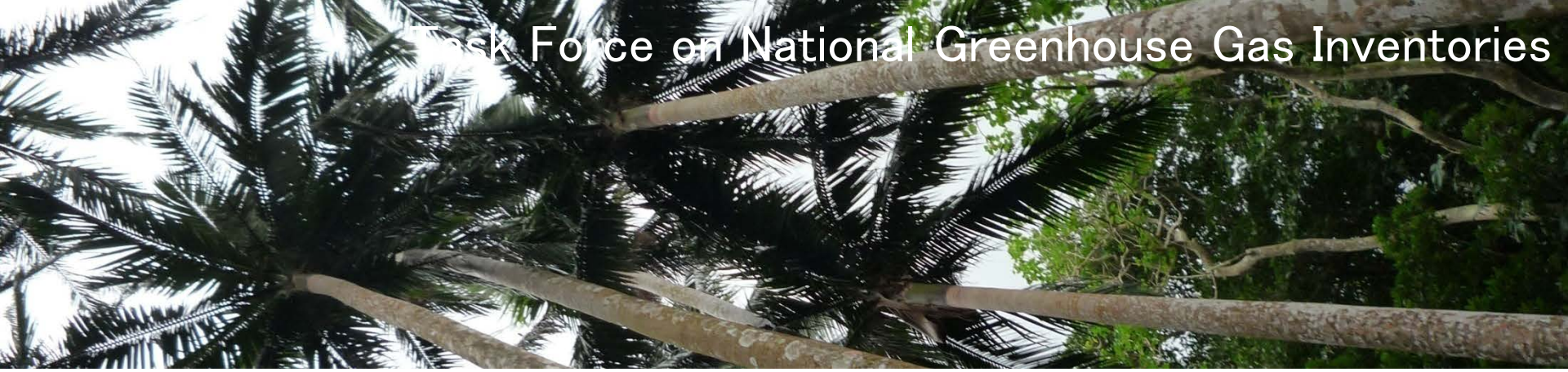

Hands-on training:

Road Transportation (1A3b)
Cement Production(2A1)
Iron and Steel Production (2C1)

WGIA10
11 July, 2012

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INTERGOVERNMENTAL PANEL ON climate change

