



WMO

**INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE**

NATIONAL GREENHOUSE GAS INVENTORIES PROGRAMME



UNEP

**ESTABLISHMENT OF A DATABASE  
ON  
GREENHOUSE GAS EMISSION FACTORS**

**Report of the First Expert Meeting**

**Paris, France**

**2-4 July 2001**

Supporting material prepared for consideration by the Intergovernmental Panel on Climate Change.

This supporting material has not been subject to formal IPCC review and approval process.



## **IPCC National Greenhouse Gas Inventories Programme and its Technical Support Unit**

The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) jointly established the Intergovernmental Panel on Climate Change (IPCC) in 1988 to:

- (i) Make periodic assessments of the science, the impacts, the economics and the options for the mitigation of/adaptation to climate change;
- (ii) Assess, and develop as necessary, methods such as the IPCC Guidelines for National Greenhouse Gas Inventories;
- (iii) Provide, on request, scientific/technical/socio-economic advice to the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP/UN FCCC) and its bodies.

The IPCC, at its 14th session in October 1998, established a Task Force on National Greenhouse Gas Inventories (TFI). The TFI was to have a Task Force Bureau (TFB) to provide guidance on the management of the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP).

In accordance with a decision taken by the IPCC at its 14th session and an offer of funding by the Government of Japan, a Technical Support Unit (TSU) for the Programme was set up in 1999 at the Institute for Global Environmental Strategies (IGES) in Hayama, Japan. The TSU took over the technical support for the NGGIP which had been managed by IPCC Working Group I since 1991, in close collaboration with the Organisation for Economic Co-operation and Development (OECD) and the International Energy Agency (IEA).

The objectives of the IPCC-NGGIP are:

- To develop and refine an internationally-agreed methodology and software including good practice guidance for the calculation and reporting of national GHG emissions and removals;
- To encourage the widespread use of this methodology and guidance by countries participating in the IPCC and by signatories of the United Nations Framework Convention on Climate Change (UNFCCC);
- To facilitate the compilation of national greenhouse gas inventories.

The primary function of the TSU which is responsible to the TFB through its two Co-chairs is to serve the needs of the NGGIP.

The TSU undertakes scientific and technological duties as part of the Programme including:

- Improving technical support for countries engaged in estimating GHG emissions and removals related to fuel use, industrial sources, waste disposal, agricultural activities and land use, land-use change, and forestry;
- Collecting, managing and disseminating information related to GHG inventories;
- Organising international meetings of experts to take up scientific and technical issues in the various sectors to assist parties compile more reliable GHG inventories;
- Responding to specific requests from parties on issues relating to GHG inventories.

February 2001

Japan

## **ACKNOWLEDGEMENTS**

This report was prepared by Tinus Pulles, Katarina Mareckova, Taka Hiraishi, Buruhani Nyenzi and Kiyoto Tanabe with assistance from Jos Olivier, Elizabeth Scheehle, Pavel Fott, Ismail Moula, Pascal Boeckx, Gabriel Hernandez, Stephanie F. Finn, Mike Woodfield, Chia Ha, Leandro Buendia and Kyoko Miwa. We are grateful to many experts who contributed to this report and attended the expert meeting. We also thank the staff of the International Energy Agency (IEA) and the staff of the Institute for Global Environmental Strategies (IGES) who assisted in organising the expert meeting.

## Table of Contents

<b>Summary .....</b>	<b>1</b>
<b>1. Introduction .....</b>	<b>3</b>
<b>2. Overview.....</b>	<b>5</b>
<b>3. Management (discussed by BOG3) .....</b>	<b>6</b>
3.1 General aspects .....	6
3.2 Database design .....	7
3.3 Data quality control .....	7
3.4 Database operation/maintenance .....	8
3.5 Supporting systems to be introduced as resource and time allow.....	8
3.6 Distribution of the EFDB.....	8
3.7 Language .....	9
3.8 Ongoing support and ensuring the sustainability of the EFDB .....	9
<b>4. Structure and contents (discussed by BOG1).....</b>	<b>10</b>
4.1 General aspects .....	10
4.2 Information categories.....	10
4.3 Rational for distinction between mandatory and optional data fields.....	11
<b>5. Functional design (discussed by BOG2) .....</b>	<b>15</b>
5.1 Overview .....	15
5.2 Database structure.....	15
5.3 Technical issues .....	17
5.4 Methods of populating the database (inputs).....	19
5.5 Methods of extracting information from the database (outputs).....	19
5.6 Issues to be resolved by the Steering Group.....	20
<b>6. Recommendation to the Task Force Bureau on Update of Strategic Implementation Plan ...</b>	<b>22</b>
6.1 Update of work plan .....	22
6.2 EFDB Steering Group.....	23
<b>Annex 1: Options for data collection and QA/QC procedures (presented in the discussion paper for BOG3 in the meeting).....</b>	<b>25</b>
<b>Annex 2: List of participants .....</b>	<b>30</b>

## Summary

The IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP) held an expert meeting on Establishment of a Database on Greenhouse Gas Emission Factors in Paris, France, on 2-4 July 2001. The objectives of this meeting were:

- Discuss the design of the database on GHG emission factors;
- Discuss/Identify the type of software to be used for the database;
- Discuss/Identify the most appropriate data collection and handling scheme to facilitate efficient data collection and quality control of the emission factors of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>;
- Discuss the procedure and schedule for pilot-testing of the prototype database.

At this meeting, the participants reached agreement on most aspects as shown below but some aspects were left for further consideration during later stages of the emission factors database (EFDB) development.

1. Users of the EFDB must be able to trust the background information provided with the quantitative value they find. This means that the inclusion/exclusion of new data in/from the database must be controlled. However usage of the EFDB information for compiling GHG inventories will always be the full responsibility of the user.
2. Data in the EFDB can be provided by:
  - Parties to the United Nations Framework Convention on Climate Change (UNFCCC);
  - Agencies and institutions;
  - Individual scientists or experts.
3. A number of operational constraints have been identified, which should be recognised when designing the EFDB, especially in terms of the resources (mainly funding and personnel) available both now and in the likely future. The EFDB should be designed to initially work at a '1st Phase' level and be expandable to enable the functions required to meet long term objectives when and if required.
4. Populating the system will not wait until users send in information but will be initiated with emission factors and other relevant parameters as available in:
  - The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (the *IPCC Guidelines*) and the IPCC report on *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (the *Good Practice Report*);
  - National GHG inventory agencies<sup>1</sup>, who are responsible for submission of their annual national GHG inventories and report to the UNFCCC;
  - Existing database of emission factors such as EDGAR, OLADE, USEPA. etc.
5. The required information categories and data fields were identified (see Table 1).
6. The EFDB should distinguish between mandatory and optional information to be contained in

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<sup>1</sup> Local data submitted from Parties not included in the Annex I to the UNFCCC (non-Annex I Parties) will be also included if they are fully verified and in the appropriate form.

the data fields. Some types of information are necessary for EFDB users (quality assessment, assessment of applicability for other countries, etc), while a minimum burden to data providers is essential to ensure data base population by countries and the scientific world.

7. The functional design elaborated 4 key areas that must be considered when writing the request for proposals. These 4 areas are:
  - Database structure;
  - Technical issues (hardware/software);
  - Methods of populating the database (inputs);
  - Methods of extracting information from the database (outputs).
8. Preferably, the EFDB should exist as both a web-based EFDB application and as a version that can be operated locally (on an individual's PC). However, as resources may not support the development of two separate applications at this time, it was recommended that the development of the web-based program proceed first. The web application should be developed in a manner that will facilitate the development of a PC-based application, being fully aware that it will be non-Annex I Parties that most need to draw on information in the EFDB. One possible option may be to have a web-based submittal form for new data and a downloadable (plus CD-ROM version) database file of the EFDB. This means the web application should support the downloading of the complete database (data only) directly to the user's hard drive so that the user can query it locally. Once the user has access to the data on a local drive, he/she can execute large queries and avoid slow internet connections. This issue shall be further considered by the EFDB Steering Group.
9. In order to ensure good management of the EFDB and to assure its usability, it is proposed that a Steering Group be established to be responsible for the EFDB management under the supervision of the TFB.
10. The EFDB should be introduced widely to the world via UNFCCC sessions such as SBSTA16 and COP8 in 2002 to increase awareness and contribution of data to/from mainly non-Annex I Parties.

