

**DATABASE ON GREENHOUSE GAS EMISSION FACTORS
(IPCC-EFDB)**

**User Manual
for WEB application**

<http://www.ipcc-nggip.iges.or.jp/EFDB/main.php>

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1 Introduction

1.1 Scope of this document

This User Manual covers the information on how to use the Emission Factor Database (EFDB) WEB application for searching of emission factors or other parameters¹ and submit data proposals for publication in EFDB. The EFDB has been developed to support the greenhouse gas emission inventory community with a library of well-documented emission factors and other parameters.

The EFDB has the objective to provide a variety of users, in particular the inventory compilers of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), with well-documented emission factors and other parameters, as well as to establish a communication platform for distributing and commenting on new research and measurement data. The web application is the core of this system and supports the following features.

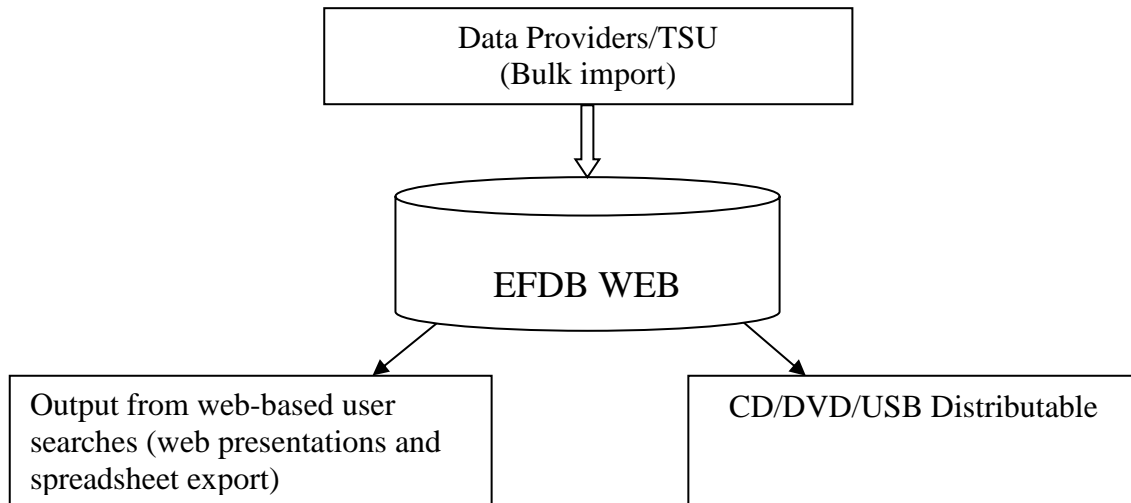
- 1) For all users with Internet access:
 - a) On-line searching EFDB for specific emission factors or other parameters and exporting the results in commercially available software.
- 2) For the EFDB management:
 - a) Accept and process proposed emission factors and other parameters.
 - b) Import emission factor data in bulk.

Figure 1-1 presents data flow diagram.

This document provides guidance for the general users to search and retrieve data as well as guidance for the data providers to propose new emission factors or other parameters.

¹ The EFDB is a database on various parameters to be used in calculation of anthropogenic emissions by sources and removals by sinks of greenhouse gases. It covers not only the so-called “emission factors” but also other relevant parameters. For convenience sake, however, the term “Emission Factor” or its abbreviation “EF” is sometimes used to represent parameters in this database generally.

Figure 1-1 EFDB data flow diagram



1.2 Objective of the EFDB

The overall objective of the EFDB is to be an always up-to-date companion for the IPCC Guidelines for National Greenhouse Gas Inventory that is seen as a worldwide resource for greenhouse gas inventory developers.

The EFDB provides a variety of users, in particular the inventory compilers of the Parties to the UNFCCC, with well-documented emission factors and other parameters, as well as establish a communication platform for distributing and commenting on new research and measurement data. Such a platform can provide an efficient means for experts and researchers to disseminate new emission factors or other parameters in a timely manner to a worldwide audience of potential end users. The EFDB is meant to be a recognised data repository where users can find emission factors and other parameters with background documentation or technical references.

While the EFDB Editorial Board has examined each entry and associated background technical documentation where made available by the data provider, following the evaluation criteria that include robustness and applicability of the data (see Appendix A), the ultimate responsibility of using this information appropriately resides with the users themselves. The members of the EFDB Editorial Board are not responsible for errors in the data as shown in the database, such as those that may be due to transcription errors from the data provider or other errors due to the inaccurate presentation of the data on submission from the data provider. The database users are highly encouraged to consult the background technical reference for the entry to better evaluate the application of the data for their own situation.

The responsibility of using this information appropriately will always remain with the users themselves.

2 Submission of data proposals and data consideration steps

Data providers are encouraged to provide the EFDB with data proposals on emission factors or other parameters. For submission of data proposal, please contact the IPCC TFI Technical Support Unit (TSU) ipcc-efdb@iges.or.jp.

The data proposal should comprise the following documents:

1. Filled in EFDB data entry form (the sheet labelled "Data" is the one where data and information should be entered).
2. A copy of data sources (e.g., peer-reviewed journal papers).

For non-English documents, English translation of abstract should be provided.

Main steps in data consideration process are as follows:

- a. A data proposal is received.
- b. Advance notice to EFDB Editorial Board who will consider the data proposal.
- c. Preliminary check by TSU (e.g. Is all the necessary information available?).
- d. The TSU forward the data proposal to the Editorial Board. Acceptance of such proposals will be subject to evaluation by the Editorial Board using well-defined criteria (see Appendix A).
- e. The Editorial Board consider the data proposal.
- f. Accepted data are published in the EFDB by the TSU.

3 Recommended client configuration: Hardware and software requirements

Hardware

To access the EFDB WEB application, it is necessary to have a PC or other device connected to Internet.

Software

- Internet browser of user's choice.
- Microsoft Office 97 or higher for generating Word and Excel outputs.
- Adobe Acrobat Reader version 4.0 or higher (to read relevant documents).

Browser configuration

The EFDB WEB application requires the browser to have Cookies and JavaScript support enabled. Default browser configuration should be suitable for viewing EFDB web application.

4 Main menu and Home page

Each page of the EFDB application contains the top menu with the links to the particular sections of the application (Figure 4-1) and links to IPCC web sites.

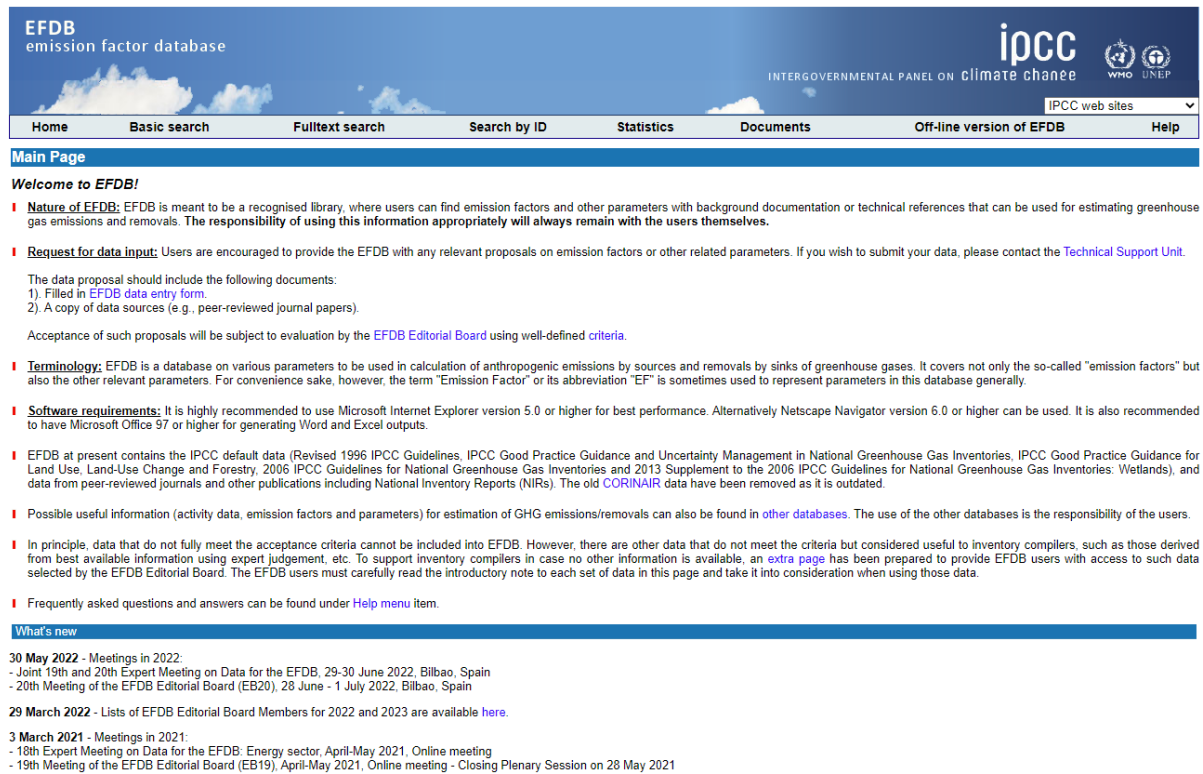
Figure 4-1 EFDB Top menu

Clicking the top menu links will navigate the browser to the corresponding section of EFDB. The following lists the responses to clicking either of the top menu links.

Link	Browser response
• Home	Returns to EFDB Main (or Home) Page (see Figure 4-2).
• Basic search	Opens the section for searching the database for emission factors or other parameters by specifying criteria such as IPCC Source/Sink Category, Gas, Fuel (if applicable), C pool (if applicable), IPCC default data or non-default data; and output table columns (see Chapter 5.1).
• Fulltext search	Opens the section for searching the database for emission factors or other parameters by specifying the keywords (see Chapter 5.2).
• Search by ID	Opens the section for searching one particular emission factor or other parameter by specifying its unique ID (see Chapter 5.3).
• Statistics	Opens the section containing statistics Table 1 and Table 2. Tables contain number of Emission Factors or Other Parameters currently available in the database, stratified by IPCC sectors/categories and sources of data
• Documents	Navigates the browser to the section where all EFDB related documents reside and are available for downloading.
• Off-line version of EFDB	Offline version of the EFDB is available here.
• Help	Opens the EFDB help section.

Choosing a link from the **IPCC web sites** drop-down box will automatically navigate the browser to the corresponding IPCC web site.

Figure 4-2 Main Page



The Main (or Home) Page consists of two sections, separated by a blue line:

- 1) A welcome message and brief description of request for data input, terminology, software requirements etc.
- 2) The section labelled *What's new* contains the latest news. It mainly contains the information about important changes in application as well as link to the offline application of the EFDB.

5 Searching the EFDB for Emission Factors or Other Parameters

You can start the search process by clicking one of the available links located at the top menu.

