

Indian Network for Climate Change Assessment [INCCA]

National Workshop

GHG Emissions Profile 2007

Industry Sector

Dr. S. Majumdar

Confederation of Indian Industry

May 11, 2009

Industry Sector

❖ Minerals

- ◆ Cement, Glass production, Ceramics

❖ Chemicals

- ◆ Ammonia, nitric acid, carbides, titanium oxide, methanol, ethylene, EDC, VCM production, carbon black, caprolactam

❖ Metal

- ◆ Iron & steel, ferro alloys, aluminum, lead, zinc and copper

❖ Other industry sectors

- ◆ Textiles, leather, F&B, food processing, pulp & paper, mining & quarrying, non-specified sectors

❖ Non-energy product use

- ◆ Lubricant, paraffin wax

Methodology

Secondary data collection	Primary data collection	Emissions calculation
<ul style="list-style-type: none">■ Websites, reports of India's planning bodies (e.g., Planning Commission), Ministries, etc.■ Research publications■ Trade magazines and sector association publications	<ul style="list-style-type: none">■ Selection of apt sample size based on size, nature of industry■ Questionnaire / survey of companies in selected sample■ Telephonic interviews with related sector associations	<ul style="list-style-type: none">■ IPCC 2006 Guidelines for GHG Inventorization■ IPCC 1996 Revised Guidelines for GHG Inventorization

Emission Factors ... 1/2

Category	Gas	EF	Source
Cement production	CO ₂	0.537 t [clinker]	CMA, 2010
Glass production	CO ₂	0.21 t [container glass]; (0.22 t - fibre glass, 0.03 t - specialty glass)	IPCC, 2006
Other sources of soda ash	CO ₂	0.41492 t [carbonate]	IPCC, 2006
Ammonia production	CO ₂	C content of NG: 99.5% C oxidation factor: 14.4 kg C/GJ	NatCom, 2004
		Fuel req't: 7.72-10.5 mn kcal/t NH ₄	FAI, 2009
Caprolactam production	N ₂ O	9 kg [chemical]	IPCC, 2006
Carbide production	CO ₂	1.1 t [CaC ₂]	IPCC, 2006
Titanium dioxide production	CO ₂	1.385 t [TiO ₂]	IPCC, 2006 [avg.]
Methanol	CO ₂	0.67 t [methanol]	IPCC, 2006
	CH ₄	2.3 t [methanol]	IPCC, 2006
Ethylene	CO ₂	1.73 t [ethylene]	IPCC, 2006
	CH ₄	3 kg [ethylene]	IPCC, 2006
EDC & VCM	CO ₂	0.296 t [EDC]; 0.47 t [VCM]	IPCC, 2006

Emission Factors ... 2/2

Category	Gas	EF	Source
Ethylene Oxide	CO ₂	0.863 t [EO]	IPCC, 2006
	CH ₄	1.79 kg [EO]	IPCC, 2006
Acrylonitrile	CO ₂	1.0 t [AcN]	IPCC, 2006
	CH ₄	0.18 kg [AcN]	IPCC, 2006
Carbon black	CO ₂	2.62 t [C black]	IPCC, 2006
	CH ₄	0.06 kg [C black]	IPCC, 2006
Iron & Steel production	CO ₂	1.46 t [BOF production]; 0.08 t [EAF]; 1.72 t [OHF]; 0.7 t [DRI]	IPCC, 2006
Ferro-alloys production	CO ₂	4.8 t [ferro-Si]; 1.5 t [ferro-Mn]	IPCC, 2006
	CH ₄	1.1 kg [ferro-Si]	
Aluminum	CO ₂	1.65 t [Al]	IPCC, 2006 [avg.]
Lead production	CO ₂	0.58 t [Imperial]; 0.25 t [Direct]; 0.2 t [secondary production]	IPCC, 2006
Zinc production	CO ₂	0.53 t [Pyro-metallurgical]	IPCC, 2006
Lubricant use	CO ₂	C content 20 t / TJ; 0.2 Ox. Dur. Use	IPCC, 2006
Paraffin wax use	CO ₂	C content 20 t / TJ; 0.2 Ox. Dur. Use	IPCC, 2006

Salient Features of Emission Data

- ❖ Total GHG emissions: 412.55 million tons
- ❖ Divided by gas
 - ◆ 405.86 million t CO₂
 - ◆ 0.15 million t CH₄
 - ◆ 0.21 million t N₂O
- ❖ Divided by sector
 - ◆ Minerals: 31.7%
 - ◆ Metals: 28.4%
 - ◆ Chemicals: 8.1%
 - ◆ Others [P&P, F&B, txtl, lthr, non-specific, etc.]: 30.4%