## 1. INTRODUCTION

### 1.1 Background

The quality of national inventories of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol (GHG inventories) depends substantially on reliable emission factors and activity data. Although it is preferable to use emission factors that reflect national circumstances, emission factor development is expensive, time consuming and necessitates a wide degree of expertise. The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (the *IPCC Guidelines*) and the recently published *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (the *Good Practice Report*) provide default emission factors for the majority of source and sink categories. Some of these default emission factors are region or country specific, but in general not all regions or countries are covered. Sharing of research information would enable countries to use or develop emission factors that are more reliable than the IPCC default emission factors without having to bear the associated research cost. For this reason, many countries have indicated (e.g. in the Expert Group Meeting on National Feedback on the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Havana, Cuba, September 1998) that an easily accessible public database on GHG emission factors with supporting scientific information would help improve the quality of GHG inventories in a cost-effective way. A database on GHG emission factors with supporting scientific information would also support the future review and update of the *IPCC Guidelines* under the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP).

With this background, a project to establish a database on GHG emission factors was initiated with a scoping meeting held in New Delhi, India, on 24-25 July 2000. After this meeting, The Task Force Bureau (TFB) on the IPCC-NGGIP discussed the future work plan for this project on development of an emission factors database, at its 4th session, 8-9 December 2000, in Geneva. It requested the Technical Support Unit (TSU) to prepare a **strategic implementation plan (SIP)** for the establishment of an Emission Factors Database and submit it to TFB for consideration. In response to this request, the TSU prepared the SIP based on the outcomes from the scoping meeting on this project held in New Delhi, India, 24-25 July 2000. The SIP was endorsed by the TFB at its 5th session on 14 March 2001 in Geneva.

### 1.2 Objectives of the meeting

This first meeting in Paris was convened in line with the SIP to focus on:

- the design of the database on GHG emission factors;
- the type of software to be used for the database;
- the most appropriate data collection and handling scheme that will facilitate efficient data collection and quality control of the emission factors of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>;
- the procedure and schedule for pilot-testing of the prototype database.

### **1.3 Participants**

This meeting was attended by 44 participants from 23 countries as well as from the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), the International Energy Agency (IEA), the Organización Latinoamericana de Energía (OLADE), the Task Force Bureau of the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP/TFB), and the Technical Support Unit of the IPCC National Greenhouse Gas Inventories Programme (IPCC-NGGIP/TSU). The meeting was co-chaired by Tinus Pulles from the Netherlands and Katarina Mareckova of the Slovak Republic.

The meeting was kindly hosted by the International Energy Agency (IEA).

## 2. OVERVIEW

The meeting firstly reaffirmed the basic principles agreed at the scoping meeting in New Delhi.

- The emission factors database (EFDB) will contain information and knowledge on emission estimation methods for all relevant gases and sectors, including additional information needed for emission estimation. It will be fully referenced.
- The EFDB will be an open system that will contain information to be provided by its users. It is built on the principle of sharing knowledge and expertise within the user community to:
  - Make information on emission factors and related parameters available to all working on the field;
  - Increase the quality of all greenhouse gas inventories.

Having reaffirmed these, the participants discussed two basic perspectives from which the EFDB can be developed. Those are:

1. Providing the users with a “*library*” with all information that is available and the user makes his/her choice on the basis of all material available;
2. Providing the users with an “*authority*”, advising the “best” value to the user.

The discussion did not result in taking either single option. Basically the “library” perspective was supported, but it was also recognised that the EFDB should be designed to facilitate users’ selection of the “best” values to them. In this context, it was agreed that users of the EFDB must be able to trust the background information provided with the quantitative value they find. This means that the inclusion/exclusion of new data in/from the database must be controlled. However usage of the EFDB information for compiling GHG inventories will always be the full responsibility of the user.

Then, the meeting split in three breakout groups (BOGs) as follows.

**BOG1: Contents and structure**

Building on the results of the New Delhi meeting, the contents of the database needs to be determined. This group focused on the emission inventory knowledge that should be included into the EFDB.

**BOG2: Functional Design and Implementation**

Implementation of the EFDB will need a series of consecutive steps. The first of these is the definition of the functional design of EFDB, in which the functional structure of the database is identified and the input and output processes are defined.

This group focused on the functional design of EFDB and hence concentrated on the relational structure and input and output processes.

**BOG3: Management**

Once EFDB is implemented, the system needs to be managed and maintained. This group dealt with all relevant issues including definition of the tasks and access authorisation of different user groups (data users, data providers and system management).

The following chapters present the outcomes from each BOG discussion.

### 3. MANAGEMENT (DISCUSSED BY BOG3)

#### 3.1 General aspects

BOG 3 identified a number of operational constraints which should be recognised when designing the EFDB, especially the resources (mainly funding and personnel) available both now and in the likely future. The project has a guaranteed support during the initial start up period, this can be expected to be followed by a period of growth in use and content (not necessarily at the same rate) during which additional resources to operate and populate the EFDB will be needed. The design, while recognising the long term desire for an open structure and an emphasis on information to assist non-Annex I Parties to report national GHG inventories, should initially work within the guaranteed resources available to the TSU. (Parties to the UNFCCC should be asked to contribute to the work.) This requires the prioritisation of the most pressing needs of the EFDB during its early period and future priorities - ranked on the likelihood of obtaining additional resources. The design should consider both database development/testing/population and the demands of future management systems. It should be noted that any additional extra resources to populate the EFDB are likely to be from Annex I Parties – and thus reflect knowledge/technology in Annex I Parties – but that it will be non-Annex I Parties that most need to draw on information in the EFDB.

Consequently:

1. The EFDB should be designed to initially work at the ‘1st Phase’ level and be expandable to ‘enable’ the functions required to meet long term objectives when and if required.<sup>2</sup>
2. Initially the EFDB should serve the most pressing user requirements. Prioritised in ‘immediate need’ order, these are:
  - Priority 1: Inventory compilers (inventory agencies);
  - Priority 2: IPCC (Future updates of the *IPCC Guidelines*);
  - Priority 3: Inventory review teams, project developers involved in the Clean Development Mechanism and Joint Implementation, corporations engaged in emissions trading, scientists, the general public and NGO’s, and consultants.
3. The EFDB system access should start as open for all to ‘read’ but have restricted ‘entry’ to write functions.
4. A support manual should be made available to EFDB users and contributors during the 1st Phase (including prototype testing<sup>3</sup>) and 2nd Phase of EFDB development.
5. To assist with populating the EFDB and to broaden the type of data included ‘downloaders’ should be encouraged to ‘contribute’.

These general points lead to specific requirements in database design, data quality control, database operation/maintenance, required support systems, and so on.

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<sup>2</sup> The final objective is to develop an Option A type database starting with Option C (as outlined in the Annex to this report).

<sup>3</sup> Emission factor experts and national greenhouse gas inventory compilers should be testers of the EFDB prototype.

## 3.2 Database design

Particular database design requirements arise from the need for data collection procedures and data quality control. Initially, while resources are restricted solely to those of the TSU and contractors data from 'accepted' sources should be entered, these '1st Phase' data sources are:

1. Default data for emission factors and other parameters from the *IPCC Guidelines* and the *Good Practice Report*;
2. Emission factors and other parameters from national GHG inventory agencies, who are responsible for submission of their annual national GHG inventories and report to the UNFCCC;
3. Established databases (such as EDGAR, OLADE, USEPA etc).

In future, as and when resources allow, 2nd Phase data sources can be included, such as:

1. Academics, literature or other peer reviewed information;
2. Experts identified by Parties or the EFDB Steering Group.

The design must allow bulk entry of information immediately and ad-hoc data entry at a later date.

In order to minimise the time and resources to input data (and encourage its use) the EFDB should distinguish between mandatory and optional fields.

## 3.3 Data quality control

The data quality control should reflect the nature of the data being entered on the EFDB. There are two development phases to ensure data quality control:

- **1st Phase data:** These require the lowest possible review/screening consistent with users being able to judge the applicability of data for their own use, nevertheless the following generic data fields should be mandatory:
  - Administrative data identifying the source of the information (Country, Agency, etc.);
  - Technical information, including a reference, fact sheet (executive summary to be in English if the reference document is not available in English);
  - Usage/Review information (to enable a user to judge applicability).And as optional fields:
  - Additional information fields may also be included.
- **2nd Phase data:** These will need more scrutiny via Expert/Evaluation Committee(s) and 'smart software' (to check for completeness) depending on its source – but should always be at the lowest level practicable. Mandatory entry fields to be filled will need to be more extensive:
  - Place of origin;
  - Source of data: Annex I Parties (National Inventory Report), Party nominated experts, scientific research, etc;
  - Technical references:
    - Reference – fact sheet – executive summary – in English
    - Date tag
    - Attached scientific report, research papers (published), link to information sites (future) – link to document submitted to the TSU;

- Use indicators (National Inventory Use);
- Information on the review of data (how it was developed and reviewed) either from
  - emission factor contributors
  - or
  - the Expert/Evaluation Committee(s).