- 1) In case you are looking for emission factors or other parameters for a particular IPCC Source/Sink Category, “Basic search” link will be useful. → **See Section 5.1 (page 7)**
- 2) In case you wish to look for emission factors or other parameters by some keywords without specifying a particular IPCC Source/Sink Category, you can use “Fulltext search” link. → **See Section 5.2 (page 16)**
- 3) If you already know the specific ID number of data record you want to retrieve, e.g.,
 - in case you have picked up the data record earlier and remember its ID; or
 - in case you have a short list of data records resulted from Option 1 or Option 2 and want to see details of a particular data record included in the short list;“Search by ID” link will be useful. → **See Section 5.3 (page 19)**

IMPORTANT! - In any case, you should always obtain the **Emission Factor Detail** for emission factors or other parameters that have been identified by any of the 3 options and that are being considered for use. → **See Section 5.4 (page 19)**

5.1 Basic search – by specifying the criteria such as the IPCC Source/Sink Category, Gas and Type of Parameter

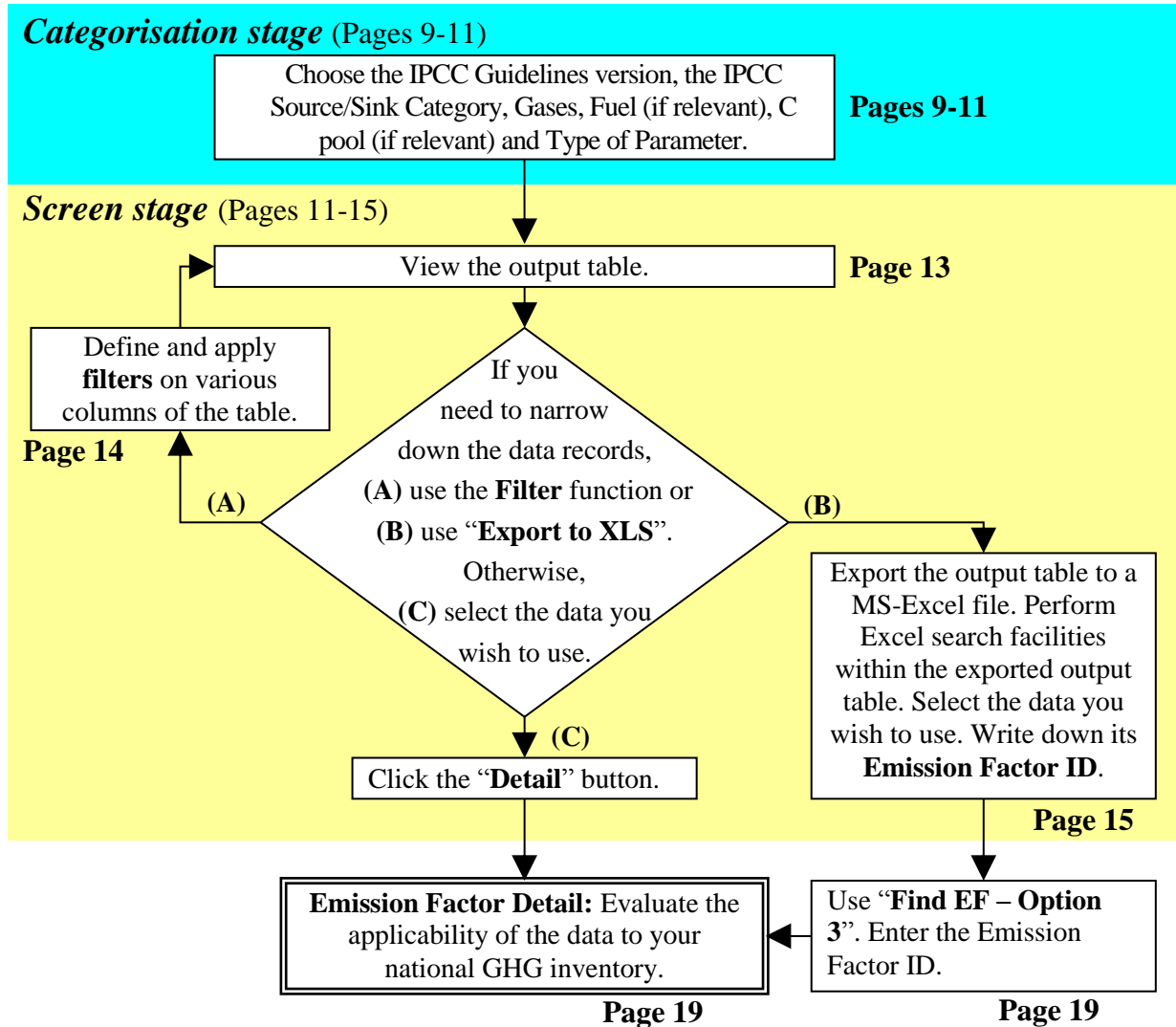
This search option consists of two main stages. These stages are designed to allow you to filter the large EFDB data set for information that is most applicable to your search criteria:

1) Categorisation stage: Specify the selection criteria. This stage results in a table of all emission factors or other parameters complying with the criteria.

- a) Choose the IPCC Guidelines version. It is possible to choose 1996 or 2006 version. Relevant IPCC categorisation (a hierarchical list of categories) for selected version will be displayed. The version is used only for categorization – it does not mean that only emission factors contained in 1996 or 2006 IPCC Guidelines can be searched. All emission factors that are currently in EFDB can be searched and the version helps only with a category list (categorization). 2006 version is selected by default.
- b) Choose the IPCC Source/Sink Category of interest.
- c) Choose the gas(es) of interest.
- d) Choose the fuel(s) or C pools, if applicable, for chosen IPCC Source/Sink Category.
- e) Choose the type of parameter of interest either by using **IPCC Default Data** or **Other (non-default) data** lists (both can be combined) or leave as is for all types of parameters.
- f) Choose regions and/or countries

2) Screen stage: Sort and filter the output table to narrow down the data records by considering properties of data, source of data, etc.

These steps help you identify a manageable subset of data from which to investigate the full **Emission Factor Detail** (see Section 5.4).



5.1.1 Categorisation stage

a) Choosing the IPCC Guidelines version

Select the **IPCC Guidelines version** from the drop-down box. You can choose between 1996 or 2006 version. 2006 version is selected by default. You will be provided with the IPCC Source/Sink categorisation (IPCC Category Tree) according to chosen IPCC Guidelines version.

The version is used only for categorization it does not mean that only emission factors contained in 1996 or 2006 IPCC Guidelines can be searched. All emission factors that are currently in EFDB can be searched and the version helps only with a category list (categorization).

b) Choosing the IPCC Source/Sink Category

Select the **IPCC Source/Sink Category** (Figure 5-1) by a hierarchical procedure. Starting at the top level, you will be presented with a series of IPCC sub-categories within the already selected category.

The complete list of the IPCC Source/Sink Categories can be found in Appendix B.

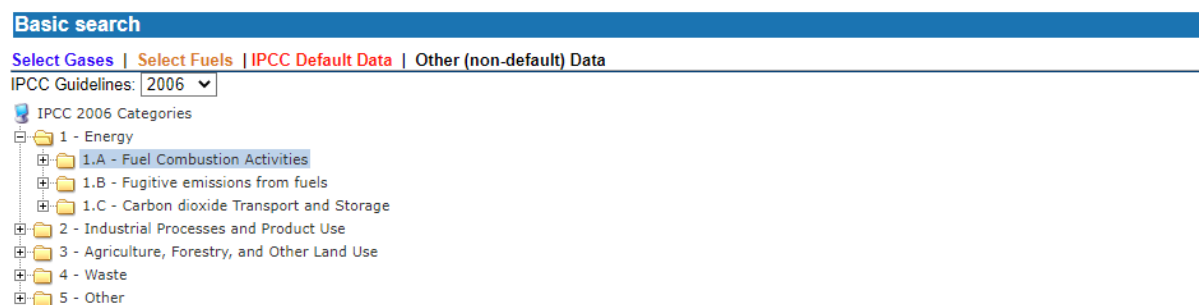
Only the emission factors and other parameters defined within the selected IPCC Source/Sink Category (including the underlying levels) will be included in the search procedure.

By clicking the IPCC Source/Sink Category it becomes selected.

Please note, there are cases when no EFs are displayed at the most disaggregated level of categories of the 2006 IPCC Guidelines. In such cases, please check the higher category level (e.g., 3A1b. Buffalo -> 3A1. Enteric Fermentation).

After choosing the desired IPCC Source/Sink Category, you can proceed to choosing Gas.

Figure 5-1 Choosing the IPCC Source/Sink Category



c) Choosing Gas

It is necessary to choose one or more **Gases** (Figure 5-2). The gases are split into several gas groups. You can choose the gas group using the selection box located at the top of the gas list. The list of gases for chosen gas group will be displayed. CO₂, CH₄ & N₂O are displayed by default. There is a checkbox located in the last column of each row of the list. It is possible to choose one or more gases by checking the checkbox and clicking the **Apply** button. It is also

possible to check/uncheck all gases within the selected group at once by checking the checkbox located in the column header and clicking the **Apply** button².

The list of all Gases can be found in Appendix C.

Figure 5-2 Choosing Gas

Gases		
CO2, CH4 & N2O		OK
Gas name	Formula	Select gas
CARBON DIOXIDE	CO2	<input checked="" type="checkbox"/>
METHANE	CH4	<input checked="" type="checkbox"/>
NITROUS OXIDE	N20	<input checked="" type="checkbox"/>

Apply

d) Choosing Fuel / C pool

If you select the IPCC Source/Sink Category 1A (1.A for 2006 version), you can specify the Fuel of interest as well before proceeding (Figure 5-3a).

The list of Fuel Categories can be found in Appendix B.

Figure 5-3a Choosing Fuel

Fuels 2006	
LIQUID -> GASOLINE	OK
Fuel 2006	<input type="checkbox"/>
Motor Gasoline	<input type="checkbox"/>
Aviation Gasoline	<input type="checkbox"/>
Jet Gasoline	<input type="checkbox"/>

Apply

If you select the IPCC Source/Sink Category 5 (3.B and 3.D for 2006 version), you can specify the C pool of interest as well before proceeding (Figure 5-3b)

² In order to check all gases in all groups, select the (All gases) from the drop-down box. Next check the checkbox located in the column header and click Apply.

Figure 5-3b Choosing C pool

e) Choosing Type of parameter

Optionally, you can further narrow down the results by specifying particular Type of parameter or their combination (Figure 5-4). Types of parameter are split into 2 groups – IPCC Default Data and Other (non-default) data and by default, all Types of parameter are unchecked which means that this criteria does not play a role during search.

