



STATISTICS ON AIR EMISSIONS AND AIR QUALITY

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**A presentation based on the Plan Bleu MED-Env
Training on air emissions statistics**

I.

**OVERALL ISSUES ON THE AIR
POLLUTION**

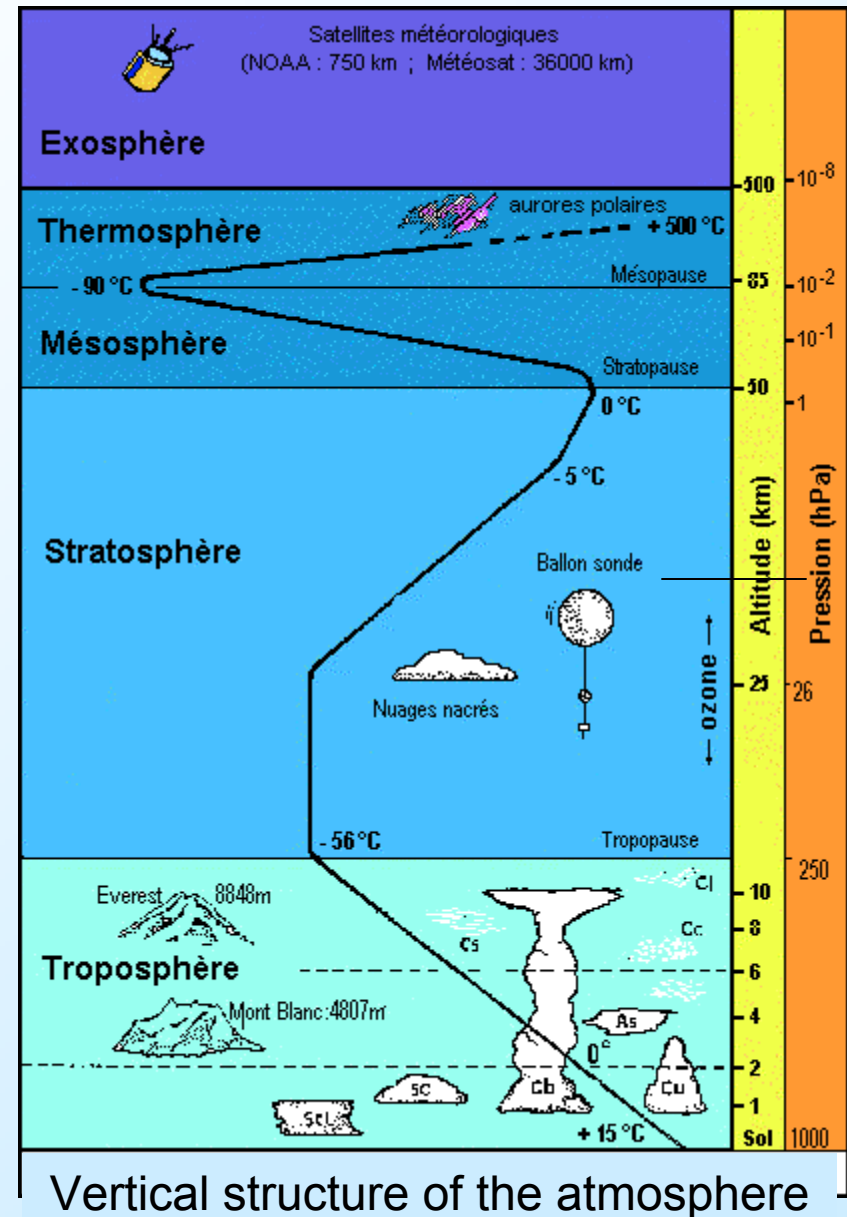
COMPOSITION OF THE ATMOSPHERE (% in volume)

- Nitrogen : 78 %
- Oxygen : 21%
- Argon : 0.93 %
- Carbon dioxide : 0.035 %
- Neon, Helium, Krypton, Hydrogen

« Good ozone » at 25 km altitude

« Bad ozone » in the lower troposphere

Increase of temperature in the stratosphere due to absorption of some solar radiations.