And as optional fields:

- Additional information, i.e. suggestions as to how other parties can use the data– applicability, associated references and as resources allow ‘hot links’ (when feasible).

### **3.4 Database operation/maintenance**

The TSU should host the EFDB during the development, testing and period of early use but as usage increases additional support will be required. The EFDB design must allow for some sharing of operation, data entry and maintenance, etc.

The database should be publicly available but information relating to the supplier of information should be restricted to the EFDB manager in order to limit the cost of responding to enquiries. The EFDB Steering Group (referred to later in section 3.8) should decide how and in what detail to respond to enquiries. The EFDB may have to have a frequently asked questions (FAQ) facility.

A separate expert network, with an electronic discussion group (EDG) developed to answer enquiries, will build a self help group and encourage the population of and users’ intimacy with the EFDB.

System manual and other supporting documentation should be prepared.

- Supporting Manual with instruction on using the EFDB and its associate e-forms for the 1st and 2nd phase data entry. (N.B. this should be a component of the database contract).

### **3.5 Supporting systems to be introduced as resource and time allow**

Comments/feedback should be collected and fed to the EDG – the EFDB design should enable a ‘flag’ system to indicate where information on an entry is the subject of discussion on the EDG.

Expert/Evaluation Committee(s) will manage the input of 2nd phase data to the EFDB.

A network of users to encourage broadening of the EFDB coverage should be identified and created.

### **3.6 Distribution of the EFDB**

To ease document control the master version should be web-based with date marked CD copies available on request. Maintenance issues relating to update and database manager should be considered by the EFDB Steering Group which is referred to later in section 3.8.

### 3.7 Language

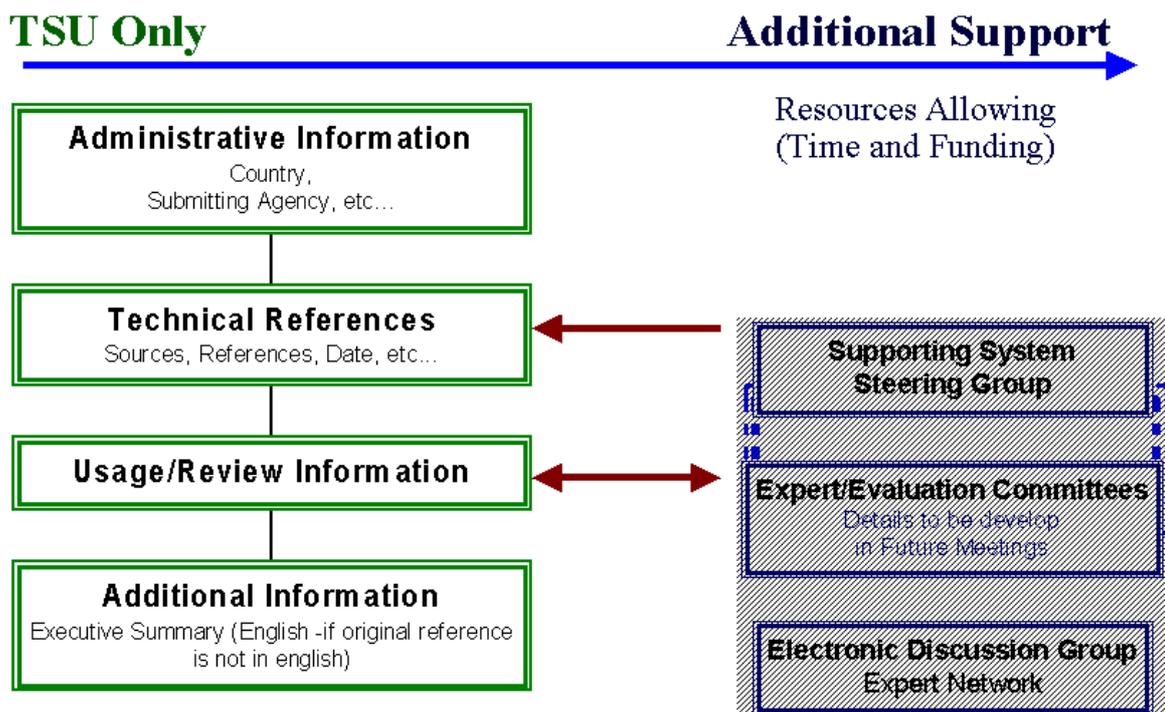
English should be used in all mandatory fields but multilingual capability is desirable and original language of reference document can be submitted with an English executive summary.

### 3.8 Ongoing support and ensuring the sustainability of the EFDB

This will require active advertising and promotion of EFDB activity. Since the project will develop in time and consequently the needs of the EFDB will also change, it is recommended that a **Steering Group** be set up to assist the TSU with the management of the EFDB.

It was also suggested that the EFDB should be introduced widely to the world via UNFCCC sessions such as SBSTA16 and COP8 in 2002 to increase awareness and contribution of data to/from mainly non-Annex I Parties.

## EFDB Management Requirements



## 4. STRUCTURE AND CONTENTS (DISCUSSED BY BOG1)

### 4.1 General aspects

BOG1 agreed upon the following principles in general aspects.

- Focus on 6 direct GHGs (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs<sup>4</sup>, SF<sub>6</sub>), but information may be given on other gases (indirect GHGs) so that the EFDB can be expanded in the future;
- Report on not only emission factors but also other parameters to calculate GHG emissions and removals<sup>5</sup>;
- Use the IPCC source/sink categories<sup>6</sup>, as detailed as possible;
- Use common format for all sectors, if possible (to enable easy querying across sectors);
- Report in common units whenever possible, besides original units;
- Refer to “Tiers” or estimation equations, though not mandatorily, where the emission factors or other parameters in question should be used (Reference to “Tiers” is optional while reference to emission estimation equations is recommended.);
- Distinguish between mandatory and optional data fields;
- Not include detailed descriptions of complex mathematical models. However, if some models are used to calculate emissions then resulting emission factors and other parameters can be included with precise reference to the models.

### 4.2 Information categories

BOG1 identified a variety of types of information that should be contained in the submissions to the EFDB; in accordance with the recommendation by BOG3 on the requirements for data quality control especially in 1st Phase (see page 7, section 3.3) these can be structured as follows

#### 1. Administrative information

- Data provider and contact information.

#### 2. Technical information

- Value, descriptive name, unit, etc. of emission factors or other parameters;
- Reference to the IPCC source/sink category;
- Main influencing factor(s) and additional influencing factor(s);
  - Influencing factors should be split into main and additional factor(s) in view of the level of importance. For example, in the case of N<sub>2</sub>O emission factors from “Road transport”, main influencing factors are fuel type, control technology (e.g. catalyst

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<sup>4</sup> More specifically, each of the hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) mentioned in Table 1 of the Common Reporting Format of the UNFCCC (see UNFCCC document FCCC/CP/1999/7).

<sup>5</sup> There are two types of parameters to be included in the EFDB, i.e. parameters to calculate emission factors and those to calculate actual emissions.

<sup>6</sup> The IPCC source/sink categories are presented in the *IPCC Guidelines*, Vol.1, Reporting Instructions.

type), etc<sup>7</sup>, and additional influencing factors are shares of cold starts/urban/highway/rural/maintenance level, etc.

- Reference to the method used (basic equation, IPCC Tier, summary of complex method);
- Reference to written material;
- Data quality (uncertainty estimate and other quality aspects<sup>8</sup>).

### 3. Usage/Review information

- Information on present application and potential applicability.

In Table 1, the required information categories and data fields are listed and described.

## 4.3 Rational for distinction between mandatory and optional data fields

BOG1 agreed, as did BOG3 (see page 7, section 3.2), that the EFDB should distinguish between mandatory and optional information. The rational for this distinction is that some types are critical for usage by the identified user categories for the EFDB (quality assessment, assessment of applicability for other countries, etc), while a minimum burden to data providers is essential to encourage data base population by countries and the scientific world.