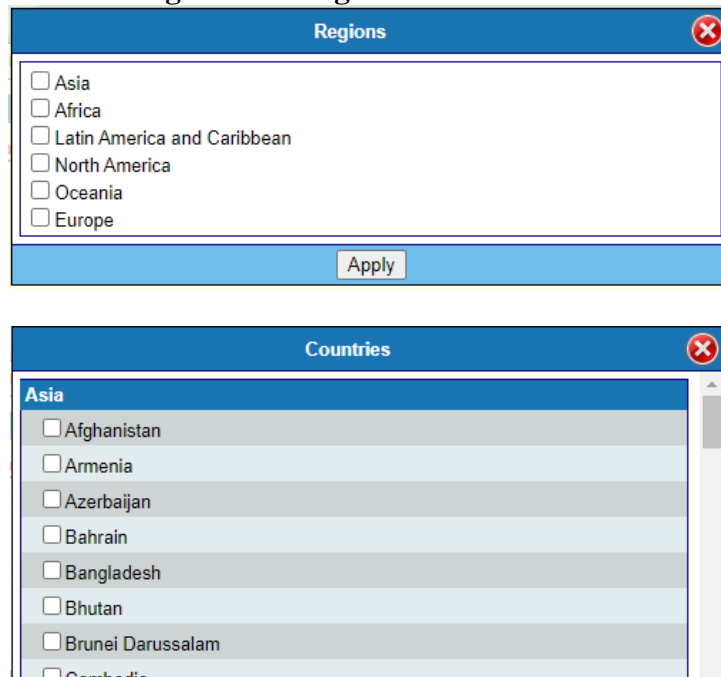
Figure 5-4 Choosing Type of parameter

Please note, there are cases when no EFs are displayed at the most disaggregated level of categories for Type of parameter “2006 IPCC default”. In such cases, please check the higher category level (e.g., 3A1b. Buffalo -> 3A1. Enteric Fermentation).

f) Choosing regions and/or countries

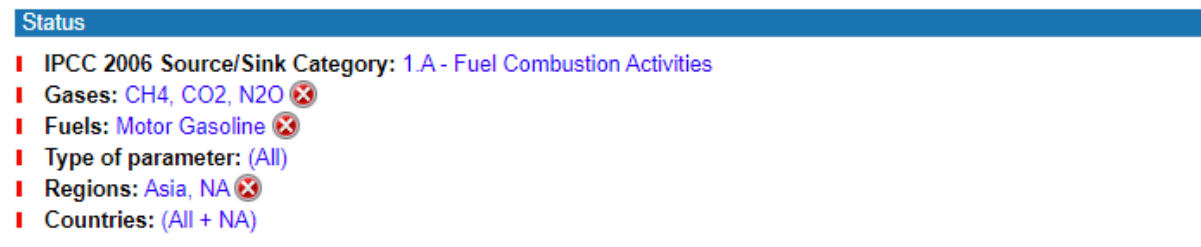
Optionally, you can narrow down the results by specifying Regions and/or Countries. Selected regions/countries are matched against “Region / Regional Conditions” column. If system identifies that this cell does not contain any relevant region/country data that could be matched against default list of regions and countries, such records will be included in search as well as they may contain other relevant information, such as conditions which may apply to any region/country.

Figure 5-5 Regions and Countries



The indication of your search or the Status section contains the information about your current search criteria (Figure 5-6).

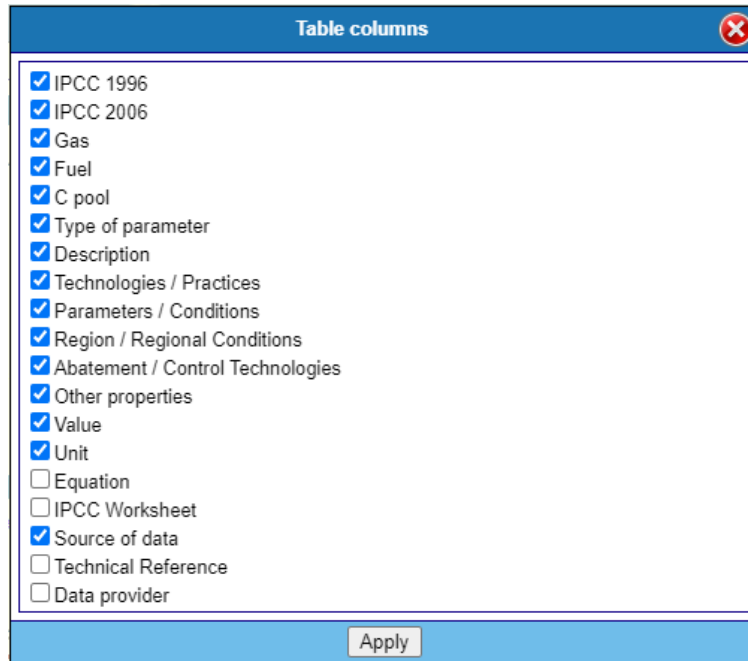
Figure 5-6 Status Section







5.1.2 Screen stage

Below the criteria is the output table of all emission factors and other parameters in the EFDB that comply with the selection criteria in the Categorisation stage (Figure 5-8). This output table contains basic data of each record. You can choose which data to show in the output table by using **Choose table columns** menu (Figure 5-7).

Figure 5-7 Choosing table columns



The number of data displayed is limited to 20 records per page. If the output table contains more than 20 emission factors, you can display the next 20 records by clicking the  button. You can display the previous 20 records by clicking the  button. You can get to the beginning of the list by clicking the  button. You can get to the end of the list by clicking the  button.

If the output table does not contain many data records and you can easily identify the data you wish to use, you do not have to attempt to narrow down the data records but just to click “**Detail**” button in the row of the data record of interest (skip to Section 5.4, page 19).

Figure 5-8 Output Table

Status										
IPCC 2006 Source/Sink Category: 1.A - Fuel Combustion Activities Gases: CH4, CO2, N2O Fuels: Motor Gasoline Type of parameter: (All) Regions: Asia, NA Countries: (All + NA)										
Displayed records: 1 - 20 / 566. ◀ ▶ ⏪ ⏩ Export to XLS										
Filter		Select Gases	Select Fuels						(All) ▼	Apply filter
Active Filters										
EF ID	IPCC 2006	Gas	Fuel	Type of parameter	Description	Region / Regional Conditions	Value	Unit	Source of data	Action
17139	1.A - Fuel Combustion Activities	CARBON DIOXIDE	Motor Gasoline	1996 IPCC default	1990 Net Calorific Values for miscellaneous fuels and products	Not Applicable	44.8	TJ/kt	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-3 on page 1.23 of the Reference Manual)	Detail
17169	1.A - Fuel Combustion Activities	CARBON DIOXIDE	Motor Gasoline	1996 IPCC default	Carbon emission factors for various fuels from different studies	Not Applicable	19.4	tC/TJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-4 on page 1-24 of the Reference Manual)	Detail
17170	1.A - Fuel Combustion Activities	CARBON DIOXIDE	Motor Gasoline	1996 IPCC default	Carbon emission factors for various fuels from different studies	Not Applicable	18.9	tC/TJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-4 on page 1-24 of the Reference Manual)	Detail
18165	1.A.3.b - Road Transportation	NITROUS OXIDE	Motor Gasoline	1996 IPCC default	N2O Default (Uncontrolled) emission factors	Not Applicable	0.6	KG/TJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-8 on Page 1.36 of the Reference Manual)	Detail
18635	1.A.3.b - Road Transportation	METHANE	Motor Gasoline	1996 IPCC default	Estimated emission factors for US Gasoline Passengers Cars	Not Applicable	0.02 -0.03	g/km	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-27 on Page 1.70) of the Reference Manual (Estimated Emission Factors for US Gasoline Passenger Cars)	Detail
18636	1.A.3.b - Road Transportation	METHANE	Motor Gasoline	1996 IPCC default	Estimated emission factors for US Gasoline Passengers Cars	Not Applicable	0.25- 0.38	g/kg fuel	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-27 on Page 1.70) of the Reference Manual (Estimated Emission Factors for US Gasoline Passenger Cars)	Detail
18637	1.A.3.b - Road Transportation	METHANE	Motor Gasoline	1996 IPCC default	Estimated emission factors for US Gasoline Passengers Cars	Not Applicable	0.006 -0.009	g/MJ	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-27 on Page 1.70) of the Reference Manual (Estimated Emission Factors for US Gasoline Passenger Cars)	Detail
18644	1.A.3.b - Road Transportation	NITROUS OXIDE	Motor Gasoline	1996 IPCC default	Estimated emission factors for US Gasoline Passengers Cars	Not Applicable	0.04	g/km	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-27 on Page 1.70) of the Reference Manual (Estimated Emission Factors for US Gasoline Passenger Cars)	Detail

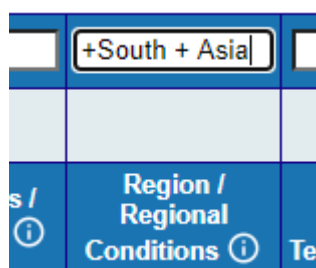
In most cases, however, the output table initially contains so many data records that you may wish to narrow them down. If that is the case, you are advised either to use the **Filter** function (see below) or to use “**Export to XLS**” (see page 15).

a) Filter function

You can narrow down the output table by defining and applying filters on the various columns of the table.

For example, if you are looking for data applicable to Asia, you can type the keyword “Asia” in the **Filter** textbox above the column for “Region / Regional Conditions”. It is possible to use keywords in combination with Boolean operators (for details on Boolean operators, see page 17). For example, if you are looking for data applicable to South Asia, you can type the keyword “+South +Asia” in the **Filter** textbox above the column for “Region/Regional Conditions” (Figure 5-9).

Figure 5-9 Filter function (keywords in combination with Boolean operators)



Multiple filters defined over the same field will be automatically combined with **AND** logical operator. Filters defined for different fields are always combined with **AND** logical operator. Words that have 3 or less characters and common language constructs (like *where*, *every*, etc.) are ignored. The active filters are always displayed in the row labelled **Active filters**. Each filter has its own link, which will switch that particular filter on or off (Figure 5-10).

Figure 5-10 Filter function (Active filters)

Filter	Select Gases							
Active Filters						high quality forage		Europe AND Western
EF ID	IPCC 1996	IPCC 2006	Gas	Type of parameter	Description	Technologies / Practices	Parameters / Conditions	Region / Regional Conditions
43106	4A1a - Dairy	3.A.1.a.i - Dairy Cows	METHANE	1996 IPCC default	Enteric Fermentation Emission Factors for Cattle	Highly productive commercialised dairy sector feeding high quality forage and grain. Dairy cows also used for beef calf production.	Average milk production of 4,200 kg/head/yr	Region: Western Europe

You can also sort the output table. Clicking the column header labels (links) of each column (except Value and Unit) will sort records by that column. Small arrow next to column label represents the sorting order (ASC – ascending, DESC – descending). Clicking the same column header will switch sorting order between ascending and descending.

The sorting and filtering techniques described above will facilitate your search for the subset of data records for which you may wish to obtain and consider the detail information. This avoids time spent considering the detail information for factors not relevant to your specific search criteria.

Clicking the “**Detail**” button in the last column of the list for each data record displays the complete information (see Section 5.4, page 19).

b) Export to Microsoft Excel (XLS)

Clicking the “**Export to XLS**” button at the top of the output table (Figure 5-11) will export the whole output table to Microsoft Excel.

Figure 5-11 Export to XLS



Microsoft Excel search facilities can then be used, independently of the EFDB web application, to perform more advanced searching within the exported output table.

