F-gases reporting in Latvia

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Air and Climate Division

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"DEVELOPMENT OF THE NATIONAL SYSTEM FOR GREENHOUSE GAS INVENTORY AND REPORTING ON POLICIES, MEASURES AND PROJECTIONS"
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Contents

- Sector overview;
- Activity data;
- Emission calculation;
- Uncertainties and time series consistency;
- QA/QC procedures;
- Archiving.

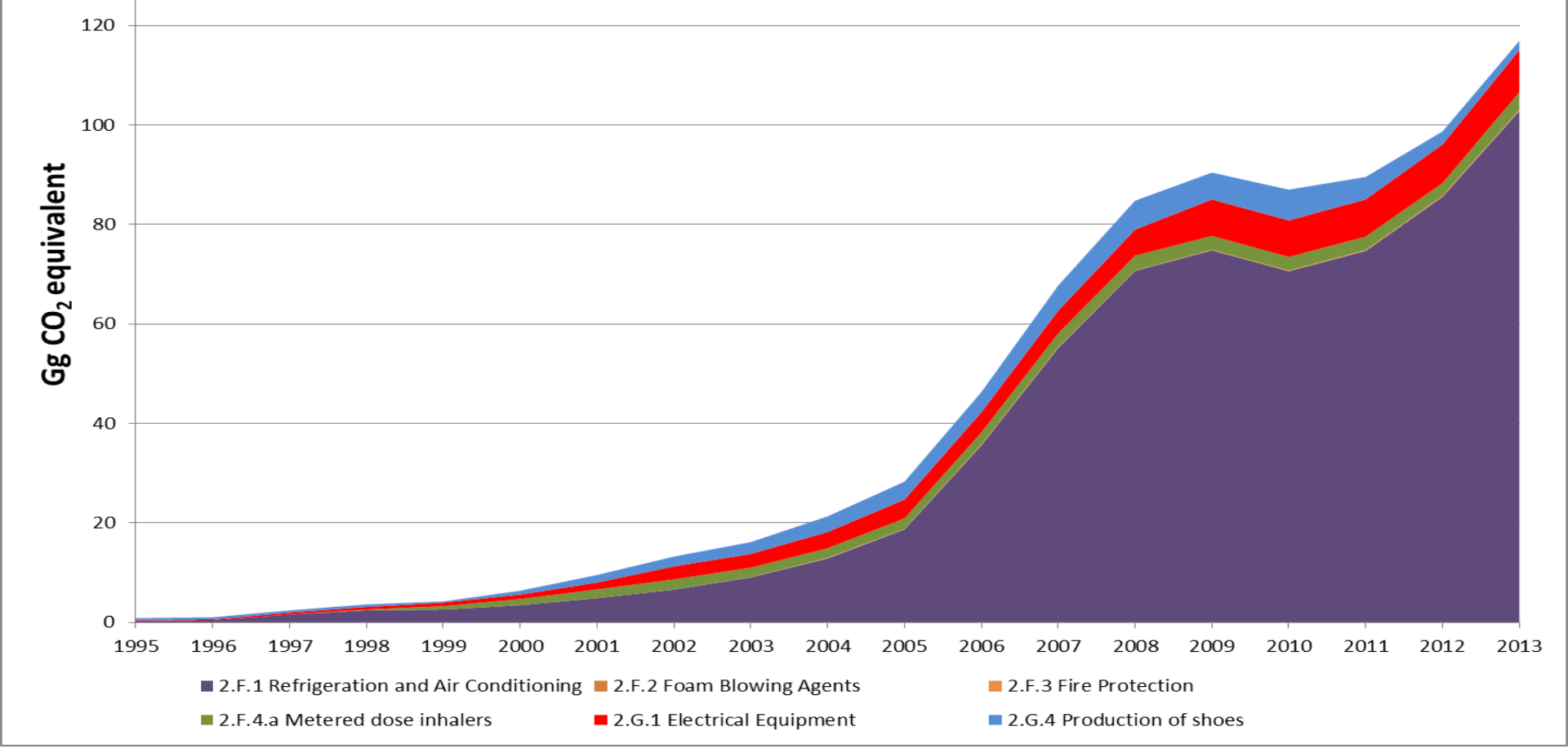
Sector overview

Product uses as substitutes for ODS (CRF 2.F)

- Refrigeration and Air Conditioning;
- Foam Blowing Agents;
- Fire Protection;
- Aerosols/Metered Dose Inhalers.

