

Task Force on Inventories

IPCC


WMO

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

UNEP

IPCC National Greenhouse Gas Inventory Programme

IPCC Software for the IPCC 2006 Guidelines



2006 IPCC Software for National Greenhouse Gas Inventories
Version from 25. February 2008
Developed by SPIRIT, Inc. Under IPCC contract

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Agenda

1. Background and software design
Simon Eggleston
2. Demonstration of Software
Nalin Srivastava
3. Spreadsheets available from 2006 Guidelines
 - Landfill Emissions
 - Harvested Wood Products
 - Fluorinated Gases (Refrigeration, Foams, Fire Protection)
4. Other support for inventories – EFDB and primer
Kiyoko Tanabe

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Fuel Combustion Activities

Sector: Energy
Category: Fuel Combustion Activities
Subcategory: 1.A.3.b.1 - Passenger cars with 3-way catalysts
Sheet: CO2, CH4 and N2O from fuel combustion by source categories - Tier 1

Fuel Type	Energy Consumption			CO2		CH4		N2O	
	A Consumption (Mass, Volume or Energy Unit)	B Conversion Factor (TJ/unit)	C Conversion Factor (C-A * B)	D CO2 Emission Factor (kg CO2/TJ)	E CO2 Amount Captured (Gg CO2) E=C*(D10 ⁻⁶ - E-Z)	F CH4 Emission Factor (kg CH4/TJ)	G CH4 Emissions (Gg CH4) G=C*F*10 ⁻⁶	H N2O Emission Factor (kg N2O/TJ)	I N2O Emissions (Gg N2O) I=C*H*10 ⁻⁶
Liquid Fuels									
Grand Summaries					Sum = 0		Sum = 0		Sum = 0

Background
&
Software Design

Simon Eggleston

Documentation

Inventory Year: 2005

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Background

- The mandate of the National Greenhouse Gas Inventory Programme (NGGIP) includes:
 - “to develop and refine an internationally-agreed methodology and software for the calculation and reporting of national GHG emissions and removals”
- Software for the 1996 Guidelines was developed
 - Development of this has been continued by the UNFCCC for non-Annex I parties
- Following completion of 2006 Guidelines we are developing similar companion software

Aims of Software Project



- To produce software that automates the Tier 1 (and most 2 methodologies) in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
 - A phased approach has been adopted
 - Demonstration version (Energy Sector) this year
 - Complete version next year
 - While future phases are anticipated they will require a decision by the IPCC plenary and so cannot be guaranteed
- The software will not impose any additional requirements onto users beyond those specified in the 2006 Guidelines to ensure a good practice inventory
 - QA/QC software items
 - Documentation items

Specific Software objectives

- Facilitate preparation of national GHG inventories according to 2006 Guidelines
 - either for complete inventories or for separate categories or groups of categories
 - assist in training and inventory review
 - harmonise reporting of greenhouse gas inventories
 - archive data and complete inventories (which may consist of estimates for a number of years)

Users of Inventory Software



- The primary target groups of users are:
 - Inventory compilers in all Parties to the UNFCCC with limited resources without their own inventory systems and who wish to apply default methods
 - Trainers and trainees on national GHG inventory compilation
- In addition a range of other potential users has been identified
 - Reviewers of national inventories
 - Academics/Researchers
 - UNFCCC Secretariat
 - Project developers
- Many of the primary target users may have both limited resources and limited internet access but have some knowledge of 2006 Guidelines and to be computer literate and be familiar with spreadsheets

Timeline



- Meeting in Doha, Qatar (January 2007)
 - Agreed on development of new software
 - Agreed on specification of software
- Agreement by Task Force Bureau (TFB) (January 2007)
 - Decided to develop in stages so as to minimise risk and ensure software meets our needs
- Software development tendered by TSU (April – July 2007)
- Contract awarded to SPIRIT a.s. (October 2007)
 - For demonstration version covering Energy sector
- Software development continues with “beta” versions available. (ongoing)
 - 2nd version distributed (April 2008)
- Work on 2nd phase contracting is now starting aiming for completion in 2009