Figure 5-12 Exported output table and Emission Factor ID

D5 fx Facility: Stepgrate, Nature of Waste: Municipal refuse				
output.xls				
	A	B	C	
1	EF ID	Gas	Description	
2	62174	NITROUS OXIDE	Nitrous Oxide Emission Factor	09100: resider
3	62962	NITROUS OXIDE	Emission Factors for N2O from Waste Incineration	Inciner
4	62882	NITROUS OXIDE	N2O Emission Factors from Waste Incineration	Facility Sludge
5	62872	NITROUS OXIDE	N2O Emission Factors from Waste Incineration	Facility Munici
	62871	NITROUS OXIDE	N2O Emission Factors from Waste	Facility

When you find the data using Microsoft Excel and you wish to examine more details to evaluate its applicability to your national GHG inventory, you should write down its **Emission Factor ID (EF ID)**. Then you should go back to the EFDB web application and implement “Search by ID” (see page 19). You can directly get to the detail information on the data record you selected.

5.2 Fulltext search using keywords

This option implements full text search on keywords³ allowing to query the database for emission factors or other parameters. The keywords entered will be matched against EF related textual data such as: *Data provider name, Gas, IPCC Source/Sink Category code, IPCC Source/Sink Category name, Fuel, EF description, IPCC worksheet number, source of data, technical reference, abstract in English, data quality, data quality reference, other information on data quality, comments from provider, comments from others and properties.*

Records that match the keywords will be automatically sorted with decreasing relevance.

Figure 5-13 FULLTEXT search using keywords

FULLTEXT Search Using Keywords													
Keywords													
manure management south america - percentage											Search		
Displayed records: 1 - 10 / 5236. [Navigation icons]													
EF ID	IPCC 1996 Source/Sink Category	IPCC 2006 Source/Sink Category	Gas	Fuel 1996	Fuel 2006	Description	Technologies / Practices	Parameters / Conditions	Region / Regional Conditions	Abatement / Control Technologies	Other properties	Value	Unit
45335	4B1b - Non-Dairy	3 A.2.a.ii - Other cattle	NITROUS OXIDE			Default Values for Percentage of Manure N Produced in Different Animal Waste Management Systems in Different World Regions (from Safley et al. 1992)	Animal Waste Management System: Anaerobic Lagoon		Region: North America		Includes buffalo	0	% of Manure Production per Animal Waste Management System
45336	4B1b - Non-Dairy	3 A.2.a.ii - Other cattle	NITROUS OXIDE			Default Values for Percentage of Manure N Produced in Different Animal Waste Management Systems in Different World Regions (from Safley et al. 1992)	Animal Waste Management System: Liquid System		Region: North America		Includes buffalo	1	% of Manure Production per Animal Waste Management System

5.2.1 How FULLTEXT search works and what can be expected from it

The FULLTEXT search function matches a natural language query against a text collection (which is simply the set of columns covered by a FULLTEXT index). For every row in a table it returns relevance - a similarity measure between the text in that row (in the columns that are part of the collection) and the query. The rows returned are automatically sorted with decreasing relevance. Relevance is a non-negative floating-point number. Zero relevance means no similarity. Relevance is computed based on the number of words in the row, the number of unique words in that row, the total number of words in the collection, and the number of documents (rows) that contain a particular word. **Any "word" that is present in the stop-word list or just too short (3 or less characters) is ignored.** Every correct word in the collection and in the query is weighted, according to its significance in the query or collection. This way, a word that is present in many documents will have lower weight (and may even have a zero weight), because it has lower semantic value in this particular collection. Otherwise, if the word is rare, it will receive a higher weight. The weights of the words are then combined to compute the relevance of the row. Such a technique works best with large collections (in fact, it was carefully tuned this way). For very small tables, word distribution

³ It should be noted that the words spelled differently are treated as different words. For example, you cannot detect the word “centre” when you enter “center” as a keyword. It is recommended to enter both “center” and “centre” as keywords if you wish to detect such a word regardless of the way how it is spelled.

does not reflect adequately their semantic value, and this model may sometimes produce bizarre results.

For example, search for the word “**IPCC**” will produce no results. The word “**IPCC**” is present in more than half of rows, and as such, is effectively treated as a stop-word (that is, with semantic value zero). It is, really, the desired behaviour - a natural language query should not return every second row from a very large table. A word that matches half of rows in a table is less likely to locate relevant documents. In fact, it will most likely find plenty of irrelevant documents.

5.2.2 Using keywords and Boolean operators

This FULLTEXT search engine supports Boolean mode. This means, it is possible to use keywords in combination with Boolean operators. If you type in multiple keywords without any Boolean operators, those keywords will be combined with **OR** logical operator.

The Boolean FULLTEXT search capability supports the following operators:

- **+** A leading plus sign indicates that this word must be present in every row returned.
- **-** A leading minus sign indicates that this word must not be present in any row returned. A single keyword prefixed with a minus sign does not work (the EFDB does not return any results).

By default (when neither plus nor minus is specified) the word is optional, but the rows that contain it will be rated higher.

- **< >** These two operators are used to change a word's contribution to the relevance value that is assigned to a row. The **<** operator decreases the contribution and the **>** operator increases it. See the example on page 18.
- **()** Parentheses are used to group words into subexpressions.
- **~** A leading tilde acts as a negation operator, causing the word's contribution to the row relevance to be negative. It's useful for marking noise words. A row that contains such a word will be rated lower than others, but will not be excluded altogether, as it would be with the **-** operator. A single keyword prefixed with a tilde does not work (the EFDB does not return any results).
- ***** An asterisk is the truncation operator. Unlike the other operators, it should be **suffix**ed to the word, not prefixed.
- **"** The phrase, that is enclosed in double quotes **"**, matches only rows that contain this phrase **literally, as it was typed**.

How to use keywords in combination with Boolean operators are illustrated on page 18.

It is possible to do sorting of the data set the same way as it works in the output table described in Section 5.1.2 (see page 11).

EXAMPLES OF A QUERY	RESPONSE
national inventory	Return the rows that contain “national” or “inventory” or both (= “ OR ” search).
+national +inventory	Return the rows that contain both of “national” and “inventory” in any order (= “ AND ” search).
"national inventory"	Return the rows that contain “national inventory”. In this case, “national inventory” is treated as one word.
+national -inventory	Return the rows that contain “national” but do not contain “inventory”.
+national inventory	Return the rows that contain “national”. If the row also contains “inventory”, it will be ranked higher.
national inventory -(+national +inventory)	Return the rows that contain either “national” or “inventory” but not both (= “ Exclusive OR ” search).
+inventory +(national annual)	Return the rows that contain “national” and “inventory”, or “annual” and “inventory”.
+inventory +(>national <annual)	Return the rows that contain “national” and “inventory”, or “annual” and “inventory”. “national” will be prioritised in searching.
invent*	Return the rows that contain any words starting with “invent”: e.g., “inventory”, “inventories”, “invention”, etc.
-inventory	Return nothing!! A single keyword prefixed with a minus sign does not work.

5.2.3 Hints

If you specify some keywords, look at the search results and find out that the first record in the set is not exactly what you expected to get, it makes no sense to browse for next records in the same data set. This is because records are sorted with relevance decreasing.

Example:

Let's say that you want to search for emission factor for CO₂ for swine in Asia temperate region. Your keywords will be: **carbon dioxide swine Asia temp** (note that we cannot use CO₂ as a keyword because words with 3 or less characters are ignored). First record of the returned data set will contain Manure management for cattle swine and buffalo, but for **METHANE, NOT CO₂!** This is because there is no CO₂ emission factor for manure management in the EFDB. So it makes no sense to browse for it in the actual result set.

5.3 Find Emission Factor or other parameter using its unique ID

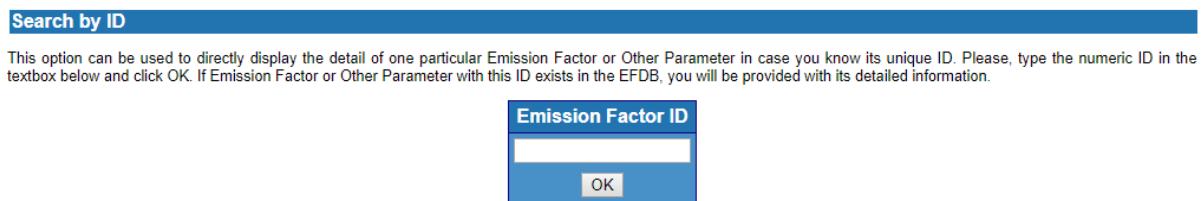
This option can be used to directly display the detail of one particular emission factor in case the user knows (or remembers) its unique ID. For example:

- in case you have picked up the data record earlier and remember its ID; or
- in case you have a short list of data records resulted from Option 1 or Option 2 and want to see details of a particular data record included in the short list (see page 15, “b) Export to XLS”).

You have to type the numeric ID in the textbox and click OK. The first number of the ID represents the IPCC Main Sector where the emission factor or other parameter belongs (e.g. 1xxxx for Energy, 4xxxx for Agriculture, etc.) (Figure 5-14).

This option is useful when you need to quickly revisit those data records that you once visited.

Figure 5-14 Find EF using unique ID



5.4 Emission Factor Detail

This page contains the complete information for the particular emission factor or other parameter (Figure 5-15). You should always obtain the **Emission Factor Detail** for emission factors or other parameters that have been identified by any of the search options and that are being considered for use. It is only on the **Emission Factor Detail** page that the complete information for an emission factor or other parameter in the EFDB is provided. This detail can be exported to Microsoft Excel and Microsoft Word clicking the “**Report to XLS**” and “**Report to DOC**” buttons.

Figure 5-15 Emission Factor Detail

Emission Factor Detail (ID: 43143)	
Administrative information	
Data Provider:	IPCC
Data Provider Country:	(Not applicable)
Data Provider Contact:	ipcc-efdb@iges.or.jp
Date calculated:	Unknown
Date submitted to EFDB by Data Provider:	(Not applicable)
Date posted to EFDB by IPCC:	2002-09-27
Technical information	
Gas:	METHANE
IPCC 1996 Source/Sink Category:	Agriculture (4) -> Manure Management (4B) -> Horses (4B6)
IPCC 2006 Source/Sink Category:	Agriculture, Forestry, and Other Land Use (3) -> Livestock (3.A) -> Manure Management (3.A.2) -> Horses (3.A.2.f)
Properties	
Technologies/Practices:	All manure is assumed to be managed in dry manure management systems, including pastures and ranges, drylots, and daily spreading on fields.
Parameters/Conditions:	Annual Average temperature is greater than 25 C; MCF value used in the estimation is 2%
Region/Regional Conditions:	Climate: Warm; Country: Developing Countries
Abatement/Control Technologies:	
Others:	
Description:	Manure Management Emission Factor
Value:	2.2 kg/head/yr
Value in common units:	
Equation:	Equation 4.15 on Page 4.30 of the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
IPCC Worksheet:	Worksheet 4-1, Sheet 1 of 2
Source of data:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 4-5 on Page 4.12 of the Reference Manual)
Technical Reference:	Woodbury, J.W. and A. Hashimoto (1993), "Methane Emissions from Livestock Manure." In International Methane Emissions, US Environmental Protection Agency, Climate Change Division, Washington, D.C., U.S.A.
Reference language:	English
Abstract in English:	
Uncertainties expressed as 95% confidence limit:	Upper: 20% Lower: -20%
Data quality:	IPCC default
Distribution shape:	
Data quality reference:	
Other info on data quality:	
Usage/Review information	
Type of parameter:	1996 IPCC default
Comments from the data provider:	
Comments from others:	
Link:	

Appendix A: Criteria to be used in the evaluation by the EFDB Editorial Board

The EFDB should assist countries in producing inventories that are neither over- nor underestimates so far as can be judged and in which uncertainties are reduced as far as practicable. To achieve this, a proposed emission factor or other parameter should:

- ✓ be in line with the fundamental principles and approaches of the IPCC guidelines for national greenhouse gas inventories.
- ✓ be accompanied by documentation describing the conditions of its derivation and information regarding the level of uncertainty, preferably quantified but at a minimum some qualitative indicators, to be attached to it.
- ✓ be unbiased and as accurate as possible.
- ✓ contribute to the EFDB by adding a value for a source not already covered or by providing a different value or an identical but independent value for an existing emission factor or parameter type. The technical information in the “properties fields” should provide the information needed to differentiate between the alternative values for emission factors or parameters for a particular source.

