

REDD Methodological Module

“Estimation of emissions from fossil fuel combustion” – E-FFC

Version - April 2010

I. SCOPE, APPLICABILITY AND PARAMETERS

Scope

This module provides a step-wise approach for estimating emissions from fossil fuel combustion in Reduced Emissions from Deforestation and Degradation (REDD) projects.

Applicability conditions

All fossil fuel combustion associated with a project may be accounted, including fossil fuel combustion of subcontractors that are conducting (parts of the) work to implement the project. Fossil fuel combustion in all situations is an optional emission source. Project proponents may, however, elect to include fossil fuel combustion if emissions are higher in the baseline than in the project case thus generating emission reductions through project activities. Where emissions from fossil fuel combustion are estimated in the baseline, monitoring and estimation must also occur in the with-project scenario¹.

Required conditions

- Where estimation of fossil fuel combustion is elected fuel consumption must be monitored.

Parameters

Parameter	SI Unit	Description
E_{FC}	tCO ₂ -e	Emission from fossil fuel combustion

II. PROCEDURE

Emissions can be estimated from either the fuel consumed or the distance travelled by the vehicles. Even though in general the first approach is appropriate for CO₂ and the second (distance travelled by vehicle type and road type) is appropriate for CH₄ and

¹ Emissions due to fossil fuel combustion both inside and outside the project boundary will be considered project emissions

N₂O, the IPCC (2006) allows CH₄ and N₂O emissions from fossil fuel combustion to be estimated as:

$$E_{FC,t} = \sum_a (Fuel_{a,t} \times EF_a) \quad (1)$$

Where:

$E_{FC,t}$	Net CO ₂ -e emissions of Fuel Consumption in year t ; tCO ₂ -e
$Fuel_{a,t}$	Amount of Fuel of type a consumed in year t ; terrajoule (TJ)
EF_a	Emission Factor of Fuel type a ; tCO ₂ -e/TJ
a	Fuel type a (e.g. diesel, gasoline, etc.)

The amount of fuel of a particular kind combusted in year t ($Fuel_{a,t}$) can be estimated as:

$$Fuel_{a,t} = Liters_{Fuel_{a,t}} \times Density_{Fuel_a} \times NCV_{Fuel} \div 10^6 \quad (2)$$

Where:

$Fuel_{a,t}$	Amount of Fuel type a consumed in year t ; TJ
$Liters_{Fuel_{a,t}}$	Quantity of Fuel of type a consumed in year t ; ltr
$Density_{Fuel_a}$	Density of Fuel type a ; kg/ltr
NCV_{Fuel_a}	Net Calorific Value of Fuel type a ; TJ/Gg

In section III, default values are provided for all parameters not monitored. However, it is recommended and encouraged to use country-specific NCVs and EFs where available.

III. DATA AND PARAMETERS NOT MONITORED (DEFAULT OR MEASURED ONE TIME)

Data / parameter:	EF_a																
Data unit:	tCO ₂ -e/TJ																
Used in equations:	1																
Description:	Emission factor																
Source of data:	Table 1.4 Chapter 1 Volume 2 of IPCC, 2006.																
Measurement procedures (if any):	<p>Default emission factors are presented in the table below.</p> <p>Table: Road transport default CO₂ emission factors.^a</p> <table border="1"> <thead> <tr> <th>Fuel Type</th><th>Default effective CO₂ emission factor (tCO₂/TJ)</th></tr> </thead> <tbody> <tr> <td>Motor gasoline</td><td>69,3</td></tr> <tr> <td>Gas/Diesel Oil</td><td>74,1</td></tr> <tr> <td>Liquefied Petroleum Gases</td><td>63,1</td></tr> <tr> <td>Kerosene</td><td>71,9</td></tr> <tr> <td>Lubricants</td><td>73,3</td></tr> <tr> <td>Compressed Natural Gas</td><td>56,1</td></tr> <tr> <td>Liquefied Natural Gas</td><td>56,1</td></tr> </tbody> </table> <p>^a Values represent 100% oxidation of fuel carbon content.</p> <p>The emission factors assume that 100% of the carbon content of the fuel is oxidized during or immediately following the combustion process (for all fuel types in all vehicles) irrespective of whether the CO₂ has been emitted as CO₂, CH₄, CO or NMVOC or as particulate matter.</p>	Fuel Type	Default effective CO ₂ emission factor (tCO ₂ /TJ)	Motor gasoline	69,3	Gas/Diesel Oil	74,1	Liquefied Petroleum Gases	63,1	Kerosene	71,9	Lubricants	73,3	Compressed Natural Gas	56,1	Liquefied Natural Gas	56,1
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Any comment:	<i>Shall be assessed every 10 years to determine whether more adequate defaults are available</i>																

Data / parameter:	$Density_{Fuel\ a}$
Data unit:	Kg/ltr
Used in equations:	2
Description:	Density of Fuel type
Source of data:	Table A3.8 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004.
Measurement procedures (if any):	Densities for relevant petroleum products as presented in table A3.8

any):	Typical Density Values for Selected Petroleum Products		
	Fuel Type	Density (kg/ltr)	Liters per tonne
	Motor gasoline	0.7407	1350
	Gas/Diesel Oil	0.8439	1185
	Naphtha	0.6906	1448
	Aviation gasoline	0.7168	1350
	Aviation Turbine fuel	0.8026	1246
	Other kerosene	0.8026	1246
Any comment:	Shall be assessed every 10 years to determine whether more adequate defaults are available		

Data / parameter:	NCV _a																											
Data unit:	GJ/tonne																											
Used in equations:	2																											
Description:	Net Caloric Value per Fuel Type																											
Source of data:	Table A3.8, page 181, IEA Statistics Manual, OECD/IEA, 2004; and, Table 1.2, Chapter 1, Volume 2, IPCC 2006 Inventory Guidelines																											
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	Orimulsion	27.5
	Natural Gas Liquids	44.2
	Motor Gasoline	44.3
	Aviation Gasoline	44.3
	Jet Gasoline	44.3
	Jet Kerosene	44.1
	Other Kerosene	43.8
	Gas/Diesel Oil	43.0
	bio-gasoline/bio-diesel	27.0
	other liquid biofuels	27.4
	^b TJ/Gg = GJ/t	
Any comment:	For more NCVs for other fuels, see the original data sources. <i>Shall be assessed every 10 years to determine whether more adequate defaults are available</i>	

IV. DATA AND PARAMETERS MONITORED

Data / parameter:	$Fuel_{a,t}$
Data unit:	litres
Used in equations:	1
Description:	Fuel consumed
Source of data:	Records of fuel consumed or distance travelled by vehicles.
Measurement procedures (if any):	<p>In the absence of direct fuel consumption data, each major fuel type used by each road vehicle type can be estimated from data of vehicle kilometers travelled (which requires a km registration system) or from the expenditure on fuel (on the basis of receipts/fuel acquired).</p> <p>Records / monitoring shall be continuous and consumption/mileage shall be divided by equipment type / road vehicle type.</p> <p>Where estimation of fossil fuel combustion is elected as an emission source, fossil fuel use by the project both inside and outside the project boundary shall be recorded and considered as project emissions.</p>
Any comment:	