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Using the 2006 IPCC Guidelines to Estimate CO₂ Emissions

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Outline

- ◆ **Differences between 1996 and 2006 IPCC Guidelines**
- ◆ **Using the Sectoral Approach to estimate emissions**
- ◆ **Issues on energy-related emissions**

Differences between 1996 and 2006 Guidelines

Simplified estimation methodology

- **Emission factors:** *Rather than separate carbon and CO₂ – estimate CO₂ directly*
- **Oxidation factors:** *Rather than differentiate oxidation based on fuels since almost no information is available on this, assume 100% oxidation – simplifies and is more conservative. Also, the oxidation factors are now included directly in the EFs.*
- **Non-energy use:** *Rather than include all energy and then make assumptions on stored carbon, the activity data explicitly exclude the non-energy use of fuels.*
- **Account for emissions where and when they occur:** *New methodologies for CO₂ captured and stored, new methodologies for CO₂ in agricultural soils, forests*

IPCC Methodologies

Tier 1

- ◆ Simplest method
- ◆ Activity data available to all countries

Tier 2

- ◆ Technology-specific emission factors

Tier 3

- ◆ More detailed or country-specific methods



2006 IPCC Guideline Methodologies

Basic computation for CO₂ emissions:

- ◆ CO₂ emissions by product: **Fuel Quantity x Emission Factor**
- ◆ Sum over all different products

Can be done from two independent sets of data:



Supply of fuels to the country
Reference Approach



Consumption by end-use sectors
Sectoral Approach

Using the 2006 IPCC Guidelines: Sectoral Approach

Step 1:

Estimating sectoral fuel consumption



Step 2:

Converting to a common energy unit
(common energy unit: TJ)



Step 3:

Multiplying by carbon dioxide emission
factors

Step 1: Estimating Sectoral Fuel Consumption

SECTOR	ENERGY			
CATEGORY	FUEL COMBUSTION ACTIVITIES			
CATEGORY CODE	1A			
SHEET	1 OF 4 (CO ₂ , CH ₄ AND N ₂ O FROM FUEL COMBUSTION BY SOURCE CATEGORIES – TIER 1)			
	Energy consumption		CO ₂	CH ₄ (etc.)
	A	B	Con	
	Consumption (Mass. Volume or Energy unit)	Conversion Factor (TJ/unit)	Con	
Liquid fuels				
Crude Oil				
Natural Gas				
Gasoline				
Jet Kerosene				
Other Kerosene				
Gas/Diesel Oil				
Residual Fuel Oil				
LPG				

Units:
 Could be in natural units (e.g. 1000 tonnes) or in energy units (e.g. TJ)

Separate sheet filled out for each sector:

Main activity electricity and heat production, Petroleum Refining, Manufacture of Solid Fuels and Other Energy Industries, Iron and Steel, Non-Ferrous Metals, Chemicals, Pulp/Paper/Print, Food Processing/Beverages/Tobacco, Non-Metallic Minerals, Transport Equipment, Machinery, Mining (excl. fuels)/Quarrying, Wood/Wood Products, Construction, Textile/Leather, Non-specified Industry, Commercial/Institutional, Residential, Agriculture/Forestry/Fishing/Fish Farms, Non-specified Stationary

Step 2: Converting to a Common Energy Unit

SECTOR	ENERGY				SELECTED NET CALORIFIC VALUES FROM THE 2006 GLS	
CATEGORY	FUEL COMBUSTION ACTIVITIES					
CATEGORY CODE	1A					
SHEET	1 OF 4 (CO ₂ , CH ₄ AND N ₂ O FROM FUEL COMBUSTION)					
Energy consumption					Factors (TJ/10 ³ tonnes)	
	A	B	C	CO ₂ Factor		
		Conversion Factor (TJ/unit)	Consumption (TJ)			
			C=A*B			
Liquid fuels					Refined petroleum products	
Crude Oil					Gasoline	44.3
Natural Gas					Jet kerosene	44.3
Gasoline					Other kerosene	44.1
Jet Kerosene					Shale oil	38.1
Other Kerosene					Gas/diesel oil	43.0
Gas/Diesel Oil					Residual fuel oil	40.4
Residual Fuel Oil					LPG	47.3
LPG					Ethane	46.4
					Naphtha	44.5
					Bitumen	40.2
					Lubricants	40.2
					Petroleum coke	32.5
					Refinery feedstocks	43.0
					Refinery gas	49.5
					Other oil products	40.2
					Other products	
					Coal tar	28.0
					Oil shale	8.9
					Orimulsion	27.5

Country-specific NCVs for natural gas and coal are given explicitly in the Revised 1996 IPCC Guidelines. The 2006 Guidelines give one default value with upper and lower limits.

Exercises – things to remember

- **Sectoral approach estimates CO₂ emissions using the consumption of fuels, not the supply**
- **Consumption of fuels includes Own Use in the Energy Sector and Transformation of fossil fuels in the Electricity Sector**
- **Certain fuels can be used for both energy and non-energy purposes – only estimate CO₂ emissions from energy use of these fuels**
- **CO₂ from biomass use is not added to emissions totals (reported as memo items) but emissions of other greenhouse gases from biomass are added to totals**
- **Emissions from consumption of bunker fuels are not included in totals for individual countries**