Other Product Manufacture and Use (CRF 2.G)

- Electrical Equipment;
- Production of shoes.



- **The emissions of F-gases are increasing since 1995 from 0.84 Gg CO2 eq. in 1995 to 116.96 Gg CO2 eq. in 2013;**
- **About 0.9% of total GHG emissions, 14.2% of total Industrial Processes emissions in 2012.**

- **The major part of F-gases emissions constitutes 2.F.1 Refrigeration and Air Conditioning (87.9 %). The second largest emission source is 2.G.1 Electrical Equipment which is responsible for 7.3 % of total F-gases emissions in 2013. Additionally 3.0 % from F-gases emissions comes from 2.F.4. Aerosols (metered dose inhalers) and 1.6 % from 2.G.4. Other (Production of shoes) in 2013.**

Basic investigation on F-gases in 2004

- Project report *"SF_6, HFC and PFC emission inventory in Latvia 1995-2003";*
- The areas and users of HFC, PFC and SF_6 gases in Latvia were identified and initial activity data was obtained;
- The sources of emissions (in accordance with IPCC 1996 methodology) and availability of activity and consumption data were assessed;
- This information was used for elaboration of questionnaire forms which were sent to 120 enterprises operating with F – gases. As the response from the enterprises was relatively low (about 28%), the expert had also find other ways to collect necessary data (i.e. use activity data from CSB, do the extrapolation etc.)

Activity data (I)

- The calculation of emissions under 2.F, 2.G.1 and 2.G.4 subsectors which covers F-gases was carried out for following gases:
    - HFC–23
    - HFC–32
    - HFC–125
    - HFC–134a
    - HFC–143a
    - HFC–152
    - HFC-245fa
    - HFC-365mfc
    - HFC–227ea and SF_6

- There is no production of HFCs in Latvia. Emissions of the PFCs and NF_3 does not occur (NO) in Latvia for all time series at all.

- The calculation of actual emissions was done in accordance with IPCC 2006 methodology.

Activity data (II)

- **Annual report on ozone depleting substances and F-gases (which are freezing agents) and on activities (production, import, export, feedstock use and destruction) with them** (According to Regulation (EU) No 517/2014 and national legislation No.563 “Regulations of ozone depleting substances and fluorinated greenhouse gases which are freezing agents”) *(Commercial, Industrial, Transport Refrigeration)*

- **Chemicals Register** *(Foam Blowing Agents)*

- **State Agency of Medicines** *(annual report on distributed metered dose inhalers (number) which contain F-gases)*

- **A/S «Latvenergo»** *(SF_6 amount in commutation and control installations)*

- **Central Statistical Bureau data bases** *(number of inhabitants, households, passenger cars, trucks & buses)*

Activity data flow

- Historical data are taken from "SF6, HFC and PFC emission inventory in Latvia 1995-2003"

- Data on imported substances from Chemicals Register, CSB and other organizations are manually inputed in emission calculation database (Excel format) in relevant IPCC sub-sectors (sheet per sector);

- Calculated activity and emission data divided in IPCC sectors are inputed manually either using copy/ paste option or Excel import in CRF Reporter software;

Refrigeration and Air Conditioning Equipment

- **Commercial** ***(incl. Industrial, Transport refrigeration, Stationary Air Conditioners)***
- **Domestic refrigeration**
- **Mobile Air Conditioners**

$$E_{Charged,\ t} = M_t \times k / 100$$

where:
$E_{charged}$ – emissions during system manufacture/assembly in year (kg)
Mt – amount of HFC-134a charged into a new equipment in year (kg);
k – charging losses (1.5 %)

$$E_{lifetime,\ t} = B_t \times x / 100$$

where:
$E_{lifetime}$ – amount of emissions during equipment operation (t)
Bt – amount of F-gases held in stocks in year t (tonnes);
x – losses during operation period (15 %)

$$E_{total,t} = E_{Containers,t} + E_{Charge,t} + E_{Lifetime,t} + E_{end\text{-}of\text{-}life,t}$$