General Specification

- **Minimum hardware specification**
 - reliable internet connections cannot be assumed
 - Hardware: Pentium CPU and 256 MB RAM
 - Operating System: Microsoft Windows 2000/XP/Vista
- **Software - freely distributable**
 - The system should be freely distributable and should avoid any financial burden on users
 - The system should be a standalone system. It should not depend on web access.
- **Help**
 - A help system should be available in each module that has information both on the operation of the software and technical help on the methodologies based on text of the 2006 Guidelines.
- **Languages**
 - system should be capable on running independently of the language version of the operating system.
 - While it would be desirable for the interface to work in the various UN Languages this is not mandatory at phase 1, however the system should be language-enabled for the future
 - User manuals will ultimately need to be in all UN languages though not as part of phase 1.

Inputs

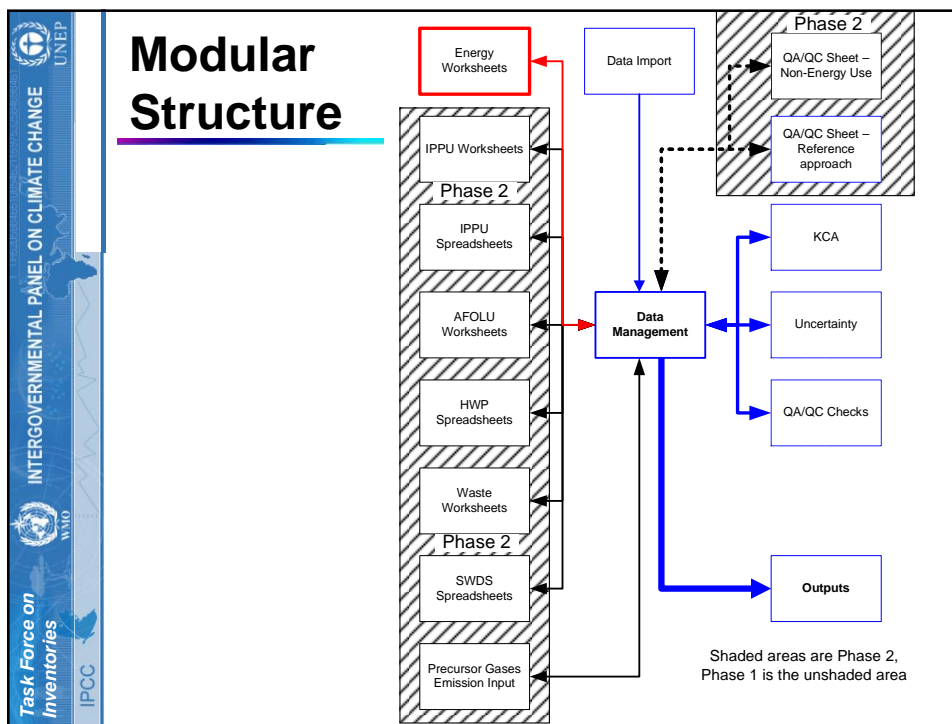
- **Numerical Data:**
 - Activity Data and its uncertainties.
 - Emission Factors and other parameters as described in the printed worksheets in the 2006 Guidelines and the uncertainty of each.
- **Additional Information**
 - Choice of Tier
 - Data Reference (source of data)
 - Comments
- **Numerical input data can be:**
 - A number
 - A notation key (limit input to those specified in the 2006GL
 - Uncertainties are expressed as +/- 95 percentiles. (Typically users write this as +/-x, +x and - y. Data may be expressed in absolute terms or as percentages and users should have flexibility on how to express inputs.)
- **The system should have a data version control. This will record the user name of who made changes to the database and the date of the change.**
- **It is expected that, in phase 1, users will input data in standard units.**
 - At a later stage this may be adapted to allow alternative units to be used with software unit conversions, proposals should allow for this in their design.
- **Some input modules may have text references to external databases but no direct hyperlinks.**

Outputs

- The system should output data according to the reporting requirements & tables of the 2006 Guidelines.
 - To form these reporting tables data are aggregated from the individual calculation sheets.
 - The structure of the reporting table is hierarchical with each sector being the sum of all of its sub-sectors.
 - Time series of individual data items (activity data or Emission factors).
 - A facility to report using the Revised 1996 Guidelines Reporting Tables should be included.
- The outputs should be:
 - Printable
 - For import into MS Excel®
 - As XML files in the CRF Data XML Format.
- In later phases more output options and formats may be required. Future phases may also ask for graphs of outputs.