To meet these standards, the proposed emission factor or other parameter should be robust, applicable and documented. Each of these criteria is briefly discussed below.

Is the emission factor or other parameter robust?

A robust emission factor or other parameter is one that, within the accepted uncertainty, is unlikely to change if there was repetition of the original measurement programme or modelling activity. Specific issues concerning robustness are:

- Are the measurement techniques including raw data validated and/or verified?
- Are the modelling techniques including supporting data validated and/or verified?
- Is the conversion (if any) from model assumptions or measurement conditions to annual or other forms of emission factors or other parameters sufficiently explained and justified?
- Is an uncertainty assessment on the emission factor or other parameter presented?

Is the emission factor or other parameter applicable?

An applicable emission factor or other parameter is one that matches either a specific IPCC Source/Sink Category or subcategory, or another well-defined source category that can be used in a national inventory compilation. An emission factor is applicable if the source and its mix of technology, operating and environmental conditions and abatement and control technologies under which the emission factor was measured or modelled are clear and allow the user to see how it can be applied.

Is the emission factor or other parameter documented?

For emission factors or other parameters to be transparent, access information to the original technical reference must be provided to evaluate the robustness and applicability as described above. This can preferably be done by providing sufficient information through a scientific or technical publication in an internationally available journal or a report or book with an ISBN number. For those emission factors or other parameters where this is not available, the data provider can provide the information required to enable a judgement on its robustness and applicability as described above through technical documentation, or by sufficient information

in the Data Entry Form to satisfy the acceptance requirements.

The information provided in the “Data” sheet of Data Entry Form should be detailed and comprehensive enough so that users may be able to evaluate the applicability to a national GHG inventory. Pivotal elements are an accurate source definition and proper information on the type and extent of validation and on known applications to date. These documentation requirements are even more important when the background document is not written in English.

The data provider should be encouraged to provide an electronic or hard copy of the technical reference to the TSU at the time of data submission or alternatively, make available this information in a publicly accessible form such as widely available scientific journals or proceedings.

Appendix B: IPCC Source/Sink Categories and Fuel Categories

Detailed description of activities included in each source/sink category can be found in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol.1 Reporting Instructions, “Understanding the Common Reporting Framework”⁴ and in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol.1, Chapter 8 (Table 8.2)⁵ and Vol.2, Chapter 1 “Introduction”⁶.

In the current EFDB web version:

- 18 categories are added under “5 Land-Use Change & Forestry” to accommodate default data provided in the report on *Land Use, Land-Use Change, and Forestry* (LULUCF) (IPCC, 2006) (Table 2.25).
- 6 categories are added under 3C to accommodate default data provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol.2, Chapter 1 “Introduction”⁷.

For details, see the note on page 28.

Table B-1 IPCC 1996 Source/Sink Categories

IPCC Code	IPCC Name
1	Energy
1A	Fuel Combustion Activities
1A1	Energy Industries
1A1a	Public Electricity and Heat Production
1A1a1	Public Electricity Generation
1A1a2	Public Combined Heat and Power Generation (CHP)
1A1a3	Public Heat Plants
1A1b	Petroleum Refining
1A1c	Manufacture of Solid Fuels and Other Energy Industries
1A1c1	Manufacture of Solid Fuels
1A1c2	Other Energy Industries (please specify)
1A2	Manufacturing Industries and Construction (ISIC)
1A2a	Iron and Steel
1A2b	Non-Ferrous Metals
1A2c	Chemicals
1A2d	Pulp, Paper and Print
1A2e	Food Processing, Beverages and Tobacco
1A2f	Other (please specify)
1A3	Transport
1A3a	Civil Aviation
1A3a1	International Aviation
1A3a2	Domestic
1A3b	Road Transportation

⁴ The electronic copy is available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs4.html>.

⁵ http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8_Ch8_Reporting_Guidance.pdf.

⁶ The electronic copy is available at <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html>.

⁷ 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. 2014 – Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds). Published: IPCC, Switzerland.

IPCC Code	IPCC Name
1A3b1	Cars
1A3b2	Light Duty Trucks
1A3b3	Heavy Duty Trucks and Buses
1A3b4	Motorcycles
1A3b5	Evaporative Emissions from Vehicles
1A3c	Railways
1A3d	Navigation
1A3d1	International Marine (Bunkers)
1A3d2	National Navigation
1A3e	Other Transportation
1A3e1	Pipeline Transport
1A3e2	Off-road
1A4	Other Sectors
1A4a	Commercial/Institutional
1A4b	Residential
1A4c	Agriculture/Forestry/Fishing
1A4c1	Stationary
1A4c2	Off-road Vehicles and Other Machinery
1A4c3	Fishing
1A5	Other
1A5a	Stationary
1A5b	Mobile
1B	Fugitive Emissions from Fuels
1B1	Solid Fuels
1B1a	Coal Mining
1B1a1	Underground Mines
1B1a2	Surface Mines
1B1b	Solid Fuel Transformation
1B1c	Other (please specify)
1B2	Oil and Natural Gas
1B2a	Oil
1B2a1	Exploration
1B2a2	Production
1B2a3	Transport
1B2a4	Refining/Storage
1B2a5	Distribution of Oil Products
1B2a6	Other (please specify)
1B2b	Natural Gas
1B2b1	Production/Processing
1B2b2	Transmission/Distribution
1B2b3	Other leakage
1B2c	Venting and Flaring
1B2c1	Oil
1B2c2	Gas
1B2c3	Combined
1B2d	Other (please specify)
2	Industrial Processes
2A	Mineral Products
2A1	Cement Production
2A2	Lime Production
2A3	Limestone and Dolomite Use
2A4	Soda Ash Production and Use
2A5	Asphalt Roofing
2A6	Road Paving with Asphalt

IPCC Code	IPCC Name
2A7	Other (please specify)
2B	Chemical Industry
2B1	Ammonia Production
2B2	Nitric Acid Production
2B3	Adipic Acid Production
2B4	Carbide Production
2B5	Other (please specify)
2C	Metal Production
2C1	Iron and Steel Production
2C2	Ferroalloys Production
2C3	Aluminium Production
2C4	SF ₆ Used in Aluminium and Magnesium Foundries
2C5	Other (please specify)
2D	Other Production
2D1	Pulp and Paper
2D2	Food and Drink
2E	Production of Halocarbons and Sulphur Hexafluoride
2E1	By-product Emissions
2E2	Fugitive Emissions
2E3	Other (please specify)
2F	Consumption of Halocarbons and Sulphur Hexafluoride
2F1	Refrigeration and Air Conditioning Equipment
2F2	Foam Blowing
2F3	Fire Extinguishers
2F4	Aerosols
2F5	Solvents
2F6	Other (please specify)
2G	Other (please specify)
3	Solvent and Other Product Use
3A	Paint Application
3B	Degreasing and Dry Cleaning
3C	Chemical Product, Manufacture and Processing
3D	Other
4	Agriculture
4A	Enteric Fermentation
4A1	Cattle
4A1a	Dairy
4A1b	Non-Dairy
4A2	Buffalo
4A3	Sheep
4A4	Goats
4A5	Camels and Llamas
4A6	Horses
4A7	Mules and Asses
4A8	Swine
4A9	Poultry
4A10	Other (please specify)
4B	Manure Management
4B1	Cattle
4B1a	Dairy
4B1b	Non-Dairy
4B2	Buffalo
4B3	Sheep
4B4	Goats

IPCC Code	IPCC Name
4B5	Camels and Llamas
4B6	Horses
4B7	Mules and Asses
4B8	Swine
4B9	Poultry
4B10	Anaerobic
4B11	Liquid Systems
4B12	Solid storage and Dry Lot
4B13	Other (please specify)
4C	Rice Cultivation
4C1	Irrigated
4C1a	Continuously Flooded
4C1b	Intermittently Flooded
4C1b1	Single aeration
4C1b2	Multiple aeration
4C2	Rainfed
4C2a	Flood prone
4C2b	Drought prone
4C3	Deep Water
4C3a	Water depth 50 – 100 cm
4C3b	Water depth greater than 100 cm
4C4	Other (please specify)
4D	Agricultural Soils
4E	Prescribed Burning of Savannas
4F	Field Burning of Agricultural Residues
4F1	Cereals
4F2	Pulse
4F3	Tuber and Root
4F4	Sugar Cane
4F5	Other (please specify)
4G	Other (please specify)
5	Land-Use Change & Forestry
5A	Changes in Forest and Other Woody Biomass Stocks
5A1	Tropical Forests
5A1a	Wet/very moist
5A1b	Moist, short dry season
5A1c	Moist, long dry season
5A1d	Dry
5A1e	Mountain moist
5A1f	Mountain dry
5A1g	Plantations
5A1h	Other (please specify)
5A2	Temperate Forests
5A2a	Coniferous
5A2b	Broadleaf
5A2c	Plantations
5A2d	Other (please specify)
5A3	Boreal Forests
5A3a	Mixed broadleaf/Coniferous
5A3b	Coniferous
5A3c	Forest tundra
5A4	Grasslands/Tundra
5A5	Other (please specify)
5B	Forest and Grassland Conversion

IPCC Code	IPCC Name
5B1	Tropical Forests
5B1a	Wet/very moist
5B1b	Moist, short dry season
5B1c	Moist, long dry season
5B1d	Dry
5B1e	Mountain moist
5B1f	Mountain dry
5B1g	Plantations
5B1h	Other (please specify)
5B2	Temperate Forests
5B2a	Coniferous
5B2b	Broadleaf
5B2c	Plantations
5B2d	Other (please specify)
5B3	Boreal Forests
5B3a	Mixed broadleaf/Coniferous
5B3b	Coniferous
5B3c	Forest tundra
5B4	Grasslands/Tundra
5B5	Other (please specify)
5C	Abandonment of Managed Lands
5C1	Tropical Forests
5C2	Temperate Forests
5C3	Boreal Forests
5C4	Grasslands/Tundra
5C5	Other (please specify)
5D	CO ₂ Emissions and Removals from Soil
5E	Other (please specify)
5-FL	Forest Land
5-FL-1	Forest Land Remaining Forest Land
5-FL-2	Land Converted to Forest Land
5-CL	Cropland
5-CL-1	Cropland Remaining Cropland
5-CL-2	Land Converted to Cropland
5-GL	Grassland
5-GL-1	Grassland Remaining Grassland
5-GL-2	Land Converted to Grassland
5-WL	Wetlands
5-WL-1	Wetlands Remaining Wetlands
5-WL-2	Land Converted to Wetlands
5-SL	Settlements
5-SL-1	Settlements Remaining Settlements
5-SL-2	Land Converted to Settlements
5-OL	Other Land
5-OL-1	Other Land Remaining Other Land
5-OL-2	Land Converted to Other Land
6	Waste
6A	Solid Waste Disposal on Land
6A1	Managed Waste Disposal on Land
6A2	Unmanaged Waste Disposal Sites
6A3	Other (please specify)
6B	Wastewater Handling
6B1	Industrial Wastewater
6B2	Domestic and Commercial Wastewater