According to Météo-France

ORIGIN OF THE POLLUTANTS

- Energy activities:
 - * fuel combustion
 - * fugitive fuels
- Industrial processes
- Solvents
- Agriculture
- Others

SOURCES OF POLLUTANTS

- power plants
- refineries
- incinerators
- factories
- domestic households
- cars and other vehicles
- animals and humans
- fossil fuel extraction and production sites
- offices and public buildings
- trees and other vegetation
- distribution pipelines
- fertilised land
- land with biological decay.

MAIN POLLUTANTS

- CO₂ : carbon dioxide
- SO_x: sulphur oxides
- NO_x : nitrogenous oxides
- VOC: volatile organic compounds
- Particulates (PM)
- CH₄: methane

CHEMICAL PROCESS: example of combustion

Fuels are made of C \rightarrow CO₂

But also

S \rightarrow SO_x (SO₂ + SO₃)

N \rightarrow NO_x (NO + NO₂) et N₂O

H \rightarrow H₂O

Cl \rightarrow HCl

minerals \rightarrow ashes (not transformed)

FUELS

Fuels			
Type	PCI (MJ / kg)	Sulfur content (%)	Carbon atomes
Waste	5 à 9	?	?
Wood	10 à 14	?	n X 6
Lignit	12 à 20	very fluctuant	?
Coal	around 26	0,3 à 8	?
Oil coke	32	2 à 6	100 ?
Heavy fuel	40	4 / 2 / 1 / 0,5	25 à 100
Domestic fuel	42	< 0,2	10 à 20
Diesel	42	< 0,05	10 à 20
Jet fuel	42	< 0,05	12
(Naphta)			6 à 10
Gasoline	44	< 0,05	4 à 10
LPG (Propane, Butane)	46	0	3 à 4
(Ethane)		0	2
Natural gas (methane)	50	0	1
Hydrogen	120	0	0

INDUSTRIAL PROCESSES

**For more information about industrial processes,
have a look on the website :**

<http://www.jrc.es/pub/english.cgi/0/733169>

IMPACTS

- Soil acidification
- Ozone layer destruction
- Greenhouse effect
- Health effects

II.

REGIONAL INDICATORS

Regional Indicators I

- Emission of CO₂ due to energy use
- Emission of CO₂ per capita
- Emission of CO₂ per GDP
- Emission of greenhouse gases (CO₂, CO, NO₂, CH₄)
- Level of vulnerability

Regional Indicators II

- Effective modeling of emission of greenhouse gases
- Air pollution
- Car ownership
- Expenditure on air pollution control per GDP
- Trend in temperature / rainfall

III.

MAIN INTERNATIONAL PROTOCOLS AND CONVENTIONS

THREE CONVENTIONS : THREE INVENTORIES

**VIENNA CONVENTION 1987 ON OZONE
LAYER PROTECTION**

**GENEVA CONVENTION 1991 ON LONG
RANGE TRANSPORT AIR POLLUTION
(CLRTAP)**

**RIO CONVENTION 1992 ON CLIMATE
CHANGE**

VIENNA CONVENTION

Documentation:

Handbook on data reporting under the Montreal protocol available on the Web site :

<http://www.unep.org/ozone/pdfs/Handbook-on-Data-Report-from-UNEP-TIE.pdf>

For worksheets and instructions :

www.unep.org/ozone/data-reporting-tools.shtml

GENEVA CONVENTION

Geographical coverage : Europe up to Oural
Including USA and Canada

Where to find information ?