Greenhouse gases

Gases in 1996 Guidelines	carbon dioxide (CO ₂)	hydrofluorocarbons (HFCs)
	methane (CH ₄)	perfluorocarbons (PFCs)
	nitrous oxide (N ₂ O)	sulphur hexafluoride (SF ₆)
Additional Gases in 2006 Guidelines	nitrogen trifluoride (NF ₃)	trifluoromethyl sulphur pentafluoride (SF ₅ CF ₃)
	halogenated ethers (e.g., C ₄ F ₉ OC ₂ H ₅ , CHF ₂ OCF ₂ OC ₂ F ₄ OCHF ₂ , CHF ₂ OCF ₂ OCHF ₂)	
	CF ₃ I, CH ₂ Br ₂ , CHCl ₃ , CH ₃ Cl, CH ₂ Cl ₂	
	C ₃ F ₇ C(O)C ₂ F ₅ , C ₇ F ₁₆ , C ₄ F ₆ , C ₅ F ₈ and c-C ₄ F ₈ O.	



Module	Annual or Time series	Number of Calculation pages	Notes
Energy	Annual	11 (4 additional for Reference approach QA/QC)	Provide Annual Total Fuel Use from sum of fuel consumption data input by fuel type for QA/QC. Energy Balance Data can be entered into the Reference approach QA/QC sheet for comparison by users. "abandoned underground coal mines" should allow time series data entry. For CCS use Reporting Table 1.4b as there is no worksheet in the 2006 Guidelines
Fluorinated Gases – Foams (2F2)	Time Series	1	Default data from global database to be provided
Fluorinated Gases – Refrigeration and Air Conditioning (2F1)	Time Series	1	
Fluorinated Gases – Fire Protection (2F3)	Time Series	1	
IPPU other than fluorinated gases above	Annual For 2F4, 2F5, 2F6, 2G2 and 2G3, users need to input data for two different years.	69 (2 additional for QA/QC checks on Non-Energy Use of Fuels)	Note spreadsheet to check Non-Energy Use of Fuels for QA/QC checks. For "2B5 Carbide Production" and "2B7 Soda Ash Production", users should choose one from two calculation pages. (Users should not use both of those two pages.) For "2G1 Electrical Equipment" and "2G2c Other", users should be able to duplicate the tables to calculate emissions of different gases using the same calculation procedure as needed. There are no worksheets in the 2006 guidelines pages for the following source/sink categories: 2A5, 2B10, 2C7, 2D3, 2D4, 2E5, 2G4, 2H so the calculation page will be for data input only.
HWP	Time Series	1	Time series default activity data from FAO entered by user.
AFOLU other than HWP	Annual and time series	66	Provide annual total land areas as sum of individual land types as a QA/QC check. Provide annual total numbers of livestock as QA/QC check. Time series is needed for lands converted.
SWDS	Time Series	1	Spreadsheets contain default data
Waste other than SWDS	Annual	18	Provide annual total waste and waste per capita (including SWDS) as QA/QC check
Import Precursor Gases	Time Series		This facility is to enter data from other inventory estimates for these gases for reporting - not to do any calculations. The gases are: SO ₂ , NO _x , NH ₃ , NMVOC and CO.