An exception to this will be allowed for existing reference data sets, such as default data for emission factors and other parameters from the *IPCC Guidelines* and the *Good Practice Report*, UNECE/CORINAIR default data, USEPA AP42 default data, EDGAR/GEIA emission factors and OLADE emission factors<sup>9</sup>. This is to allow data comparison by the users to reference data sets.

Besides a formal screening of the presence of the mandatory fields, a basic screening of the contents of information supplied to the EFDB will be part of the acceptance procedure. In the future more formal quality aspects will be included in this procedure.

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<sup>7</sup> Some participants proposed that a certain factor, among other main influencing factors, should be further emphasised for each IPCC source/sink category (e.g. fuel type for Energy Sector).

<sup>8</sup> Data quality ratings developed for other data sets in existing databases can be quoted here but no new quality rating scheme will be developed especially for the EFDB.

<sup>9</sup> These data are supposed to be entered into the EFDB in the “1st Phase” (see page 6).

**TABLE 1. REQUIRED INFORMATION CATEGORIES AND DATA FIELDS**

Required data fields	Mandatory or Optional	NOTE
1. Administrative information		
<ul style="list-style-type: none"> <li>• Person/agency that submitted the data               <ul style="list-style-type: none"> <li>- Name of the person/agency</li> <li>- Country</li> <li>- Contact information</li> </ul> </li> </ul>	Mandatory	Direct contact information such as phone numbers and e-mail addresses of data providers should be submitted to the database manager, but may not be shown openly to the users. This is because it may be a deterrent for data providers to contribute their data if they do not have time and resources to handle direct inquiries.
2. Technical information		
<ul style="list-style-type: none"> <li>• Gas</li> </ul>	Mandatory	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, SF <sub>6</sub> and each of the HFCs and PFCs mentioned in Table 1 of the Common Reporting Format of the UNFCCC.
<ul style="list-style-type: none"> <li>• IPCC source/sink category or activity definition</li> </ul>	Mandatory	Follow the IPCC source/sink categories. Category definitions listed in the <i>IPCC Guidelines</i> , Vol.1, Reporting Instructions, should be used. If no specific category applies, sector “other” should be used.
<ul style="list-style-type: none"> <li>• IPCC worksheet number if applicable</li> </ul>	Optional	IPCC worksheet numbers presented in the <i>IPCC Guidelines</i> , Vol.2, Workbook, should be used.
<ul style="list-style-type: none"> <li>• Main influencing factor(s)</li> </ul>	Mandatory	e.g. fuel type, technology type, livestock subtypes (see page 14, Box1 “Example for Common Sectoral Approach”). Some participants proposed that a certain factor for each IPCC source/sink category should be further emphasised among others (e.g. fuel type for Energy Sector).
<ul style="list-style-type: none"> <li>• Additional influencing factor(s)</li> </ul>	Optional	e.g. load factors, capacity, maintenance level, feed composition (see page 14, Box1 “Example for Common Sectoral Approach”). If applicable, also the value of these factors should be specified
<ul style="list-style-type: none"> <li>• Descriptive name of emission factors or other parameters</li> </ul>	Mandatory	Maybe some guidance on exact terminology will be necessary to be able to perform correct queries.
<ul style="list-style-type: none"> <li>• Value of the parameter in original units</li> </ul>	Mandatory	Average
<ul style="list-style-type: none"> <li>• Original unit of parameter</li> </ul>	Mandatory	
<ul style="list-style-type: none"> <li>• Value of the parameter in common units</li> </ul>	Optional	If possible, common units should also be submitted together with the conversion factors used.
<ul style="list-style-type: none"> <li>• Common unit of parameter</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>• The equation used for estimating the emission (Tier)</li> </ul>	Optional	Tier – optional Equations – recommended

<ul style="list-style-type: none"> <li>Source of data (Use indicator)</li> </ul>	Mandatory	e.g. scientific literature, official national inventory reports (NIRs), other country inventory studies, other, ...
<ul style="list-style-type: none"> <li>Technical reference <ul style="list-style-type: none"> <li>- Full Reference</li> <li>- Language</li> <li>- Abstract in English</li> </ul> </li> </ul>	Mandatory Mandatory Optional	
<ul style="list-style-type: none"> <li>Upper and lower boundaries (confidence limits) at the 95% confidence interval or uncertainty</li> </ul>	Mandatory	Include text box to explain when range or uncertainty is not given/available or give expert judgement on order of magnitude of uncertainty. The units of the range should be specified. This will be not mandatory for existing reference data sets to be entered during "1st Phase", such as default data from the <i>IPCC Guidelines</i> and the <i>Good Practice Report</i> , UNECE/CORINAIR default data, USEPA AP42 default data, EDGAR/GEIA emission factors and OLADE emission factors.
<ul style="list-style-type: none"> <li>Data quality <ul style="list-style-type: none"> <li>- Calculated, expert judgement, modelled or based on existing systems USEPA, CORINAIR</li> <li>- Give info on shape of distribution (normal, log normal, uniform, triangle, ...)</li> </ul> </li> </ul>	Mandatory Optional	Data quality ratings developed for other data sets in existing databases can be quoted here but no new quality rating scheme will be developed especially for the EFDB.
<ul style="list-style-type: none"> <li>Reference of data quality if different from reference of emission factors or other parameters</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>Other information relevant to the determination of the quality</li> </ul>	Optional	
<b>3. Usage/Review information</b>		
<ul style="list-style-type: none"> <li>Type of emission factors</li> </ul>	Mandatory	Measured, Modelled, Compiled or "Implied" (see footnote 10 on page 17) from a reported set, Adjusted (to reflect a specific country)
<ul style="list-style-type: none"> <li>Information on the review of the data <ul style="list-style-type: none"> <li>- Measured data <ul style="list-style-type: none"> <li>- Measurement techniques</li> <li>- Amount and frequency of measurements</li> <li>- Date of measurements</li> </ul> </li> <li>- Modelled data (to be defined)</li> </ul> </li> </ul>	Mandatory	Minimum information for measured data could include: measurement standard, periodicity of measurement, external quality control performed.
<ul style="list-style-type: none"> <li>Year in which the data are applicable</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>Country/region where the data applicable</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>Possible applicability</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>Comments from the data provider</li> </ul>	Optional	
<ul style="list-style-type: none"> <li>Comments from "others"</li> </ul>	Optional	

## BOX 1: EXAMPLE FOR COMMON SECTORAL APPROACH

### <ENERGY Sector>

**IPCC source/sink category:** “1A1 Energy industries”...“1A1a(i)-Public Electricity Generation”

**Main influencing factors:** fuel type - combustion technology (e.g. boiler, FBC, capacity) - control technology (e.g. FOD)

**Additional influencing factors:** load factor; maintenance level

**IPCC source/sink category:** “1A3 Transport”...“1A3b(i) Cars”

**Main influencing factors:** fuel type - control technology (e.g. catalyst type)

**Additional influencing factors:** shares of cold starts/urban/highway/rural/maintenance level

**IPCC source/sink category:** “1A4 Other Sectors”...“1A4b-Residential”

**Main influencing factors:** fuel type - combustion type (e.g. central heating, fire place, cooking)

**Additional influencing factors:** load factor, moisture content of biofuel; maintenance level

**IPCC source/sink category:** “1B1a(i) Coal Mining, Underground Mines”

**Main influencing factors:** production technology

**Additional influencing factors:** methane recovery

### <INDUSTRIAL PROCESSES Sector>

**IPCC source/sink category:** “2B Chemical Industry”...“2B2 Nitric Acid Production”

**Main influencing factors:** production technology (e.g. old methodology/NSCR/...)

**Additional influencing factors:** maintenance level; average effectiveness of control technology

### <AGRICULTURE Sector>

**IPCC source/sink category:** “4A Enteric Fermentation”...“4A1a Dairy Cattle”

**Main influencing factors:** animal subtypes (e.g. young animals/males/females)

**Additional influencing factors:** feed composition, climate

### <LAND-USE CHANGE AND FORESTRY Sector>

**IPCC source/sink category:** “5A Changes in Forest and Other Woody Biomass Stocks”...“5A1 Tropical Forests”

**Main influencing factors:** tree species

**Additional influencing factors:** country

### <WASTE Sector>

**IPCC source/sink category:** “6B Wastewater Handling”...“6B2 Domestic and Commercial Wastewater”

**Main influencing factors:** Wastewater characteristics – Handling systems

**Additional influencing factors:** temperature

## 5. FUNCTIONAL DESIGN (DISCUSSED BY BOG2)

### 5.1 Overview

BOG2 addressed the design of the EFDB and the tools or applications which will be used to access the information in this database. This section addresses the four main areas that must be considered when writing the specification for the database design and highlights some issues and problems which need to be resolved. These four areas are:

1. Database Structure;
2. Technical Issues (hardware/software);
3. Methods of populating the database (inputs);
4. Methods of extracting information from the database (outputs).

