Malé Declaration emissions inventory workshop
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Session 5 – Vegetation fires and forestry (Sector 9) and Waste (Sector 10)

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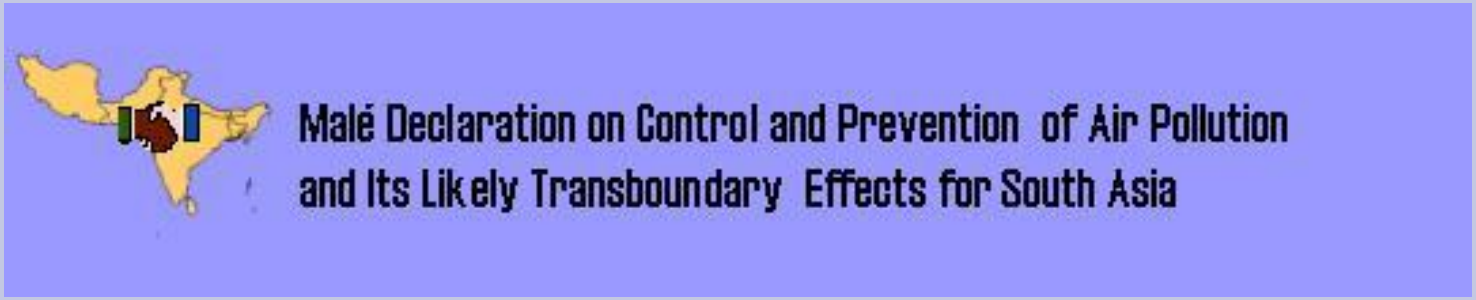

Emissions from Vegetation fires and forestry (Sector 9)

- **Emissions of CO, NOx, SO_2, NMVOCs and PM from on-site vegetation fires resulting from changes in land use, forestry management practices or by accident.**

  Includes:

  - burning during conversion of forests, woodlands, or grasslands to agricultural or other uses;
  - prescribed burns for fire management or forest stand maintenance; and
  - other vegetation fires started either accidentally by man or naturally by lightning

Emissions from Vegetation fires and forestry

<u>Excluded</u> are emissions from:

- **savanna burning (agricultural practice)**
- **emissions of NMVOCs from living trees in managed forests**
  (Estimated by modellers in the same way as for natural vegetation - therefore not usually included in the inventory process but treated as natural emissions).

Emissions from Vegetation fires and forestry

Default biomass consumption and emission factors for use in estimation of emissions from burning of forests and grasslands

Vegetation type	Biomass consumption (tonnes/ha) [a b]	SO_2 emission factor (kg/tonne biomass burned) [i]	NOx emission factor (kg as NO_2/tonne biomass burned) [i]	CO emission factor (kg CO/tonne biomass burned) [i]	NMVOC emission factor (kg/tonne biomass burned) [i]	PM_{10} emission factor (kg/tonne biomass burned) [g]	$PM_{2.5}$ emission factor (kg/tonne biomass burned) [i]	NH_3 emission factor (kg/tonne biomass burned) [i]
Tropical/subtropical forest (primary)	120	0.57	2.45	104	8.1	10.5	9.1	1.3
Tropical/subtropical forest (secondary)	42	0.57	2.45	104	8.1	10.5	9.1	1.3
Tropical/subtropical grassland (exluding savanna burning)	5.2	0.35	6	65	3.4	8.3	5.4	0.26 [j]
Tropical pasture	24	0.35	6	65	3.4	8.3	5.4	0.26 [j]
Eucalypt forests	69	1	4.6	107	5.7	17.6	13	1.4
Other temperate forest	50	1	4.6	107	5.7	17.6	13	1.4
Shrubland (general)	27 [c]	0.35 [h]	6 [h]	65 [h]	3.4 [h]	8.3 [h]	5.4 [h]	0.26 [j]
Temperate grasslands	4.1	0.35	6	65	3.4	8.3	5.4	0.26 [j]
Boreal forest	41	1	4.6	107	5.7	17.6	13	1.4
Peatland	41	1	4.6	107	5.7	17.6	13	1.4
Boreal grasslands/Tundra	10	0.35	6	65	3.4	8.3	5.4	0.26 [j]

Emissions from Vegetation fires and forestry

For forest burning - national data available online from FAO State of the Worlds Forests 2009

- **Annex 2: Table 2. Total forest area burnt (ha)**

  Assume = Mean annual forest cover change (if negative in sign).