Atmospheric Emission Inventory Guidebook

3 rd edition October 2002 update

http://reports.eea.eu.int/EMEP_CORINAIR3/en/

CLIMATE CHANGE CONVENTION (UNFCCC)

Kyoto Protocol (1997) :

- GHG emission limitation up to 2008 – 2012 with regard to 1990 (developped countries annex I)
- Emission inventory and National Communications
- Flexibility mechanisms (emission trading system, Mechanism for Clean development, Joint implementation)

CLIMATE CHANGE CONVENTION (UNFCCC)

COP 4 : compliance system for all countries

(compliance to commitments, good operation of flexibility mechanisms, sanctions and technical assistance)

COP 6 and 7 : developing countries (financial

ressources, technology transfert, strengthening of capacities, adaptation to changes)

CLIMATE CHANGE CONVENTION (UNFCCC)

Direct GHG

CO ₂	Carbon dioxide	HFC's	Hydrofluorocarbons
CH ₄	Methane	PFC's	Perfluorocarbons
N ₂ O	Nitrous oxide	SF ₆	Sulphur hexafluoride

Indirect GHG

SO ₂	Sulphur dioxide
NO _x	Nitrogen oxide (NO) + Nitrogen dioxide (NO ₂)
CO	Carbone monoxide
NM VOC	Non-Methane Volatile organic Compounds

THREE CONVENTIONS: Summary

R. BOUSCAREN

EMISSION INVENTORY SYNTHESIS TABLE

17/01/2004

CONVENTION	OBJECTIVE	MAIN PROTOCOLE	SPONSOR	POLLUTANTS	INVENTORY	DATE	GEOGR EXTENSION	DEFINITION	PERIODICITY	REPORTING FORMAT
VIENNE	Ozone layer	Montreal	UN	CFC's, etc...	Production Consumption	1987	World	Each country	Yearly	
			EC EEA	SO ₂ , NO _x , VOC, NH ₃ , PM	EMEP/CORINAIR	1985	EU (15)	Each country	Yearly	NRF
GENEVE	LRTAP	Gothenburg	UN-ECE	SO ₂ , NO _x , VOC	EMEP/CORINAIR	1990	Large Europe	Each country	Yearly	NRF
			EMEP	NH ₃ , PM, HM's, POP's, etc ...	EMEP/CORINAIR		Large Europe	50x50 km	Every 5 years	
RIO	Climatic change	Kyoto	UN	CO ₂ , CH ₄ , N ₂ O other GHG's	UNFCCC/IPCC	1995	World	Each country	Yearly	CRF

IV.

INVENTORIES AND REPORTING

IPCC/OECD/IEA PROGRAMME ON NATIONAL GREENHOUSE GAS INVENTORIES

- In February 1991 the OECD held a workshop in Paris on greenhouse gas emission inventory methodology to consider the OECD report 'Estimation of Greenhouse Gas Emissions and Sinks' (Background Report). The workshop produced (OECD, 1991) consensus on:
- a basic methodology document as the best available starting point for work on consistent national emission estimates and
- a proposed plan for a two-year programme of work to improve and disseminate the inventory methodology.²³

IPCC

- IPCC subsequently adopted the Work Programme with support from OECD and IEA and recognised that method development effort should (IPCC, 1992):
- build on available information both best available scientific data from ongoing research and currently available inventories and methods
- provide a simple default method accessible to all participating countries while allowing more detailed methods to those countries which have more extensive capabilities
- have careful documentation and review procedures to ensure consistency and transparency of results.

02 March 2005

IPCC GUIDELINES

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (“IPCC Guidelines”).
- IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
- Parties may use different methods (“tiers”), using more detailed approaches for “key sectors”
- Parties can also use national methodologies which they consider better able to reflect their national situation provided that these methodologies are compatible with the IPCC Guidelines and are well documented

IPCC MAIN SECTORS FOR REPORTING EMISSIONS AND REMOVALS :

- All Energy (Combustion + Fugitive)
- Industrial Processes
- Solvent and other Product Use
- Agriculture
- Land Use Change and Forestry
- Waste

REPORTING REQUIREMENTS

CRF: Common Reporting Format

- A reporting Format – tables supplied by UNFCCC
- Compatible with Inventories compiled using SNAP
- Compatible with NFR
- Detailed and needs careful completion!