### 5.2 Database structure

The database structure is presented in **Figure 1**. It provides a high level overview of the main informational areas which define an emission factor. These areas will translate into related tables in the EFDB. This diagram is not exhaustive; it is a starting point for creating a detailed data map in which the individual tables, fields, and relationships are outlined.

The main functional areas on this diagram are:

a) Gases; b) Reference/Quality; c) IPCC Source/Sink Category; and d) Unit of Measurement.

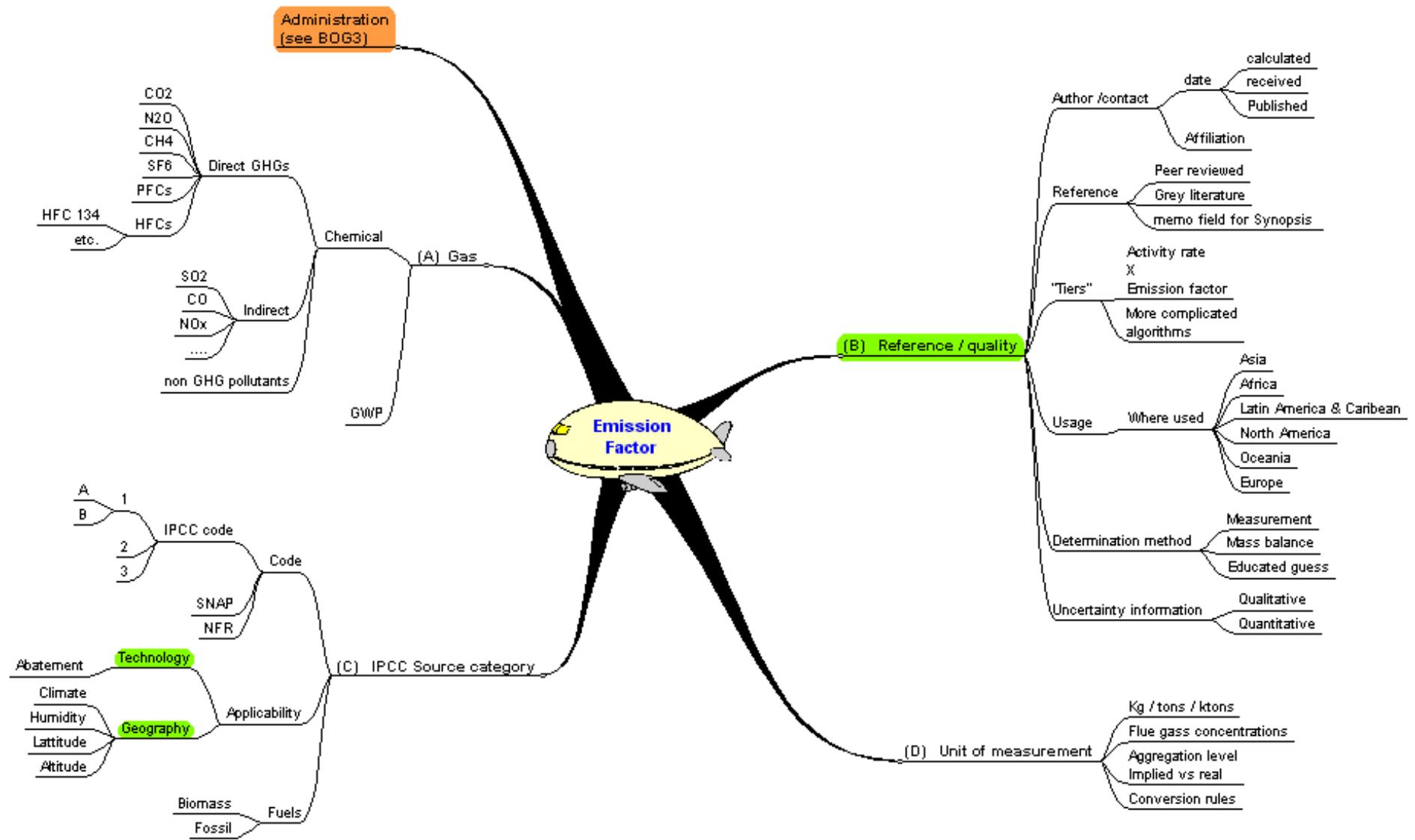
#### 5.2.1 Gas Table

As agreed in the scoping meeting on this project held in New Delhi in 2000 and reaffirmed by BOG1, the focus of the EFDB is GHGs, and as such it will only contain emission factors and other parameters for the following direct GHGs: CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, SF<sub>6</sub>, PFCs, and HFCs. If necessary, additional GHGs could easily be added to the database without increasing the number of fields in the database or altering the database structure. Other gas attributes could be readily stored in the gas table, for example, Global Warming Potential (GWP), full gas name, molecular weight, etc.

#### 5.2.2 Reference/Quality Table

This table is very important to the proper use of the EFDB because it will contain the information that will enable the user to evaluate the quality of an emission factor or other parameter. It will not contain a **new** quality rating developed solely for the EFDB, but will store **existing** quality ratings developed for other data sets (for example, for USEPA AP42 or UNECE/CORINAIR). It will also contain text descriptions summarising how the factor was derived, an abstract of any published references, complete technical references, complete contact information (name, organisation, etc.), a description of measurement methods, the equation used for estimating the emission (Tier), and key dates related to the data submittal and factor creation. The table will also store the upper and lower boundaries for the 95% confidence interval for the emission factor or other parameter.

FIGURE 1. DATABASE STRUCTURE



### 5.2.3 IPCC Source/Sink Category Table

The activity information related to the emission factor or other parameter will be defined by the IPCC source/sink category in conjunction with key additional descriptive factors. This information includes technology-specific data, geographic-specific information (climate, latitude/longitude, altitude, etc.) and fuel data. In those cases, in which these additional data are not applicable these fields can remain blank. BOG1 has given some examples of descriptive factors that should be stored for each source/sink category (see page 14, Box1 “Example for Common Sectoral Approach”). Additionally, the source/sink category table can (but does not have to) map the IPCC source/sink category to the category codes developed in other systems (SNAP, NFR). The design of this table is crucial to the querying capabilities of the database and careful thought should be given to the individual fields.

### 5.2.4 Unit of Measurement

The unit of measurement table(s) will contain all standard units and supply conversion factors for the various units. Other factors which need to be considered here include: flue gas concentration, and aggregation level (real vs. implied<sup>10</sup>). We should consider moving these latter parameters into the data quality reference table.

## 5.3 Technical issues

The technical issues are outlined in **Figure 2**.

In writing the specifications for the software we need to make sure this database and its applications are readily accessible to most users. To this end, the EFDB should require a minimum of system resources (e.g. Windows 95 compatible, Office 95 Compatible, Pentium I co-processor, 32 megabytes RAM). It should be developed in a widely accepted programming language and have the potential to support multiple (linguistic) languages.

BOG2 preferred that the EFDB exist as both a web-based EFDB application and as a version that can be operated locally (on the individual’s PC). However, as resources may not support the development of two separate applications at this time, BOG2 recommends that the development of the web-based program proceed first.<sup>11</sup> The web application should be developed in a manner that will facilitate the development of a PC-based application.

Prior to the development of a PC-based application, the web application should support the downloading of all the EFDB (data only) directly to the user’s hard drive so that the user can query it locally. Once the user has access to the data on a local drive, he/she can execute large queries and

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<sup>10</sup> The scoping meeting on this project held in New Delhi in 2000 noted “Implied emission factors, as defined in the UNFCCC Common Reporting Format, in most cases are time-dependent and weighted averages of the underlying emission factors used in the calculation of GHG emissions. They could be included as a second priority with a clear indication that they should not be used for inventory calculations directly, but may serve as an order of magnitude check.”