IPCC Code	IPCC Name
6B3	Other (please specify)
6C	Waste Incineration
6D	Other (please specify)
7	Other (please specify)

<Note on Processing Data from GPG-LULUCF and Wetlands Supplement>

In processing data of emission factors and other parameters from the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF)*, 18 new categories were added under “5 Land-Use Change & Forestry” in the list of "IPCC Category". These categories consist of 6 land use categories in GPG-LULUCF namely: Forest land (5-FL), Cropland (5-CL), Grassland (5-GL), Wetlands (5-WL), Settlements (5-SL), and Other land (5-OL). Each land use category is further sub-categorized into two based on the status and recent history of land use. Thus, for instance, for Forest land (5-FL), the sub-categories are: Forest land Remaining Forest land (5-FL-1) and Land Converted to Forest land (5-FL-2). These categories correspond to the sections and subsections of Chapter 3 of *GPG-LULUCF*. Linkage between these categories and the 1996 IPCC Guidelines’ reporting categories is elaborated in Section 3.1.2 of *GPG-LULUCF* (pages 3.11-3.14).

The EFDB has been remodeled to incorporate the 2006 IPCC Guidelines new structure of the source/sink categories. The current source/sink categories in the 1996 Guidelines will be retained in view of the need for the Parties to the UNFCCC to continue using the 1996 Guidelines. The search function are improved so that users can search for data according to either source/sink classification (1996 Guidelines or 2006 Guidelines).

In addition, six new categories, namely 3C.8-3.C13 (see page 35), were added into the EFDB to reflect default data from Wetlands Supplement.

Fuel categories used in the EFDB are based on, but not identical to, the basic fuels hierarchy presented in the *Annex B* of the IPCC Guidelines, “Understanding the Common Reporting Framework”⁸ and in the *Annex B*, Vol.2, Chapter 1 “Introduction”⁹.

Table B-2 Fuel 1996 Categories

Fuel Name
LIQUID -> Crude Oil
LIQUID -> Orimulsion
LIQUID -> Natural Gas Liquids
LIQUID -> GASOLINE -> Motor Gasoline
LIQUID -> GASOLINE -> Aviation Gasoline
LIQUID -> GASOLINE -> Jet Gasoline
LIQUID -> Jet Kerosene
LIQUID -> Other Kerosene
LIQUID -> Shale Oil
LIQUID -> Diesel Oil
LIQUID -> Gas Oil
LIQUID -> Residual Fuel Oil
LIQUID -> Liquefied Petroleum Gas (LPG)
LIQUID -> Ethane
LIQUID -> Naphtha
LIQUID -> Bitumen
LIQUID -> Lubricants
LIQUID -> Petroleum Coke
LIQUID -> Refinery Feedstock
LIQUID -> Refinery Gas
LIQUID -> Paraffin Waxes
LIQUID -> White Spirit/Industrial spirits (SBP)
LIQUID -> Other Oils
SOLID -> Peat
SOLID -> Lignite/Brown Coal
SOLID -> Other Sub-Bituminous Coal
SOLID -> Anthracite
SOLID -> Coking Coal
SOLID -> Other Bituminous Coal
SOLID -> Oil Shale
SOLID -> COKE -> Coke Oven Coke
SOLID -> COKE -> Other cokes from solid fuels
SOLID -> Coal-derived tars and oils
SOLID -> BKB/PATENT FUEL -> Patent Fuel
SOLID -> BKB/PATENT FUEL -> Brown Coal Briquettes
SOLID -> DERIVED GASES -> Coke Oven Gas
SOLID -> DERIVED GASES -> Blast Furnace Gas
SOLID -> DERIVED GASES -> Gas Works Gas
SOLID -> DERIVED GASES -> Other gases and mixtures from coal-derived carbon
SOLID -> Undifferentiated Coal
GAS -> Natural Gas
OTHER FUELS -> Municipal Solid Waste (Garbage)

⁸ The electronic copy is available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs4.html>.

⁹ The electronic copy is available at <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>.

Fuel Name
OTHER FUELS -> Industrial Waste
OTHER FUELS -> Fuel mixtures (fossil and biomass) ^{a, b}
OTHER FUELS -> Waste Gas (especially chemical industry)
OTHER FUELS -> Other Wastes (specify nature) ^c
BIOMASS -> SOLID -> Wood/Wood Waste
BIOMASS -> SOLID -> Agricultural Waste (corncoobs, straw, etc...)
BIOMASS -> SOLID -> Charcoal
BIOMASS -> SOLID -> Other solid biomass
BIOMASS -> LIQUID -> Bio-Alcohol
BIOMASS -> LIQUID -> Sulphur Lies (Black Liquor)
BIOMASS -> LIQUID -> Sewage Sludge
BIOMASS -> LIQUID -> Other liquid biomass
BIOMASS -> GAS -> Landfill Gas
BIOMASS -> GAS -> Sludge Gas (Sewage Gas)
BIOMASS -> GAS -> Other Biogas

- a) When making a data proposal for this fuel type, the data provider must specify the details concerning composition of the mixture of fuel in the *PaP TcTab 2 SXX b* property field.
- b) This fuel type is meant for emission factors or other parameters for non-CO₂ gases. As regards parameters on CO₂ such as CEF (Carbon Emission Factor), it is advisable for data providers to input data on each fuels separately rather than data on the mixture of those fuels.
- c) This category includes tires, hospital/clinical waste and hazardous waste. The data provider must specify the details concerning composition of the mixture of fuel in the *PaP TcTab 2 SXX b* property field.

Table B-3 IPCC 2006 Source/Sink Categories

IPCC Code	IPCC Name
1	Energy
1.A	Fuel Combustion Activities
1.A.1	Energy Industries
1.A.1.a	Main Activity Electricity and Heat Production
1.A.1.a.i	Electricity Generation
1.A.1.a.ii	Combined Heat and Power Generation (CHP)
1.A.1.a.iii	Heat Plants
1.A.1.b	Petroleum Refining
1.A.1.c	Manufacture of Solid Fuels and Other Energy Industries
1.A.1.c.i	Manufacture of Solid Fuels
1.A.1.c.ii	Other Energy Industries
1.A.2	Manufacturing Industries and Construction
1.A.2.a	Iron and Steel
1.A.2.b	Non-Ferrous Metals
1.A.2.c	Chemicals
1.A.2.d	Pulp, Paper and Print
1.A.2.e	Food Processing, Beverages and Tobacco
1.A.2.f	Non-Metallic Minerals
1.A.2.g	Transport Equipment
1.A.2.h	Machinery
1.A.2.i	Mining (excluding fuels) and Quarrying
1.A.2.j	Wood and wood products
1.A.2.k	Construction
1.A.2.l	Textile and Leather
1.A.2.m	Non-specified Industry

IPCC Code	IPCC Name
1.A.3	Transport
1.A.3.a	Civil Aviation
1.A.3.a.i	International Aviation (International Bunkers)
1.A.3.a.ii	Domestic Aviation
1.A.3.b	Road Transportation
1.A.3.b.i	Cars
1.A.3.b.i.1	Passenger cars with 3-way catalysts
1.A.3.b.i.2	Passenger cars without 3-way catalysts
1.A.3.b.ii	Light-duty trucks
1.A.3.b.ii.1	Light-duty trucks with 3-way catalysts
1.A.3.b.ii.2	Light-duty trucks without 3-way catalysts
1.A.3.b.iii	Heavy-duty trucks and buses
1.A.3.b.iv	Motorcycles
1.A.3.b.v	Evaporative emissions from vehicles
1.A.3.b.vi	Urea-based catalysts
1.A.3.c	Railways
1.A.3.d	Water-borne Navigation
1.A.3.d.i	International water-borne navigation (International bunkers)
1.A.3.d.ii	Domestic Water-borne Navigation
1.A.3.e	Other Transportation
1.A.3.e.i	Pipeline Transport
1.A.3.e.ii	Off-road
1.A.4	Other Sectors
1.A.4.a	Commercial/Institutional
1.A.4.b	Residential
1.A.4.c	Agriculture/Forestry/Fishing/Fish Farms
1.A.4.c.i	Stationary
1.A.4.c.ii	Off-road Vehicles and Other Machinery
1.A.4.c.iii	Fishing (mobile combustion)
1.A.5	Non-Specified
1.A.5.a	Stationary
1.A.5.b	Mobile
1.A.5.b.i	Mobile (aviation component)
1.A.5.b.ii	Mobile (water-borne component)
1.A.5.b.iii	Mobile (Other)
1.A.5.c	Multilateral Operations
1.B	Fugitive emissions from fuels
1.B.1	Solid Fuels
1.B.1.a	Coal mining and handling
1.B.1.a.i	Underground mines
1.B.1.a.i.1	Mining
1.B.1.a.i.2	Post-mining seam gas emissions
1.B.1.a.i.3	Abandoned underground mines
1.B.1.a.i.4	Flaring of drained methane or conversion of methane to CO ₂
1.B.1.a.ii	Surface mines
1.B.1.a.ii.1	Mining
1.B.1.a.ii.2	Post-mining seam gas emissions
1.B.1.a.ii.3	Abandoned Surface Mines – 2019 Refinement
1.B.1.a.iii	Coal Exploration – 2019 Refinement
1.B.1.b	Uncontrolled combustion and burning coal dumps
1.B.1.c	Solid fuel transformation [1.B.1.c - Fuel Transformation – 2019 Refinement]