Mobile and Stationary Air Conditioning

- **Top-down method from 2006 IPCC was used for mobile air conditioners. Amount of gas could be estimated using coefficients of methodology and statistical (number of passenger cars, trucks, buses (registered after 1995).**

Emission estimation from stocks:

$$E_{lifetime,\ t} = B_t \times x / 100$$

where:

$E_{lifetime}$ *– amount of emissions during equipment operation (t)*
Bt – amount of F-gases held in stocks in year t (tonnes);
x – losses during operation period (15 %)

End of life emissions:

$$E_{end\text{-}of\text{-}life,t} = M_{t\text{-}d} \times p/100$$

where:

$E_{end\text{-}of\text{-}life,t}$ *– amount of emissions from system disposal (t)*
Mt-d– amount of HFCs charged into domestic refrigerators and freezers in year (t-n) (t)
P – residual charge of HFC in equipment being disposed of expressed in % of full charge (100%)

Foam Blowing

- **The imported amount of foams is obtained from Chemicals Register where companies that import products containing specific chemicals have to report their data.**
- **Although it can be assumed that not all foams imported in country in particular year are used in the same year, the import data is used to estimate actual emissions as there is no available information on amounts sold.**
- **The emission calculations were done according to 2006 IPCC Guidelines Tier 1a method using activity data on imported foams and default emission factors**
- **Equation from 2006 IPCC Guidelines for emissions from closed-cell foam in year was used:**

$$Emissions_t = Bank_t \times EF_{AL}$$

where:

$Emissions_t$ = emissions from closed-cell foam in year t, tonnes

$Bank_t$ = HFC charge blown into closed-cell foam manufacturing between year t and year t-n, tonnes

EF_{AL} = annual loss emission factor, fraction

t = current year

Fire Protection

- **Amount of F-gases in annually installed equipment and amount held in containers is used as activity data for emission estimations from stocks. It is assumed that 2% from total stocks is emitted during equipment operations annually according to 2006 IPCC Guidelines;**
- **2001-2006 data from pilot inventory;**

$$E_{lifetime,\ t} = B_t \times x / 100$$

where:

$E_{lifetime}$ *– amount of emissions during equipment operation (t)*

Bt – amount of F-gases held in stocks in year t (tonnes);

x – losses during operation period (2 %)

- **Since 2007 extrapolation is done due to the lack of activity data.**

Metered Dose Inhalers

- **Emissions can be estimated only from used gas in medicine (no information on other aerosols containing F-gases). Data of inhalers containing HFC-134a is obtained annualy from State Agency of Medicines (All importers of the medical preparations shall report the imported and sold amount of medicines);**
- **Emissions only from aerosols used in medicine for asthmatics are estimated;**
- **Average amount of HFC-134a in types of medicines were found out during previous F-gases research.**

$$Emissions_t = S_t \times EF + S_{t-1} \times (1-EF)$$

where:

$Emissions_t$ = emissions in year t, tonnes

S_t – quantity of HFC and PFC contained in aerosol products sold in year t, tonnes

S_{t-1} – quantity of HFC and PFC contained in aerosol products sold in year t-1, tonnes

EF = emission factor (=fraction of chemical emitted during the first year), fraction

Electrical Equipment

- There is only one enterprise using SF_6 in commutation and control installations.
- Enterprise imports equipment already filled with SF_6. There is no manufacturing of the electric equipment containing SF_6 in Latvia, therefore only emissions from charging and operating were estimated using amount of SF_6 in newly installed equipment as activity data (Data received directly from the enterprise).
- Tier1 default emission factor method from 2006 IPCC Guidelines was used. Emissions are estimated by multiplying default regional emission factor (for Europe) by amount of SF_6 used in equipment in enterprise.