<sup>11</sup> In the last plenary session, however, some participants stressed the significant advantages especially to non-Annex I Parties that would be provided by the PC-based database. One possible option may be to have a web-based submittal form for new data and a downloadable (plus CD-ROM version) database file of the EFDB. This issue shall be further considered by the EFDB Steering Group.

avoid slow internet connections. (Downloading files raises the issue of version management. See the end of this section for a discussion of this issue.)

Protection and security must also be considered and will be the joint responsibility of the organisation hosting the database on its server and the database designer.

FIGURE 2. TECHNICAL ISSUES

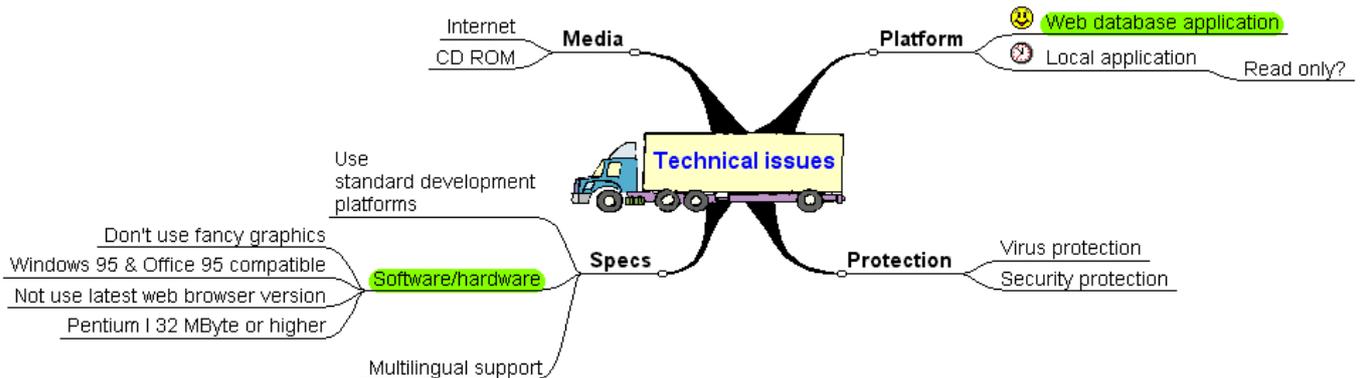
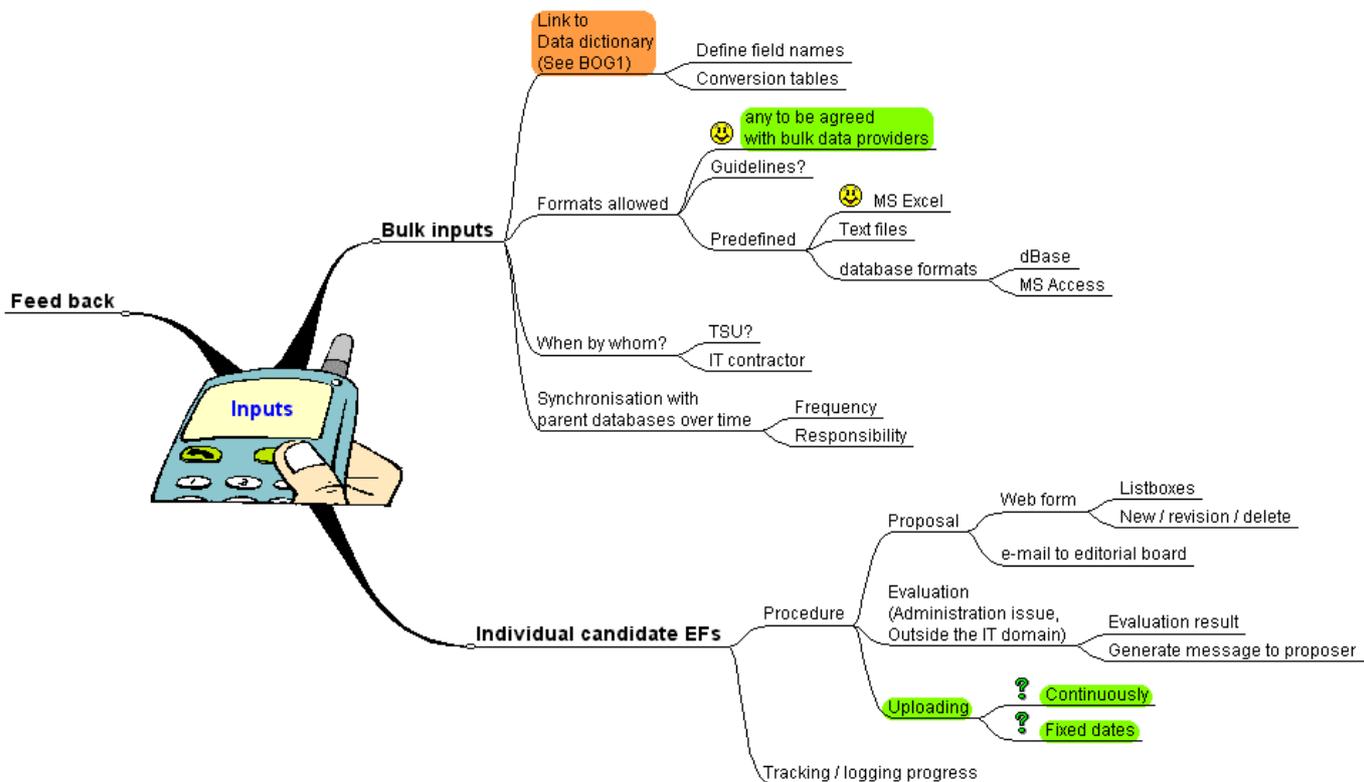


FIGURE 3. METHODS OF POPULATING THE DATABASE



## 5.4 Methods of populating the database (inputs)

The methods of populating the database are outlined in **Figure 3**.

### 5.4.1 Bulk import

To make the EFDB functional as soon as possible, BOG2 recommends that existing emission factor databases be imported into the EFDB as BOG3 also suggested (see page 7, section 3.2). In order to do this, a common import format needs to be agreed upon by the data providers and the database developers. Possible common formats include Excel, ascii-text files, dbase and Access files. This bulk import process should occur early into the development process to allow testing and debugging of the application. During this phase a data dictionary needs to be developed so that each database can be mapped into the EFDB. **Although some of the databases use IPCC definitions, converting each of these databases to the EFDB format may require significant resources.** It is unclear as to who will have this responsibility (TSU or the IT contractor). Synchronisation of the EFDB with future versions of existing databases such as EDGAR, OLADE also needs to be addressed.

### 5.4.2 Single import

A web form for uploading **individual emission factors** into the EFDB will also be needed. This form should contain a series of textboxes and drop-down boxes to readily obtain the information from the user. Quality checks for mandatory fields (see pages 12 to 13, Table 1) should be built into this form. Additionally, the TSU will do an initial “sanity check” of all factors submitted. This input process should allow revisions to existing factors, additions of new factors, and deletions of existing factors. This is a critical input process since it is during this stage that the emission factors and other parameters that are more relevant to developing countries are most likely to be added.

### 5.4.3 “Mini-batch” import

In addition to bulk and single import processes, we need to provide a middle ground for those emission factor developers who wish to submit a small batch of emission factor records (perhaps on the order of 10 or 20 individual records). For example, the user could fill out an Excel spreadsheet template or Access database template and email or ftp the submission to a central administrator. Again, we need to consider when and how these submittals are included in the master database and who reviews them.