IPCC Code	IPCC Name
1.B.1.c.i	Charcoal and Biochar Production – 2019 Refinement
1.B.1.c.ii	Coke Production – 2019 Refinement
1.B.1.c.iii	Solid to Solid Fuel Production – 2019 Refinement
1.B.1.c.iv	Gasification Transformation – 2019 Refinement
1.B.2	Oil and Natural Gas
1.B.2.a	Oil
1.B.2.a.i	Venting
1.B.2.a.ii	Flaring
1.B.2.a.iii	All Other
1.B.2.a.iii.1	Exploration [1.B.2.a.i – Exploration – 2019 Refinement]
1.B.2.a.iii.2	Production and Upgrading [1.B.2.a.ii – Production and Upgrading – 2019 Refinement]
1.B.2.a.iii.3	Transport [1.B.2.a.iii – Transport – 2019 Refinement]
1.B.2.a.iii.4	Refining [1.B.2.a.iv – Refining – 2019 Refinement]
1.B.2.a.iii.5	Distribution of oil products [1.B.2.a.v – Distribution of Oil Products – 2019 Refinement]
1.B.2.a.iii.6	Other [1.B.2.a.vi – Others – 2019 Refinement]
1.B.2.a.vii	Abandoned oil wells – 2019 Refinement
1.B.2.b	Natural Gas
1.B.2.b.i	Venting
1.B.2.b.ii	Flaring
1.B.2.b.iii	All Other
1.B.2.b.iii.1	Exploration [1.B.2.b.i – Exploration – 2019 Refinement]
1.B.2.b.iii.2	Production [1.B.2.b.ii – Production and Gathering – 2019 Refinement]
1.B.2.b.iii.3	Processing [1.B.2.b.iii – Processing – 2019 Refinement]
1.B.2.b.iii.4	Transmission and Storage [1.B.2.b.iv – Transmission and Storage – 2019 Refinement]
1.B.2.b.iii.5	Distribution [1.B.2.b.v – Distribution – 2019 Refinement]
1.B.2.b.iii.6	Other [1.B.2.b.vii – Other – 2019 Refinement]
1.B.2.b.vi	Gas Post-Meter – 2019 Refinement
1.B.2.b.viii	Abandoned gas wells – 2019 Refinement
1.B.3	Other emissions from Energy Production
1.C	Carbon dioxide Transport and Storage
1.C.1	Transport of CO ₂
1.C.1.a	Pipelines
1.C.1.b	Ships
1.C.1.c	Other (please specify)
1.C.2	Injection and Storage
1.C.2.a	Injection
1.C.2.b	Storage
1.C.3	Other
2	Industrial Processes and Product Use
2.A	Mineral Industry
2.A.1	Cement production
2.A.2	Lime production
2.A.3	Glass Production
2.A.4	Other Process Uses of Carbonates
2.A.4.a	Ceramics
2.A.4.b	Other Uses of Soda Ash
2.A.4.c	Non Metallurgical Magnesia Production
2.A.4.d	Other (please specify)
2.A.5	Other (please specify)
2.B	Chemical Industry
2.B.1	Ammonia Production

IPCC Code	IPCC Name
2.B.2	Nitric Acid Production
2.B.3	Adipic Acid Production
2.B.4	Caprolactam, Glyoxal and Glyoxylic Acid Production
2.B.5	Carbide Production
2.B.6	Titanium Dioxide Production
2.B.7	Soda Ash Production
2.B.8	Petrochemical and Carbon Black Production
2.B.8.a	Methanol
2.B.8.b	Ethylene
2.B.8.c	Ethylene Dichloride and Vinyl Chloride Monomer
2.B.8.d	Ethylene Oxide
2.B.8.e	Acrylonitrile
2.B.8.f	Carbon Black
2.B.9	Fluorochemical Production
2.B.9.a	By-product emissions
2.B.9.a_R	HCFC-22 Production – 2019 Refinement
2.B.9.b	Fugitive Emissions
2.B.9.b_R	HFC Production – 2019 Refinement
2.B.9.c	PFC Production – 2019 Refinement
2.B.9.d	SF6 Production – 2019 Refinement
2.B.9.e	NF3 Production – 2019 Refinement
2.B.9.f	Fluoropolymer Production – 2019 Refinement
2.B.9.g	Other Fluorochemical Production – 2019 Refinement
2.B.10	Other (Please specify) [2.B.11 – Other – 2019 Refinement]
2.B.10_R	Hydrogen Production – 2019 Refinement
2.C	Metal Industry
2.C.1	Iron and Steel Production
2.C.2	Ferroalloys Production
2.C.3	Aluminium production
2.C.4	Magnesium production
2.C.5	Lead Production
2.C.6	Zinc Production
2.C.7	Other (please specify) [2.C.8 – Other – 2019 Refinement]
2.C.7_R	Rare Earths Production – 2019 Refinement
2.D	Non-Energy Products from Fuels and Solvent Use
2.D.1	Lubricant Use
2.D.2	Paraffin Wax Use
2.D.3	Solvent Use
2.D.4	Other (please specify)
2.E	Electronics Industry
2.E.1	Integrated Circuit or Semiconductor
2.E.2	TFT Flat Panel Display
2.E.3	Photovoltaics
2.E.4	Heat Transfer Fluid
2.E.4_R	Microelectromechanical systems (MEMS) – 2019 Refinement
2.E.5	Other (please specify)
2.F	Product Uses as Substitutes for Ozone Depleting Substances
2.F.1	Refrigeration and Air Conditioning
2.F.1.a	Refrigeration and Stationary Air Conditioning
2.F.1.b	Mobile Air Conditioning
2.F.2	Foam Blowing Agents

IPCC Code	IPCC Name
2.F.3	Fire Protection
2.F.4	Aerosols
2.F.5	Solvents
2.F.6	Other Applications (please specify)
2.G	Other Product Manufacture and Use
2.G.1	Electrical Equipment
2.G.1.a	Manufacture of Electrical Equipment
2.G.1.b	Use of Electrical Equipment
2.G.1.c	Disposal of Electrical Equipment
2.G.2	SF ₆ and PFCs from Other Product Uses
2.G.2.a	Military Applications
2.G.2.b	Accelerators
2.G.2.c	Other (please specify) [2.G.2.d – Other – 2019 Refinement]
2.G.2.c_R	Waterproofing of Electronic Circuits – 2019 Refinement
2.G.3	N ₂ O from Product Uses
2.G.3.a	Medical Applications
2.G.3.b	Propellant for pressure and aerosol products
2.G.3.c	Other (Please specify)
2.G.4	Other (Please specify)
2.H	Other
2.H.1	Pulp and Paper Industry
2.H.2	Food and Beverages Industry
2.H.3	Other (please specify)
3	Agriculture, Forestry, and Other Land Use
3.A	Livestock
3.A.1	Enteric Fermentation
3.A.1.a	Cattle
3.A.1.a.i	Dairy Cows
3.A.1.a.ii	Other Cattle
3.A.1.b	Buffalo
3.A.1.c	Sheep
3.A.1.d	Goats
3.A.1.e	Camels
3.A.1.f	Horses
3.A.1.g	Mules and Asses
3.A.1.h	Swine
3.A.1.j	Other (please specify)
3.A.2	Manure Management
3.A.2.a	Cattle
3.A.2.a.i	Dairy cows
3.A.2.a.ii	Other cattle
3.A.2.b	Buffalo
3.A.2.c	Sheep
3.A.2.d	Goats
3.A.2.e	Camels
3.A.2.f	Horses
3.A.2.g	Mules and Asses
3.A.2.h	Swine
3.A.2.i	Poultry
3.A.2.j	Other (please specify)
3.B	Land

IPCC Code	IPCC Name
3.B.1	Forest land
3.B.1.a	Forest land Remaining Forest land
3.B.1.b	Land Converted to Forest land
3.B.1.b.i	Cropland converted to Forest Land
3.B.1.b.ii	Grassland converted to Forest Land
3.B.1.b.iii	Wetlands converted to Forest Land
3.B.1.b.iv	Settlements converted to Forest Land
3.B.1.b.v	Other Land converted to Forest Land
3.B.2	Cropland
3.B.2.a	Cropland Remaining Cropland
3.B.2.b	Land Converted to Cropland
3.B.2.b.i	Forest Land converted to Cropland
3.B.2.b.ii	Grassland converted to Cropland
3.B.2.b.iii	Wetlands converted to Cropland
3.B.2.b.iv	Settlements converted to Cropland
3.B.2.b.v	Other Land converted to Cropland
3.B.3	Grassland
3.B.3.a	Grassland Remaining Grassland
3.B.3.b	Land Converted to Grassland
3.B.3.b.i	Forest Land converted to Grassland
3.B.3.b.ii	Cropland converted to Grassland
3.B.3.b.iii	Wetlands converted to Grassland
3.B.3.b.iv	Settlements converted to Grassland
3.B.3.b.v	Other Land converted to Grassland
3.B.4	Wetlands
3.B.4.a	Wetlands Remaining Wetlands
3.B.4.a.i	Peat Extraction remaining Peat Extraction
3.B.4.a.ii	Flooded land remaining flooded land
3.B.4.a.iii	Other Wetlands Remaining Other Wetlands
3.B.4.b	Land Converted to Wetlands
3.B.4.b.i	Land converted for peat extraction
3.B.4.b.ii	Land converted to flooded land
3.B.4.b.iii	Land converted to other wetlands
3.B.5	Settlements
3.B.5.a	Settlements Remaining Settlements
3.B.5.b	Land Converted to Settlements
3.B.5.b.i	Forest Land converted to Settlements
3.B.5.b.ii	Cropland converted to Settlements
3.B.5.b.iii	Grassland converted to Settlements
3.B.5.b.iv	Wetlands converted to Settlements
3.B.5.b.v	Other Land converted to Settlements
3.B.6	Other Land
3.B.6.a	Other land Remaining Other land
3.B.6.b	Land Converted to Other land
3.B.6.b.i	Forest Land converted to Other Land
3.B.6.b.ii	Cropland converted to Other Land
3.B.6.b.iii	Grassland converted to Other Land
3.B.6.b.iv	Wetlands converted to Other Land
3.B.6.b.v	Settlements converted to Other Land
3.C	Aggregate sources and non-CO ₂ emissions sources on land
3.C.1	Burning

IPCC Code	IPCC Name
3.C.1.a	Burning in Forest Land
3.C.1.b	Burning in Cropland
3.C.1.c	Burning in Grassland
3.C.1.d	Burning in All Other Land
3.C.2	Liming
3.C.3	Urea application
3.C.4	Direct N ₂ O Emissions from managed soils
3.C.5	Indirect N ₂ O Emissions from managed soils
3.C.6	Indirect N ₂ O Emissions from manure management
3.C.7	Rice cultivations
3.C.8	CH ₄ from Drained Organic Soils
3.C.9	CH ₄ from Drainage Ditches on Organic Soils
3.C.10	CH ₄ from Rewetting of Organic Soils
3.C.11	CH ₄ Emissions from Rewetting of Mangroves and Tidal Marshes
3.C.12	N ₂ O Emissions from Aquaculture
3.C.13	CH ₄ Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils
3.C.14	Other (please specify)
3.D	Other
3.D.1	Harvested Wood Products
3.D.2	Other (please specify)
4	Waste
4.A	Solid Waste Disposal
4.A.1	Managed Waste Disposal Sites
4.A.2	Unmanaged Waste Disposal Sites
4.A.3	Uncategorised Waste Disposal Sites
4.B	Biological Treatment of Solid Waste
4.C	Incineration and Open Burning of Waste
4.C.1	Waste Incineration
4.C.2	Open Burning of Waste
4.D	Wastewater Treatment and Discharge
4.D.1	Domestic Wastewater Treatment and Discharge
4.D.2	Industrial Wastewater Treatment and Discharge
4.E	Other (please specify)
5	Other
5.A	Indirect N ₂ O emissions from the atmospheric deposition of nitrogen in NO _x and NH ₃
5.B	Other (please specify)