New IPCC Inventory Software

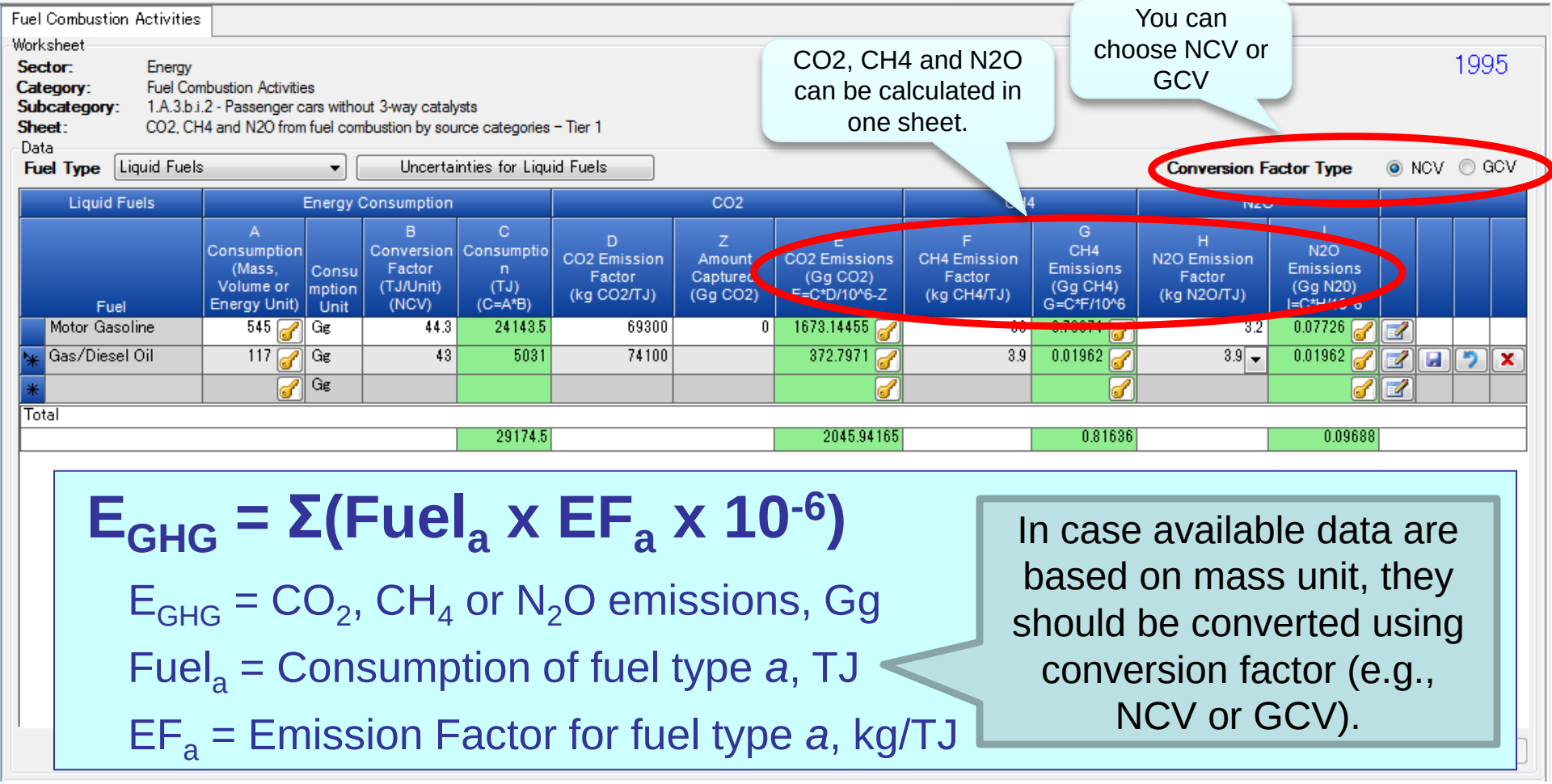
- Can be used to estimate emissions and removals for reporting according to either the 1996, GPG, or 2006 Guidelines
- Will help non-Annex I countries in inventory compilation and management
  - Various useful functions: Uncertainty and Key category analysis, time series data entry, etc.
  - For some categories, complex calculation equivalent with Tier 2 in 1996 Guidelines can be implemented.
    - Actual emissions from consumption of F-gases
    - First Order Decay (FOD) method for emissions from landfill sites
  - Also, for other categories, calculation consistent with Tier 1 in 1996 Guidelines can be implemented.

→ Let's see some examples!!

Examples

- Let's try calculation using the IPCC Inventory Software for some categories under Energy and Industrial Processes sectors that are major sources in many countries.
  - **Fuel combustion (Road Transportation): 1A3b**
    - Simple equations consistent with the 1996 Guidelines
    - A few minor difference from 1996 Guidelines about treatment of carbon stored in products (non-energy use) and oxidation factor
  - **Cement Production: 2A1**
    - Consistent with Tier 1 in the 1996 Guidelines (Either cement production or clinker production can be used as activity data)
    - Improved calculation based on cement production
  - **Iron and Steel Production: 2C1**
    - Consistent with Tier 1b in the 1996 Guidelines

Fuel Combustion (Road Transportation)



$$E_{GHG} = \Sigma(Fuel_a \times EF_a \times 10^{-6})$$

E_{GHG} = CO_2, CH_4 or N_2O emissions, Gg

$Fuel_a$ = Consumption of fuel type *a*, TJ

EF_a = Emission Factor for fuel type *a*, kg/TJ

In case available data are based on mass unit, they should be converted using conversion factor (e.g., NCV or GCV).

- Consumption of fuel should be the amount of fuel combusted. Non-energy use should not be included.
- Oxidation factor is assumed to be 100%. If necessary, carbon unoxidized can be taken into account by adjusting the EF value.