## 5.5 Methods of extracting information from the database (outputs)

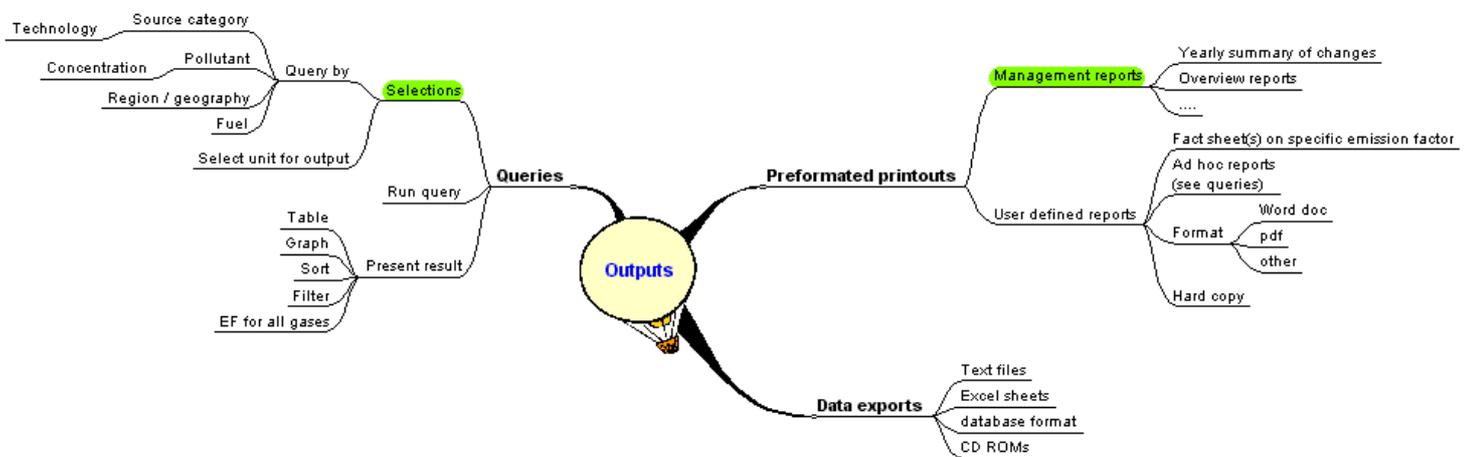
The methods of extracting information from the database are outlined in **Figure 4**.

An important part of the database tool will be making the information available to users. To this end, BOG2 recommends that the users be able to query the database on the following fields: Source Category (to the technology level), gas, region, geographic conditions, fuel type and unit type. Query screens should be refined during the development process. The user should be able to make their selections by from one or more of these descriptive categories by using dropdown boxes. The user should be able to sort and filter the output. The results of queries could be presented as tables, graphs, and reports. The EFDB web tool should be capable of creating ad-hoc reports from queries and pre-formatted fact sheets on specific emission factors or other parameters. These reports should be accessible in different formats (e.g. Excel, adobe (.pdf), and Word (.doc)).

Finally, the EFDB application should be capable of exporting the database tables as ascii text files, Excel sheets, and in other common database formats. The user should also be able to request a copy of the data on CD-ROM.

BOG2 also discussed creating management reports that are created off-line and will summarise changes to the EFDB since the preceding year or last official version. BOG2 members also requested that a overview report be created summarising key attributes of the EFDB (e.g. Number of factors by region, category etc.)

**FIGURE 4. METHODS OF EXTRACTING INFORMATION FROM THE DATABASE**



## 5.6 Issues to be resolved by the Steering Group

There are a some important issues related to data import and export that need resolution by the EFDB Steering Group proposed by BOG3. These issues include:

1. Resolving supervisory responsibilities - BOG2 proposed that an editorial board review all changes and additions to the EFDB. An email message would be generated and sent to each member of the board upon the submittal of any new data. Until final acceptance into the EFDB, the record could be flagged as “pending” or be held in a separate database until reviewed and accepted. However, maintaining such an editorial board is an additional administrative burden. (Ultimately, the users of the EFDB are responsible for the consequences of their use of any factor in the EFDB when compiling their GHG inventory and should review all supporting reference documentation carefully.)
2. Continuous updating vs. batch updates to the database – BOG2 discussed whether each individual submittal should be automatically be incorporated into the “live” publicly accessible database or whether these submittals should only be incorporated once or twice each year in a batch upload into the master. BOG2 did not decide which method was better. It was noted that scientists would prefer continuous updates since they are in search of the most recent data at all times. Inventory compilers may prefer less frequent updates, as they only need to compile their

inventories once each year and would not want to revise their data each time a new factor appeared.

3. Version management is a key issue that the Steering Group needs to resolve and is related to the issues outlined in #1 and #2 above. If users can download the data at any time to their local PCs, should they be downloading the most recent data including all recently submitted changes? When users query the on-line database, will they see all recently submitted additions and revisions or only the last published version of the database? What of the “mini-batch” additions? When will those appear in the database? When requests for CD-ROMS are made, will these CDs contain the most recent data or data that is updated only in six month increments (or some other interval)? Should all versions of the database at any given time be identical? The contractor chosen to develop the EFDB should help resolve these issues providing input on cost and ease of different version management systems.

## **6. RECOMMENDATION TO THE TASK FORCE BUREAU ON UPDATE OF STRATEGIC IMPLEMENTATION PLAN**

### **6.1 Update of work plan**

Following the discussion at the meeting, it is suggested that the TFB update the work plan in the SIP as follows.

#### **Preparation of the call for tender to produce the EFDB and set up of the Steering Group [at TFB 6, 9 August 2001]**

The TSU and the Co-Chairs of the EFDB Project will draft the call for tender to produce the database building upon the conclusions of this meeting by the end of July. The call for tender will be subject to endorsement by the Task Force Bureau (TFB) at its 6th session to be held on 9th August 2001 in Geneva, Switzerland.

Also, the members and responsibilities of the EFDB Steering Group will be recommended to the TFB for their endorsement at the same session.

#### **Call for tender, selection of the IT experts (software developers) [By the end of August]**

After endorsement by the TFB, the TSU will issue a call for tender to some candidate software developers with a view to selection of the most appropriate IT experts by the end of August.

#### **Development of a prototype database (Detailed design and Programming) [September – December 2001]**

Selected IT experts will further develop the database structure and the input and output processes as decided upon in the functional design. This process will be supervised by the TSU in consultation with the Co-Chairs of the EFDB Project and the TFB members. Also it is desired that a group representing the users judge the final detailed designs of input and output windows and forms.

Having finalised the detailed design of the database, the IT experts will implement it in applications and a set of working web pages. During this process, user's manual and relevant documents have to be developed. Furthermore, the default data presented in the IPCC Guidelines and the Good Practice Report will be put into the prototype database during this phase.

The prototype database, together with user's manual and relevant documents, is expected to be ready by 14 December 2001.

#### **Pilot testing of the prototype database [January – March 2002]**

The prototype database will be made available to expert reviews including all participants in this meeting for pilot testing between late January and late March 2002.

(All participants in this meeting are invited to take part in the pilot testing.)

The reviewers will be requested to submit their comments to the TSU in a timely manner. The TSU will prepare a summary table of the comments for consideration by the Second Expert Meeting.

### **Second Expert Meeting [small-scale, mid April 2002]**

For continuity, this meeting will involve as far as possible participants from the first expert meeting. Participants are expected to:

- (i) Further discuss technical aspects to improve user-friendliness of the database taking into consideration the comments from reviewers;
- (ii) Further elaborate the most appropriate data collection and QA/QC procedures building upon the conclusions of this meeting.
- (iii) Determine the procedures and schedule for data populating.

### **Demonstration of the prototype database at SBSTA16 [June 2002]**

The TSU will hold a special side event to demonstrate the EFDB (prototype) at SBSTA16 in June 2002, with a view to enhancing the public awareness of this project and the EFDB.

### **Finalisation of the EFDB construction**

**[May – October 2002]**

Any bugs or other shortcomings of the prototype database and (web) application identified by the pilot testing will need to be promptly repaired. The user group that judged the detailed design is also mandated to check the bug repairing process.

TFB will discuss the outcomes of the Second Expert Meeting, probably in May or June 2002, with the Co-Chairs of the EFDB Project. The TSU will implement the TFB decision on the refinement of the database, with the IT experts. The TSU will also implement the activities to collect and input more data. Data collection and input into the database at this stage will be implemented according to the procedures and schedule agreed upon by the Second Expert Meeting.

The EFDB will come into full operation by the end of October 2002.

### **Demonstration of the complete EFDB at COP8 [November 2002]**

The TSU will hold a special side event at COP8 to make an announcement of establishment of the EFDB and to demonstrate how to utilise it.

## **6.2 EFDB Steering Group**

In order to ensure good management of the EFDB and to assure its usability, it is proposed that a Steering Group is established to take on the following responsibilities under the supervision of the TFB:

- Prepare decisions on all open issues in time for implementing in the first version of EFDB planned for end of 2002;
- Follow and assess progress in executing the Strategic Implementation Plan for the Establishment of an Emission Factors Database (SIP);
- Mediate and propose solutions for any problems or decisions that might arise during implementation, population and testing of EFDB;
- To steer and arrange the further development of EFDB once the first release has been published, and deal with the long term issues including establishment of “editorial board”, modality of updating, and version management, as proposed by BOG2;

- Prepare a solution for long term ownership and hosting of EFDB for consideration by the Task Force Bureau on the IPCC National Greenhouse Gas Inventories Programme;
- Harmonisation with other activities such as UNECE Task Force on Emission Inventory and Projection (TFEIP).

