential equation has been obtained
  - This functions was applied from 1975 back to 1950
  - Consequently the amount of waste disposed into landfills has been estimated

Example – Population and GDP

- **Latvia**
  - Weighted average of population growth rate and GDP growth rate
  - Extrapolate backwards

$$GR_{Waste} = 0.5 * GR_{population} + 0.5 * GR_{GDP}$$

Thank you!

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