Annexure 3.1

Emission Factors

Bakery

Emission Factor for Wood Burning (kg/t)
PM_{10} = 17.3, SO_2 = 0.2, NOx = 1.3, CO =126.3, HC = 114.5 (VOC as HC)
*$PM_{2.5}$ /PM_{10} ratio considered was =0.68
http://www.epa.gov/ttn/chief/ap42/index.html (Sec. 1.9, pp. 1.10.4, Table 1.9.1)
(Rakesh Kumar and Abba Elizabeth., 2003), VOC to HC - lb/ton - kg/ton*
Emission Factor for Diesel Burning (kg/kiloliters)
SPM= 0.25, PM_{10} =60% of SPM, $PM_{2.5}$ =40% of SPM, CO= 0.63, SO_2 =17.25S,
NOx = 2.75, HC = 0.12, (Sulfur content = 0.35%) - automobile euro norms
(TERI, Environmental Effects of Energy Production
Transportation and Consumption in NCR, New Delhi, 1992)

Crematoria
Emission factors for wood burning (kg/t)
PM_{10}=17.3, SO_2 = 0.2, NOx 1.3, CO =126.3, HC =114.5 (VOC as HC)
*$PM_{2.5}$ /PM_{10} ratio considered was =0.68
http://www.epa.gov/ttn/chief/ap42/index.html (Sec. 1.9, pp. 1.10.4, Table 1.9.1)
Emission Factor Kerosene (kg/t)
SPM =1.95, PM_{10} =0.61, SO_2 =4, NOx =2.5, CO=62, HC =19
URBAIR, Working Group 1992 - Kerosene, Residential Emission Factor - Electric (kg/ body)
Emission Factor Electric (kg/body)
PM_{10} =0.000025, SO_2 = 0.0544, NOx =0.308, CO =0.141, NVOC =0.013
*$PM_{2.5}$ /PM_{10} ratio considered was =0.68
http://www.naei.org.uk/emissions/selection.php
Body burning was separately calculated based on emission factor electric crematoria

Open Eat Outs
Emission factor for LPG
PM_{10} =2.10, SO_2 = 0.40, NOx = 1.8, CO= 0.25, HC as VOC=0.07
Assessment of Sources of Air, Water and Land Pollution – A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategies – Part one – Rapid Inventory Techniques in Environmental Pollution by A.P. Economopolous, WHO, Geneva, 1993
Particulate emission LPG considered as $PM_{2.5}$
Emission factor for Kerosene : SPM=0.06, PM_{10}=0.61, SO_2 =4, NOx =2.5, CO = 62
Urban Air Quality Management Strategy in Asia – Greater Mumbai Report edited by Jitendra J. Shah and Tanvi Nagpal, World Bank Technical Paper No. 381, 1997
Emission factor for Coal : SPM =20, SO_2 = 13.3, NOx =3.99, CO=24.92, HC =0.5
Environmental effects of energy production, transformation and consumption in the National Capital Region submitted to the Ministry of Environment & Forest, by Tata Energy Research Institute (TERI), New Delhi, February 1992

Domestic Cooking

Emission Factor for LPG : PM=2.1, CO =0.252, SO_2 = 0.4, NOx = 1.8, VOC = 0.072

Emission Factor for Kerosene : PM_{10}=0.61, SO_2 =4, NOx =2.5, CO = 62

Assessment of Sources of Air, Water and Land Pollution – A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategies – Part one – Rapid Inventory Techniques in Environmental Pollution by A.P. Economopolous, WHO, Geneva, 1993

Hotels & Restaurants

Emission factor for LPG

PM_{10} =2.10, SO_2 = 0.40, NOx = 1.8, CO= 0.25, HC as VOC=0.07

Assessment of Sources of Air, Water and Land Pollution – A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategies – Part one – Rapid Inventory Techniques in Environmental Pollution by A.P. Economopolous, WHO, Geneva, 1993

Particulate emission LPG considered as PM2.5

Emission factor for Coal : SPM =20, SO_2 = 13.3, NOx =3.99, CO=24.92, HC =0.5

Environmental effects of energy production, transformation and consumption in the National Capital Region submitted to the Ministry of Environment & Forest, by Tata Energy Research Institute (TERI), New Delhi, February 1992

Open Burning

Emission Factor (kg/MT) PM_{10} = 8, $PM_{2.5}$ =5.44, CO=42, SO_2=0.5000,NOx= 3, VOC= 21.5

A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategies – Part one – Rapid Inventory Techniques in Environmental Pollution by A.P. Economopolous, WHO, Geneva, 1993

Aircrafts

Emission factor domestic flight

PM10=0.99*, CO =11.8, SOx =0.8, NOx =8.3, VOC=0.5

Emission factor international flight

PM10=0.99*, CO =6.1, SOx =1.6, NOx =26, VOC=0.2

** A Guide to Rapid Source Inventory Techniques and their Use in Formulating Environmental Control Strategies – Part one – Rapid Inventory Techniques in Environmental Pollution by A.P. Economopolous, WHO, Geneva, 1993*

Other emission factors are taken from

www.ecotourism.org/onlineLib/Uploaded/ … Airplanes emissions. PDF

PM2.5/PM10 = 0.92

Preparation of Fine Particulate Emission Inventories -Student Manual, APTI Course 419B, Sec. 4.2.1, pg-4.7

Locomotive

Emission Factors Line haul operations (kg/l) : CO= 0.0075, NOx =0.0591, SO_2 = 0.0043, PM=0.0014
Yard operations (kg/locomotive/month): CO = 278.75, NOx = 1572.75, SO_2 = 116.25, PM = 43,
*$PM_{2.5}/PM_{10}$= 0.68 PM is considered as PM_{10} U.S. EPA, 1992a (Cited from Mexico Emission Inventory, Vol. V, p.71 & p.73)

Marine Vessels

Emission factors *(kg/t fuel consumed)*: PM_{10} =1.03, CO =1.85, SO_2 =11, NOx= 10, VOC as HC = 0.83, Density of diesel = 0.86 (HSD) *UK-Shipping international-Fuel oil*

Paved & Unpaved Dust

Paved Road Dust : $PM_{2.5}$ = 0.39, PM_{10}= 1.93
** Strengthening Environmental Management at the State Level (Cluster) Component E- Strengthening Environmental Management at West Bengal Pollution Control Board, TA No. 3423-IND, Asian Development Bank, Nov. 2005 (Table 12, Page 23) USEPA AP42 Paved, Section 13.2.1.4 Motor Transport Statistics, Transport Commissioner Office, Mumbai* Silt loading estimate -0.531 gm/m2 (*Kolkata ADB report –Table 13, page 23) Break and tire wear correction – (USEPA AP42 Paved, Section 13.2.1.4, Table 13.2.1.2) Wet days = 120, (IMD, Mumbai)

Emission factor for industrial and vehicular sources are given in respective chapters