A Worksheet

Sector	Energy									
Category	Fuel combustion activities									
Category Code	1A. ³⁶									
Sheet	4 of 4 (CO ₂ , CH ₄ and N ₂ O from fuel combustion by source categories – Tier 1)									
	Energy consumption			CO ₂		CH ₄		N ₂ O		
	A	B	C	D	E	F	G	H	I	
	Consumption (Mass, Volume or Energy unit)	Conversion Factor (TJ/unit)	Consumption (TJ)	CO ₂ Emission Factor (kg CO ₂ /TJ)	CO ₂ Emissions (Gg CO ₂)	CH ₄ Emission Factor (kg CH ₄ /TJ)	CH ₄ Emissions (Gg CH ₄)	N ₂ O Emission Factor (kg N ₂ O/TJ)	N ₂ O Emissions (Gg N ₂ O)	
			C=A*B		E=C*D*10 ⁶		G=C*F*10 ⁶		I=C*H*10 ⁶	
Biomass	Information items ^a									
Wood / Wood Waste										
Sulphite Lyes										
Other Primary Solid Biomass										
Charcoal										
Biogasoline										
Biodiesels										
Other Liquid Biofuels										
Landfill Gas										
Sludge Gas										
Other Biogas										
Municipal wastes (biomass fraction)										
				Total		Total		Total		

³⁶ Fill out a copy of this worksheet for each source category listed in Table 2.16 of the Stationary combustion chapter and insert the source category name next to the worksheet number.

^a Information item: Emissions from biomass fuels are only reported as an information item because they are not added to the national totals. They are dealt with in the AFOLU sector.

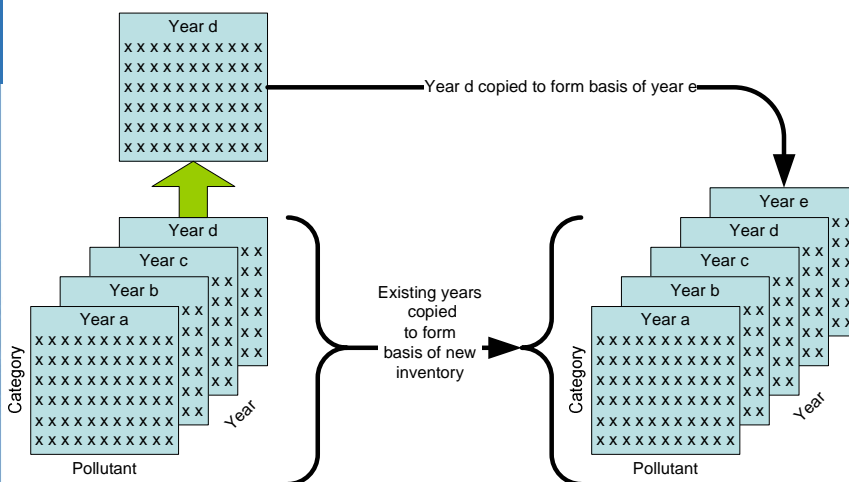
Worksheet Modules

- For those modules based on the worksheets:
 - modules will open with a screen to select the sub-category (i.e. the calculation page)
 - the calculation page will open and users input the appropriate data. Help will refer to the appropriate chapter or section in the 2006 guidelines.
 - the calculation page should look like the worksheets in the 2006 Guidelines as much as possible.
 - users be able to enter data, a reference for the data and an optional comment
 - users will then save the data and can select another sub-category (calculation page)
 - each module will contain sectoral QA/QC checks on the data.

Spreadsheet Modules

- Some spreadsheets are included in the 2006 Guidelines
 - Solid Waste Disposal Sites (landfills)
 - Harvested Wood Products
 - Some Fluorinated Gases (e.g. refrigeration)
- These will be included in the same format with an interface to them from the software
- It will be also be possible to use them as stand-alone programmes

