

## **Annex 2 – Detailed discussion of methodology and data for estimating CO<sub>2</sub> emissions from fossil fuel combustion**

CO<sub>2</sub> emissions from fuel combustion are calculated on the basis of statistics for burning fuels, the carbon content of the fuels and the degree of oxidation.

The National Institute for Statistics annually provides the statistics on fuels, through the published document Energy Balance (see Annex 4.2).

The energy data are already available in tera-joules on a net calorific value basis. The apparent consumption considers different NCVs given for production, imports and exports fuels.

The emissions are estimated following the IPCC simple method (Tier 1) for fuel combustion. The default emission factors used in calculation, for both reference and sectoral approaches are presented in the table below:

**Table 1 Emission factors used to estimate CO<sub>2</sub> emissions from fuel combustion**

Fuel	EF	Unit	IPCC fuel category
Crude oil*	20	tC/TJ	liquid
Gasoline	18.9	tC/TJ	liquid
Jet kerosen	19.5	tC/TJ	liquid
Other kerosene	19.6	tC/TJ	liquid
Gas/diesel oil	20.2	tC/TJ	liquid
Residual fuel oil	21.1	tC/TJ	liquid
LPG	17.2	tC/TJ	liquid
Refinery gas	20/18.2 <sup>a)</sup>	tC/TJ	liquid
Other oil	20	tC/TJ	liquid
Coking coal	25.8	tC/TJ	solid
Sub-bit coal	26.2	tC/TJ	solid
Lignite**	27.6	tC/TJ	solid
Coke oven coke	29.5	tC/TJ	solid
Coke oven gas***	13	tC/TJ	solid
Blast furnace gas***	66	tC/TJ	solid
Lubricants	20	tC/TJ	liquid
Natural gas	15.3	tC/TJ	gas
Solid biomass	29.9	tC/TJ	biomass

\* crude oil includes natural gas liquids

\*\* lignite includes brown coal

\*\*\*EF used in the sectoral approach calculations

<sup>a)</sup> as recommended in Table I-2 (Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook), two different values are used: one for reference approach, another one for sectoral calculations.

The emission calculation considers for the carbon stored in products and the carbon remained un-oxidised during combustion.

The national energy balance reports only aggregate data on non-energy use of fuels and there are no data regarding feedstock use in the specific sector. For the available data, the default fractions of carbon stored are used.

The default fractions for carbon oxidized during combustion, used in calculation, are:

- coal - 0.98;
- oil and oil products - 0.99;
- natural gas - 0.995.

The differences between reference and sectoral approaches are difficult to explain since the same source of data and the same EFs have been used to estimate emissions in both ways. Possible reasons could be:

- the reference approach does not deal with the non-energy uses of fuels as if they are combustion activities. A correction is done considering carbon stored in products, but information related to this area is limited in the national energy balance;
- high statistical differences (see Annex 4.2)