Table B-4 Fuel 2006 Categories

Fuel Name
LIQUID -> Crude Oil
LIQUID -> Orimulsion
LIQUID -> Natural Gas Liquids (NGLs)
LIQUID -> GASOLINE -> Motor Gasoline
LIQUID -> GASOLINE -> Aviation Gasoline
LIQUID -> GASOLINE -> Jet Gasoline
LIQUID -> Jet Kerosene

Fuel Name
LIQUID -> Other Kerosene
LIQUID -> Shale Oil
LIQUID -> Gas Oil
LIQUID -> Diesel Oil
LIQUID -> Residual Fuel Oil
LIQUID -> Liquefied Petroleum Gases
LIQUID -> Ethane
LIQUID -> Naphtha
LIQUID -> Bitumen
LIQUID -> Lubricants
LIQUID -> Petroleum Coke
LIQUID -> Refinery Feedstocks
LIQUID -> OTHER OIL -> Refinery Gas
LIQUID -> OTHER OIL -> Waxes
LIQUID -> OTHER OIL -> White Spirit & SBP
LIQUID -> OTHER OIL -> Other Petroleum Products
SOLID -> Anthracite
SOLID -> Coking Coal
SOLID -> Other Bituminous Coal
SOLID -> Sub-Bituminous Coal
SOLID -> Lignite
SOLID -> Oil Shale and Tar Sands
SOLID -> Brown Coal Briquettes
SOLID -> Patent Fuel
SOLID -> COKE -> Coke Oven Coke and Lignite Coke
SOLID -> COKE -> Gas Coke
SOLID -> Coal Tar
SOLID -> DERIVED GASES -> Gas Works Gas
SOLID -> DERIVED GASES -> Coke Oven Gas
SOLID -> DERIVED GASES -> Blast Furnace Gas
SOLID -> DERIVED GASES -> Oxygen Steel Furnace Gas
SOLID -> Undifferentiated Coal
GAS -> Natural Gas
OTHER FOSSIL FUELS -> Municipal Wastes (non-biomass fraction)
OTHER FOSSIL FUELS -> Industrial Wastes
OTHER FOSSIL FUELS -> Waste Oils
PEAT -> Peat
BIOMASS -> SOLID BIOFUELS -> Wood/Wood Waste
BIOMASS -> SOLID BIOFUELS -> Sulphite Lyes (Black Liquor)
BIOMASS -> SOLID BIOFUELS -> Other Primary Solid Biomass
BIOMASS -> SOLID BIOFUELS -> Charcoal
BIOMASS -> LIQUID BIOFUELS -> Biogasoline
BIOMASS -> LIQUID BIOFUELS -> Biodiesels
BIOMASS -> LIQUID BIOFUELS -> Bio-Alcohol
BIOMASS -> LIQUID BIOFUELS -> Sewage Sludge
BIOMASS -> LIQUID BIOFUELS -> Other Liquid Biofuels
BIOMASS -> GAS BIOMASS -> Landfill Gas
BIOMASS -> GAS BIOMASS -> Sludge Gas
BIOMASS -> GAS BIOMASS -> Other Biogas
BIOMASS -> OTHER NON-FOSSIL FUELS -> Municipal Wastes (biomass fraction)
OTHER FUELS -> Fuel mixtures (fossil and biomass)

Appendix C: List of Gases

The primary goal of the EFDB is to become a recognised library of well-documented emission factors and other parameters to estimate emissions of direct greenhouse gases such as CO₂, CH₄, N₂O, HFCs, PFCs and SF₆. However, information on indirect greenhouse gases (SO₂, NO_x, NMVOCs, CO, NH₃) can be also contained in the EFDB. Further, the EFDB may be expanded in the future so that it also accommodates information on other gases.

Table C-1 below shows the list of gases currently contained in the EFDB gas table.

Table C-1 List of Gases

Gas Name	Gas Abbreviation
SULPHUR DIOXIDE (SO ₂ +SO ₃)	SO ₂
NITROGEN OXIDES (NO+NO ₂)	NO _x
NON METHANE VOLATILE ORGANIC COMPOUNDS	NMVOC
METHANE	CH ₄
CARBON MONOXIDE	CO
CARBON DIOXIDE	CO ₂
NITROUS OXIDE	N ₂ O
AMMONIA	NH ₃
NF ₃	NF ₃
CH ₂ Br ₂	CH ₂ Br ₂
CH ₃ CCl ₃	CH ₃ CCl ₃
CHCl ₃	CHCl ₃
CH ₃ Cl	CH ₃ Cl
CH ₂ Cl ₂	CH ₂ Cl ₂
CH ₃ OCH ₃	CH ₃ OCH ₃
(CF ₃) ₂ CFOCH ₃	(CF ₃) ₂ CFOCH ₃
(CF ₃)CH ₂ OH	(CF ₃)CH ₂ OH
CF ₃ CF ₂ CH ₂ OH	CF ₃ CF ₂ CH ₂ OH
(CF ₃) ₂ CHOH	(CF ₃) ₂ CHOH
HFE-125	CF ₃ OCHF ₂
HFE-134	CHF ₂ OCHF ₂
HFE-143a	CH ₃ OCF ₃
HCFE-235da2	CF ₃ CHClOCHF ₂
HFE-245cb2	CF ₃ CF ₂ OCH ₃
HFE-245fa2	CF ₃ CH ₂ OCHF ₂
HFE-254cb2	CHF ₂ CF ₂ OCH ₃
HFE-347mcc3	CF ₃ CF ₂ CF ₂ OCH ₃
HFE-356pcf3	CHF ₂ CF ₂ CH ₂ OCHF ₂
HFE-374pc2	CHF ₂ CF ₂ OCH ₂ CH ₃
HFE-7100	C ₄ F ₉ OCH ₃
HFE-7200	C ₄ F ₉ OC ₂ H ₅
H-Galden 1040x	CHF ₂ OCF ₂ OC ₂ F ₄ OCHF ₂
HG-10	CHF ₂ OCF ₂ OCHF ₂
HG-01	CHF ₂ OCF ₂ CF ₂ OCHF ₂
SF ₅ CF ₃	SF ₅ CF ₃
c-C ₃ F ₆	c-C ₃ F ₆
HFE-227ea	CF ₃ CHFOCF ₃
HFE-236ea2	CF ₃ CHFOCHF ₂

Gas Name	Gas Abbreviation
HFE-236fa	CF ₃ CH ₂ OCF ₃
HFE-245fa1	CHF ₂ CH ₂ OCF ₃
HFE-263fb2	CF ₃ CH ₂ OCH ₃
HFE-329mcc2	CF ₃ CF ₂ OCF ₂ CHF ₂
HFE-338mcf2	CF ₃ CF ₂ OCH ₂ CF ₃
HFE-347mcf2	CF ₃ CF ₂ OCH ₂ CHF ₂
HFE-356mec3	CF ₃ CHF ₂ CF ₂ OCH ₃
HFE-356pcc3	CHF ₂ CF ₂ CF ₂ OCH ₃
HFE-356pcf2	CHF ₂ CF ₂ OCH ₂ CHF ₂
HFE-365mcf3	CF ₃ CF ₂ CH ₂ OCH ₃
(CF ₃) ₂ CHOCHF ₂	(CF ₃) ₂ CHOCHF ₂
(CF ₃) ₂ CHOCH ₃	(CF ₃) ₂ CHOCH ₃
-(CF ₂) ₄ CH(OH)-	-(CF ₂) ₄ CH(OH)-
C ₄ F ₈ O	C ₄ F ₈ O
HFC-23	HFC-23
HFC-32	HFC-32
HFC-41	HFC-41
HFC-43-10mee	HFC-43-10m
HFC-125	HFC-125
HFC-134	HFC-134
HFC-134a	HFC-134a
HFC-152a	HFC-152a
HFC-143	HFC-143
HFC-143a	HFC-143a
HFC-227ea	HFC-227ea
HFC-236fa	HFC-236fa
HFC-245ca	HFC-245ca
CF ₄	CF ₄
C ₂ F ₆	C ₂ F ₆
C ₃ F ₈	C ₃ F ₈
C ₄ F ₁₀	C ₄ F ₁₀
c-C ₄ F ₈	c-C ₄ F ₈
C ₅ F ₁₂	C ₅ F ₁₂
C ₆ F ₁₄	C ₆ F ₁₄
SF ₆	SF ₆
C ₄ F ₆	C ₄ F ₆
C ₅ F ₈	C ₅ F ₈
CF ₃ I	CF ₃ I
HFC-152	CH ₂ FCH ₂ F
HFC-161	CH ₃ CH ₂ F
HFC-236cb	CH ₂ FCF ₂ CF ₃
HFC-236ea	CHF ₂ CHF ₂ CF ₃
HFC-245fa	CHF ₂ CH ₂ CF ₃
HFC-365mfc	CF ₃ CH ₂ CF ₂ CH ₃
TRIFLUOROMETHYL SULPHUR PENTAFLUORIDE	SF ₅ CF ₃

Appendix D: Basic Information on Units

Prefixes and multiplication factors

Multiplication Factor	Abbreviation	Prefix	Symbol
1 000 000 000 000 000	10^{15}	peta	P
1 000 000 000 000	10^{12}	tera	T
1 000 000 000	10^9	giga	G
1 000 000	10^6	mega	M
1 000	10^3	kilo	k
100	10^2	hecto	h
10	10^1	deca	da
0.1	10^{-1}	deci	d
0.01	10^{-2}	centi	c
0.001	10^{-3}	milli	m
0.000 001	10^{-6}	micro	μ

Units and abbreviations

cubic metre	m^3
hectare	ha
gram	g
tonne	t
Joule	J
degree Celsius	$^{\circ}C$
calorie	cal
year	yr
capita	cap
gallon	gal
dry matter	d.m.
kilogram	kg
pound	lb
atmosphere	atm
Pascal	Pa
hour	h
Watt	W

Units and abbreviations, and standard equivalents

1 tonne of oil equivalent (toe)	1 toe	1 x 10 ¹⁰ calories	1 x 10 ¹⁰ cal
1 ktoe		41.868 terajoules	41.868 TJ
1 short ton	1 sh t	0.9072 tonne	0.9072 t
1 tonne	1 t	1.1023 short tons	1.1023 sh t
1 tonne	1 t	1 megagram	1 Mg
1 kilotonne	1 kt	1 gigagram	1 Gg
1 megatonne	1 Mt	1 teragram	1 Tg
1 gigatonne	1 Gt	1 petagram	1 Pg
1 kilogram	1 kg	2.2046 pounds	2.2046 lb
1 hectare	1 ha	10 ⁴ square meters	10 ⁴ m ²
1 calorie _{IT}	1 cal _{IT}	4.1868 Joules	4.1868 J
1 atmosphere	1 atm	101.325 kilopascal	101.325 kPa
1 gram	1 g	0.002205 pounds	0.00205 lb
1 pound	1 lb	453.6 gram	453.6 g
1 terajoule	1 TJ	2.78 x 10 ⁵ kiloWatt hour	2.78 x 10 ⁵ kWh
1 kilowatt hour	1 kWh	3.6 x 10 ⁶ Joules	3.6 x 10 ⁶ J