Initialising a new year's inventory

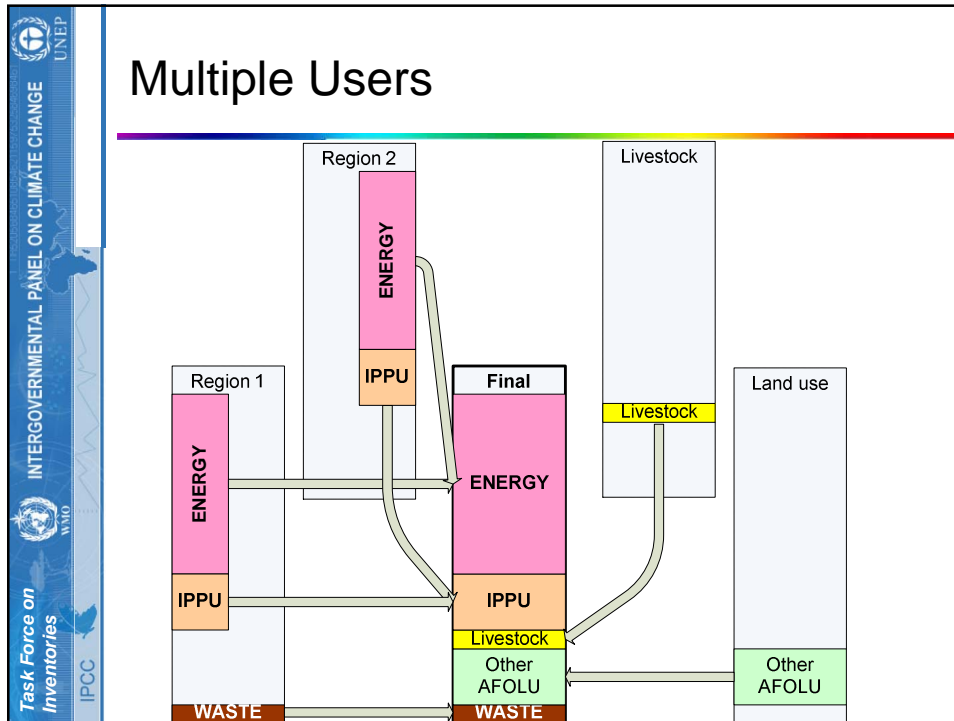


QA/QC functions


- At the data input level there should be some checks.
 - For numerical input these will flag numbers outside a “reasonable” value or a notation key.
 - For emission factors and other parameters, if the input data is outside the range defined by the default value and its uncertainty this should be flagged to the user. Such values should be allowed by the software.
 - Checks do not limit users – merely indicate possible issues
 - Reference Approach
 - Non-Energy Use of Fuels

Flexibility

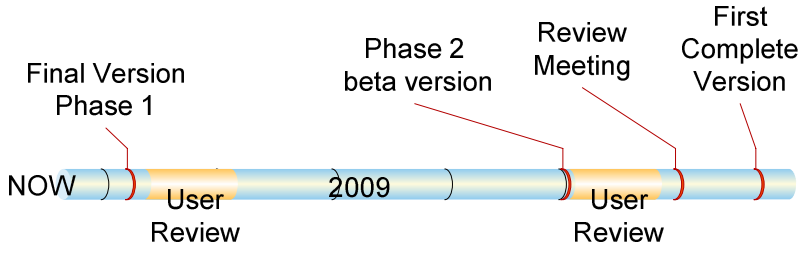
- Within each sub-category the user should have the flexibility to both to:
 - Duplicate the calculation page to stratify inputs
 - e.g. so the same calculations can be made for regions of the country with different parameters used in the estimate
 - Add additional sub-categories
 - In these cases the data management part of the software should ensure that these changes are applied consistently to all years in the same time series



- Way forward
- A second phase will be contracted to produce:
 - Complete software for all sectors
 - Minimal quality control
 - Time series handling
 - There may be further development to include additional items such as:
 - More quality control
 - Improved input/output
 - Improved help
 - Language options



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The way forward



Final Version Phase 1
 Phase 2 beta version
 Review Meeting
 First Complete Version
 NOW 2009
 User Review User Review

- Timing depends on contracts etc.
- Aim to have working complete software in 2009
- Decision on 3rd phase taken after review meeting


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Summary

- Inventory Software is being written for the 2006 Guidelines
- It is aimed at
 - Users with limited resources
 - As a training tool
- The software will be free to users
- A modular structure will make the software more flexible – it can be used as a whole, in part or in a distributed fashion
- The software will display all the calculations – it is not a “black box”

If you would like to **review the software**
please leave your name and email

Many thanks