INVENTORIES QUALITY

- **Comparability**
- **Completeness**
- **Consistency**
- **Transparency**
- **Accuracy**
- **Timeliness**

INVENTORIES AND REPORTING I

Documentation

Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (3 volumes) (The Reporting Instructions - The Workbook - The Reference Manual)

Good Practice Guidance and Uncertainty Management Corrigendum (GPGAUM-Corr.2001.01, 15 june 2001)

Available on the site : <http://www.ipcc-nggip.iges.or.jp/public>

INVENTORIES AND REPORTING II

Database on Greenhouse Gas Emission Factors (IPCC –
EFDB)

User Manual for Web application Version 1.00 (19 septembre
2003)

Annex to the User Manual Guidance on the “properties” field
Version A-1.00 (19 septembre 2003)

Available on the site :

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

V.

CALCULATION METHODS

KNOWLEDGE OF EMISSIONS

1. DIRECT MEASUREMENT

- **Extraction of pollutants outside of the gaseous flux**
- **Transfer of pollutants from the flux to a measuring or analysis device**
- **Measure or analysis (including calibration)**

2. BASIC MODEL FOR EMISSION ESTIMATES

**based on the product of (at least) two variables :
emission factors and another parameter (fuel burnt or
activity...)**

3. INPUT / OUTPUT BALANCE OF A PROCESS

(Solvents, heavy metals, etc...)

**Method at first sight simple nevertheless misleading
in some cases**

EMISSION INVENTORY

The basic model for an emission estimate is the product of (at least) two variables, for example:

- **an activity statistic and a typical average emission factor for the activity,**
- **an annual fuel consumption and an emission factor in grams of pollutants per ton of fuel**
- **an emission measurement over a period of time and the number of such periods emissions occurred in the required estimation period.**

Emissions from road traffic : More Complex Method

- Fuel consumption :
 - per fuel type
 - per vehicle category

- Vehicle stock
 - Number of vehicles per vehicle category
 - Age distribution of the vehicle stock

- Driving conditions:
- Annual mileage per vehicle class
 - Annual mileage per road class
 - Average speed of vehicles

- Emission factors
- .Per vehicle class
 - .Per production year
 - .Per road class (average speed)

- Other parameters
- .Fuel properties
 - .Climatic conditions

Calculation of annual emissions of all pollutants for all CORINAIR road traffic source categories

SNAP: Selected Nomenclature for sources of Air Pollution

- developed as part of the CORINAIR project for distinguishing emission source sectors, sub-sectors and activities.
- Take note of the difference between a technical nomenclature (SNAP 97) and a socio-economical nomenclature (for instance ISIC)

Group 1:

Combustion in energy and transformation industries

Access to chapters

SNAP	Name of SNAP/CORINAIR Activity	NFR 1	CRF/IPCC classification
01	COMBUSTION IN ENERGY AND TRANSFORMATION INDUSTRIES		
0101	Public power	1a	
010101	Combustion plants > = 300 MW (boilers)	1a	1A1a Electricity and heat production
010102	Combustion plants > = 50 and < 300 MW (boilers)	1a	1A1a Electricity and heat production
010103	Combustion plants < 50 MW (boilers)	1a	1A1a Electricity and heat production
010104	Gas turbines	1a	1A1a Electricity and heat production
010105	Stationary engines	1a	1A1a Electricity and heat production
0102	District heating plants	1a	
010201	Combustion plants > = 300 MW (boilers)	1a	1A1a Electricity and heat production
010202	Combustion plants > = 50 MW and < 300 MW (boilers)	1a	1A1a Electricity and heat production
010203	Combustion plants < 50 MW (boilers)	1a	1A1a Electricity and heat production
010204	Gas turbines	1a	1A1a Electricity and heat production
010205	Stationary engines	1a	1A1a Electricity and heat production
0103	Petroleum refining plants	1b	
010301	Combustion plants > = 300 MW (boilers)	1b	1A1b Petroleum refining
010302	Combustion plants > = 50 MW and < 300 MW (boilers)	1b	1A1b Petroleum refining
010303	Combustion plants < 50 MW (boilers)	1b	1A1b Petroleum refining

V.

UNSD QUESTIONNAIRE ON AIR