Emission Data: Minerals, Chemicals

- ❖ Minerals total: 131 mn t CO₂
 - ◆ Cement: 130 mn t
 - ◆ Glass & ceramics: 0.43 mn t
 - ◆ Soda ash use: 0.59 mn t
- ❖ Chemicals total: 33.5 mn t CO₂
 - ◆ FF use + process
 - ◆ CO₂: 27.89 mn t
 - ◆ CH₄: 0.11 mn t
 - ◆ N₂O: 0.17 mn t

Emission Data: Metals, Other

- ❖ Metals total: 122.74 mn t
 - ◆ Iron & steel, Al, Pb, Zn, Mg, Ferro-alloys, Cu
 - ◆ CO₂: 122.37 mn t
 - ◆ CH₄, N₂O: miniscule
- ❖ Others total: 124.5 mn t
 - ◆ Pulp & paper, F&B, textile, leather, mining, quarrying, non-specific
 - ◆ CO₂: 123.9 mn t
 - ◆ CH₄, N₂O: miniscule

Emissions from Industry Sector

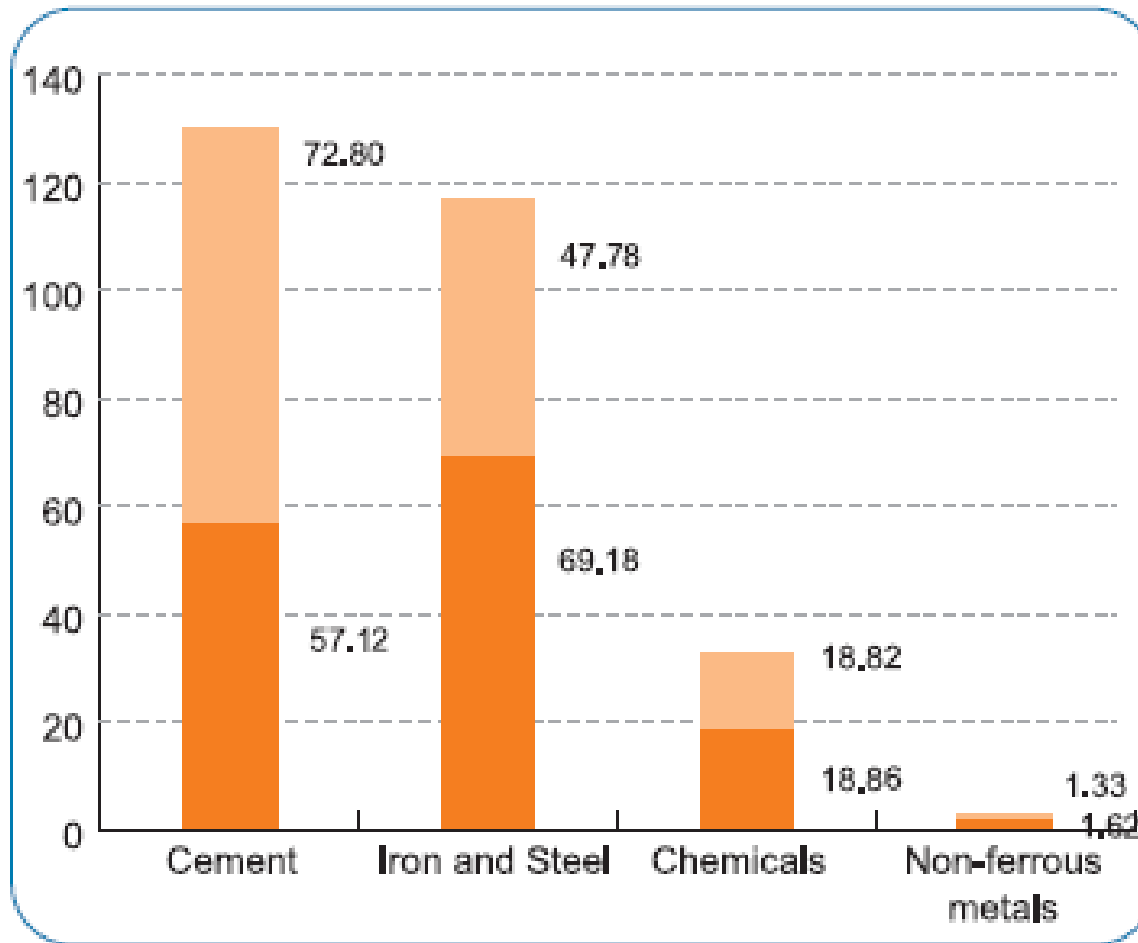


Figure 6.2: Relative CO₂ emissions in million tons due to fossil fuel combustion and process emissions in different industries