Cement Production

$$E_{CO2} = [\Sigma(M_{c,i} \times C_{cl,i}) - Im + Ex] \times EF_{clc}$$

E_{CO2} = CO_2 emissions from cement production, tonnes

$M_{c,i}$ = mass of cement produced of type *i*, tonnes

$C_{cl,i}$ = clinker fraction of cement type *i*, fraction

Im = imports for consumption of clinker, tonnes

Ex = exports of clinker, tonnes

EF_{clc} = emission factor for clinker, tonnes CO_2/tonne clinker

- National-level data should be collected on:
  - Cement production by type (Portland, masonry, etc.)
  - Clinker fraction by cement type
- If detailed information on cement type is not available, multiply total cement production by:
  - Default Ccl = 0.75 (if blended/'masonry' is much)
  - Default Ccl = 0.95 (if all is essentially 'Portland')
- Data should be obtained on the amount of clinker imported & exported.

Cement Production

You can choose cement production or clinker production as activity data.

Cement Production | Capture and storage or other reduction

Worksheet

Sector: Industrial Processes and Product Use
Category: Mineral Industry
Subcategory: 2.A.1 - Cement production
Sheet: 1 of 1

1995

Data

Calculation based on Cement production (Cement production / Clinker production)

	A	B	C
Individual Type of Cement Produced	Mass of Individual Type of Cement Produced (tonne)	Clinker Fraction in Cement (Fraction)	Mass of Clinker in the Individual Type of Cement Produced (tonne)
			C = A * B
Portland	3537000	0.96	3395520
Masonry	1492000	0.64	954880
Total			
	5029000		4350400

D	E	F	G	H	I	J
Mass of Clinker in the Individual Type of Cement Produced (tonne)	Imports for Consumption of Clinker (tonne)	Export of Clinker (tonne)	Mass of Clinker in the Country (tonne) G = D - E + F	Emission Factor for the Clinker (tonne CO2/tonne Clinker)	CO2 Emissions (tonne CO2) I = G * H	CO2 Emissions (Gg CO2) J = I / 1000
4350400	1278000	0	3072400	0.52	1597648	1597.648

Uncertainties | Time Series data entry... | Delete selected

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Iron and Steel Production

$$E_{CO2} = \Sigma(AD_i \times EF_i)$$

E_{CO2} = CO_2 emissions from iron & steel production, tonnes

AD_i = quantity of material *i* (iron or steel) produced, tonnes

EF_i = emission factor for production of material *i*, tonnes CO_2/tonne material *i* produced

Material *I* includes:

- Crude steel from Basic Oxygen Furnace (BOF)
- Crude steel from Electric Arc Oxygen Furnace (EAF)
- Crude steel from Open Hearth Furnace (OHF)
- Pig iron not converted to steel
- Direct reduced iron (DRI)
- Sinter
- Pellet

Iron and Steel Production

Emissions from Metal Industry | Capture and storage or other reduction

Worksheet

Sector: Industrial Processes and Product Use
Category: Metal Industry
Subcategory: 2.C.1 - Iron and Steel Production
Sheet: CO2 Emissions

1995

Data

Gas CARBON DIOXIDE (CO2)

	Type of Steelmaking Method, etc	A Amount of Steel or Iron Production (tonne)	B Emission Factor (tonne CO2/tonne produced)	C CO2 Emissions (tonne CO2)	D CO2 Emissions (Gg)
				C = A * B	D = C / 10^3
	Basic Oxygen Furnace (BOF)	6219370	1.46	9080280.2	9080.2802
*	Pig Iron Production	4620377	1.35	6237508.95	6237.50895
*					
Total				15317789.15	15317.78915

- Default EFs are:
  - BOF steel: 1.46 t-CO_2/t
  - EAF steel: 0.08 t-CO_2/t
  - OHF steel: 1.72 t-CO_2/t
  - Pig iron: 1.35 t-CO_2/t
  - DRI: 0.70 t-CO_2/t
  - Sinter: 0.20 t-CO_2/t
  - Pellet: 0.03 t-CO_2/t

Global average default = 1.06 t-CO_2/t

(If activity data on steel production for each process is not available, multiply total steel production by this EF.)

Let's start exercise!