- **Annex 2: Table 3 Biomass before burning (t/ha)**

  This value must be multiplied by a **combustion factor** (proportion of pre-fire fuel biomass consumed) for which IPCC default values are 0.36 for primary tropical forest, 0.55 for secondary tropical forest. E.g. if the **biomass before burning** is 179 t/ha for primary tropical forest, the **'Biomass consumption**' value to go in column B in the worksheet is179 x 0.36 = 64.4 t/ha.

Emissions from Treatment and Disposal of Wastes (Sector 10)

Source categories:

- **Emissions from municipal/commercial/industrial solid waste disposal through waste incineration**
- **Ammonia emissions from human excreta**

  (Emissions from landfills, and sewage treatment are mostly CH_4/CO_2, thus not included in manual)

Emissions produced:

- **SO_2, NO_x, CO, NMVOCs, NH_3, PM**

Emissions from Treatment and Disposal of Wastes

Emissions from incineration of municipal solid wastes:

- Estimate amount of Municipal Solid Waste (MSW) generated by multiplying the urban population by per capita MSW generation rate (country -pecific values given in Annex 2A.1 of the 2006 IPCC guidelines).
- Estimate fraction of total MSW incinerated (some country-specific data are also included in Annex 2A.1 of the IPCC guidelines - default of 5% OK for most DCsunless country specific data are given.)
- Unless better information is available, assume this waste in burned in the open.
- Enter EFs for each pollutant

Draft IPCC Guidelines Annex 2A.1
http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf

Emissions from Treatment and Disposal of Wastes

Emissions from incineration of municipal and industrial/ commercial wastes:

Default emission factors (uncontrolled) for estimating emissions from waste combustion

	Emission factors[a] (kg per tonne waste incinerated)						
Waste/Incinerator Type	**SO_2**	**NO_X**	**CO**	**NMVOC**	**NH_3**[d]	**PM_{10}**[c]	**$PM_{2.5}$**
Municipal Wastes:							
--Mass burn refractory wall	1.73	1.23	0.685	0.02[e]	0	12.6	-
--Modular excess air	1.73	1.24	-	-	0	12.6	-
--Modular starved air	1.61	1.58	0.15	-	0	1.72	-
--Refuse-derived fuel-fired	1.95	2.51	0.96	-	0	34.8	-
--Trench	1.25	-	-	-	0	18.5	-
--Open burning	0.5	3	42	15	0	8	-
Industrial/commercial:							
--Multiple chamber	1.25	1.5	5	1.5[b]	0	3.5	-
--Single chamber	1.25	1	10	75[b]	0	7.5	-

Emissions from Treatment and Disposal of Wastes

Ammonia emissions from human excreta:

- **From latrines** (A latrine is a simple 'dry' toilet built outside the house over a hole dug in the ground or a concrete reservoir)
- **'Free-range' defecation/urination** (Not using a toilet but depositing dung and urinating out in the open in fields/bush etc.)
- **Estimate emissions of ammonia by multiplying estimated human population using latrines, or not using toilets at all, by suitable emission factors**

Emissions from Treatment and Disposal of Wastes

Sheet: 6.2 Ammonia emissions from human excreta

Sector: Waste

Sub-sector: Human excreta

BACK TO MENU

Defecation/urination practice	A Number of people [a]	B NH_3 emission factor (kg/person/yr)		C NH_3 emissions (tonnes/yr)
			Default	C = A x B/1000
Latrines			1.6[b]	0
Outside in fields/bush			0.8[c]	0
Total				0.00

[a] Assume = rural population only

[b] From EMEP/Coriniar (2004)

[c] Assume this is 50% of latrine emission factor (equal to the ratio between indoor and meadow ammonia emissions for larger farm animals)

Compilation of emissions for Vegetation fires and Forestry (Sector 9) and for Waste (Sector 10)

Practical session:

1. Filling in workbook with dummy data *(see Exercise 8 notes)*
2. Plenary session – *sharing problems encountered etc.*