**ANNEX 1:****OPTIONS FOR DATA COLLECTION AND QA/QC PROCEDURES (PRESENTED IN THE DISCUSSION PAPER FOR BOG3 IN THE MEETING)**

In the discussion paper for BOG3 in the meeting, 3 options for data collection and QA/QC procedures are presented for consideration. These options were developed taking into consideration the outcomes of the New Delhi scoping meeting. These were presented, among many other possible options, just to facilitate discussion in this meeting.

**TABLE: SUMMARY OF THE OPTIONS PRESENTED IN THIS SECTION**

	<b>Option A</b>	<b>Option B</b>	<b>Option C</b>
Data Providers	Anyone	Only accredited experts	Only accredited organisations
QA/QC	By an editorial board	By regular expert meetings organised by source category	By data providers themselves
Merit	Wide collection of data will be expected. Users may be able to find more suitable data to their circumstances among the wide range of information.	High quality will be confirmed for all of the data included in the database. Users may be able to fully rely on the data quality.	QA/QC can be achieved in an efficient manner, which will reduce the workload of the database host.
Demerit	<ul style="list-style-type: none"> <li>- Data of not so high quality are included, though minimum quality requirement will be ensured.</li> <li>- The workload of the database host will be heavy.</li> </ul>	<ul style="list-style-type: none"> <li>- Variety of the data included in the database would be reduced.</li> <li>- The workload of the database host will be heavy.</li> <li>- Organising the regular expert meetings will be quite a burden.</li> </ul>	<ul style="list-style-type: none"> <li>- It is difficult to ensure consistency among data providers in terms of strictness of data quality checks</li> <li>- The data of so high quality are included, though minimum quality requirement will be ensured.</li> </ul>
Cost implications	<ul style="list-style-type: none"> <li>- Need to maintain the editorial board</li> <li>- Need to support heavy workload of the database host</li> </ul>	<ul style="list-style-type: none"> <li>- Need to convene the expert meetings on a regular basis</li> <li>- Need to support heavy workload of the database host</li> </ul>	<ul style="list-style-type: none"> <li>- Need to maintain the good network of the data providers.</li> <li>- Need to support workload of the database host</li> </ul>

## **Option A: Wider data collection with minimum quality check by an editorial board**

### *Principles*

This option is to pursue as wide inclusion of data as possible. Key elements of this option are as follows.

### **Data providers**

The option 1) presented in the section 2.3 would be taken, i.e. **no restriction on the qualification to propose data for inclusion into the database**. Anyone can make a proposal.

### **QA/QC procedures**

The concept of the options 1) and 2) presented in the section 2.3 should be taken, i.e. **to include data from all possible sources but only those with no or little reference information**. To ensure the minimum quality, an **editorial board** consisting of inventory experts will be organised. The editorial board will judge the data proposed to be included against the criteria with the assistance of the database host (or the TSU).

### **Criteria for inclusion of data**

All data will be included if the following conditions are met at least:

- a) They are not included in the database yet
- b) Their origin is traceable and known
- c) They are accompanied with at least the following attributes:
  - the gas
  - the IPCC source sector the emission factor applies to
  - the key influencing factors (e.g. geographical area where the data is applicable)

### *Procedures*

#### **Bulk upload**

In the early stages of populating the database, it is likely that information of existing collections of emission factors are offered for inclusion. Such collections will be accepted by EFDB for inclusion if each factor complies with the condition c) above. In this case the origin will refer to the original emission factor collection.

#### **Individual candidate data**

1. EFDB candidate data are proposed (electronically) to the database host.
2. The host sends the candidate data for review to at least two members of the editorial board with expertise in the relevant sector.
3. If both members agree that the above criteria are met, the factor is accepted. If both agree that the criteria are not met, the factor is refused. If the two members disagree, the factor is sent out to all members of the editorial board and acceptance is by “a majority of votes”.

### *Key question for this option*

- How many experts and through what procedures should the editorial board be organised? TOR of the editorial board may have to be devised.

## **Option B: Intensive quality assurance and quality control by regular expert meetings**

### *Principles*

This option is to ensure all the data included in the database are of high quality. It allows only the data selected carefully to be included. Key elements of this option are as follows.

### **Data providers**

The option 2) presented in the section 2.2 would be taken, i.e. **only the partners specified through an agreed procedure could be allowed to propose data in a standard format, for inclusion into the database.**

### **QA/QC procedures**

The concept of the option 3) presented in the section 2.3 would be taken, i.e. **to include only the data carefully screened through regular expert meetings, organised by source category.** This might require significant financial and institutional resources that are not currently available.

### **Criteria for inclusion of data**

Data to be included in the database have to meet the following conditions at least:

- a) They are not included in the database yet
- b) Their origin is traceable and known
- c) They are accompanied with at least the following attributes:
  - the gas
  - the IPCC source sector the emission factor applies to
  - the key influencing factors (e.g. geographical area where the data is applicable)
  - uncertainty data
  - reference information
- d) The high quality of the data (or the reliability of the reference) should be strictly confirmed through careful examination by the regular expert meetings.

More detailed criteria must be developed by the regular expert meeting at its first session.

### *Procedures*

1. EFDB candidate data are proposed (electronically) to the database host.
2. The host prepares and submits the documents containing information on the candidate emission factors to the regular expert meetings for review.
3. The regular expert meetings organised by source category undertake careful examination of the candidate data and make decisions whether to accept them or not.

### *Key questions for this option*

- How many experts and how often should the regular expert meetings be organised? TOR of the regular expert meetings may have to be devised.
- How can we make the detailed criteria, in particular d) above, practical and adequate?
- How should we treat the default values in the *IPCC Guidelines* and in the *Good Practice Report*? Some of them may fail to meet the rigorous criteria suggested by this option.
- How should we treat information of existing data collections? Should we allow the bulk input, or apply the same strict criteria as is the case with the individual candidate data?

## **Option C: Decentralised autonomous quality assurance and quality control by a limited number of data providers**

### *Principles*

This option is to seek an efficient way to undertake QA/QC of the data for inclusion into the database. Key elements of this option are as follows.

### **Data providers**

The option 2) presented in the section 2.2 would be taken, i.e. **only the partners specified through an agreed procedure could be allowed to propose data in a standard format, for inclusion into the database**. Furthermore, the data providers are expected to be rather reliable organisations in this case. Governments would be one of the most probable candidates.

### **QA/QC procedures**

The concept of the option 4) presented in the section 2.3 would be taken, i.e. **to include only the data submitted through a limited number of data providers (e.g. governments), who would pre-screen the data according to the criteria**. QA/QC is to be done only by the accredited data providers themselves in this option.

### **Criteria for inclusion of data**

Data to be included in the database have to meet the following conditions at least:

- a) They are not included in the database yet
- b) Their origin is traceable and known
- c) They are accompanied with at least the following attributes:
  - the gas
  - the IPCC source sector the emission factor applies to
  - the key influencing factors (e.g. geographical area where the data is applicable)
  - uncertainty data
  - reference information
- d) The quality of the data (or the reliability of the reference) should be checked by the accredited data providers themselves.

More detailed criteria must be developed to ensure consistency among different data providers.

### *Procedures*

1. The data providers check the quality of EFDB candidate data according to the agreed criteria before submission to the database host.
2. EFDB candidate data that have gone through the quality check by the data providers are proposed (electronically) to the database host.
3. The database host accepts all of the proposed data.

### *Key questions for this option*

- How should we select the data providers?
- How should we develop the detailed criteria to be commonly used by the data providers?

- How should we treat the default values in the *IPCC Guidelines* and in the *Good Practice Report*? Some of them may fail to meet the rigorous criteria suggested by this option.
- How should we treat information of existing data collections? Should we allow the bulk input, or apply the same strict criteria as is the case with the individual candidate data?

## **ANNEX 2: LIST OF PARTICIPANTS**

**IPCC Expert Meeting:  
Establishment of a Database on Greenhouse Gas Emission Factors  
International Energy Agency (IEA)  
Paris, France  
2 - 4 July, 2001**

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