

Malé Declaration 1ST emissions inventory workshop

AIT, Bangkok, 3rd – 5th July 2006

Part 7 – Vegetation fires and forestry (Sector 9)

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Malé Declaration on Control and Prevention of Air Pollution
and Its Likely Transboundary Effects for South Asia

Emissions from Vegetation fires and forestry

- ❖ **Emissions of CO, NO_x, SO₂, 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

Excluded 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	NO _x emission factor (kg as NO ₂ /tonne biomass burned) ⁱ	CO emission factor (kg CO/tonne biomass burned) ⁱ	NM VOC emission factor (kg/tonne biomass burned) ⁱ	PM ₁₀ emission factor (kg/tonne biomass burned) ⁹	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 (excluding 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

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Sector 10 – Emissions from Treatment and Disposal of Wastes

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Emissions from Treatment and Disposal of Wastes

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 and industrial/ commercial wastes:

- ❖ Enter (or estimate based on per capita data) amount of each type of waste burned by type of incineration method used,
- ❖ Estimate emissions of SO_2 , NO_x , CO , NMVOCs, ammonia and PM_{10} by multiplying the amount of waste burned for each waste/incinerator type by emission factors for each pollutant.

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

Waste/Incinerator Type	Emission factors ^a (kg per tonne waste incinerated)						
	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

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Sub-sector: Human excreta

Defecation/urination practice	A	B		C
	Number of people ^a	NH ₃ emission factor (kg/person/yr)		NH ₃ emissions (tonnes/yr) C = A x B/1000
		Default		
Latrines			1.6 ^b	0
Outside in fields/bush			0.8 ^c	0
Total				0.00

^a Assume = rural population only

^b From EMEP/Corinair (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 8:

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