Emission estimation from charging:

$$E_{Charged,\ t} = M_t \times k\ /100$$

where:

$E_{charged}$ – emissions during system manufacture/assembly in year (kg)
Mt – amount of HFC-134a charged into a new equipment in year (kg);
k – charging losses (%)

Emission estimation from stocks:

$$E_{lifetime,\ t} = B_t \times x\ /\ 100$$

where:

$E_{lifetime}$ – amount of emissions during equipment operation (t)
Bt – amount of F-gases held in stocks in year t (tonnes);
x – losses during operation period (%)

Production of Shoes

- **Source of HFC-134a emissions is production and use of shoes whose soles are filled with HFC-134a. Manufacturing of shoes (shoe soles) containing HFC-134a occurred in 1995-2002. After 2002 only HFC-134a emissions from stocks and disposal is emitted.**

Emissions from manufacturing:

$$E_{production} = HFC_{filled} \times k$$

where:

$E_{production}$ *– HFC-134a emissions from shoe manufacturing (t)*
HFC_{filled} *– total amount of HFC used in manufacturing of shoes (t)*
k – leakage from shoes production (%)

Emissions from stocks:

$$E_{stocks} = HFC_{stocks} \times x$$

where:

E_{stocks} *– HFC-134a emissions from shoe lifetime (t)*
HFC_{stocks} *– total amount of HFC-134 held in stocks in shoe soles and used in country in particular year (t)*
x – leakage from using of shoes during its lifetime (%)

Emissions from disposal:

$$E_{disposal} = HFC_{remained} \times Q$$

where:

$E_{disposal}$ *– total amount of HFC-134a emissions from disposal*
$HFC_{remained}$ *– total amount of HFC-134a remained in shoes after their lifetime in year*$^{-3}$ *(t)*
Q – leakage from disposal (%)

Uncertainties and time series consistency

- Activity data for HFCs is obtained from reports of enterprises operated with F-gases therefore it is assumed that uncertainty could arise to 75%. Also uncertainty of emission factors for HFCs is assumed as 75%.

- Combined emission uncertainty was estimated using Approach 1 of the 2006 IPCC Guidelines.

- Time series of the estimated emissions are consistent because the same methodology, emission factors and data sources are used for sectors for all years in time series.

QA/QC procedures

- QA/QC check is performed according to 2006 IPCC.
- All estimations of the emissions done in the LEGMC are checked on the logical mistakes by checking the time series of the activity data, emission factors and emissions consistency to display all significant and illogic changes in the activity data and emissions.
- Emissions are checked by using time series and CRF Reporter tools (continuing)
- Quality control check list is filled for each category taking into account criteria given in QA/QC plan approved in national legislation. All findings were documented and introduced in GHG inventory.
- Quality manager from LEGMC has checked the data between CRF and NIR to ensure the consistency as well as QC actions were done in CRF in purpose to double check if all sub-applications are covered.
- As from 2015 according to 2006 IPCC Guidelines the Industrial Processes and Solvent and Other Product Use sectors have merged in one sector – Industrial Processes and Product Use, the order for data input in CRF Reporter and completion of relevant NIR subchapters for three experts responsible of IPPU sector have been set up in the instruction. Preparation of such instruction for each sector has been determined with national legislation (Regulation of Cabinet of Ministers No. 217) and it is planned to update it every year before the start of a new inventory cycle. Additionally internal inventory preparation plan has set up for LEGMC experts to ensure consistency in sectors where more than one responsible expert are involved. Also it was done to promote inventory preparation in a timely manner.

Archiving

- Emission calculation database (Excel files) are stored on the sectoral expert`s computer;
- F-gases activity data are stored on the sectoral expert`s computer in separate folder;
- All previously mentioned electronic information is stored also on the common folder ftp://212.70.174.35 (user protected);
- Originals and print out copies are stored by the sectoral expert.

Thank you for your attention!

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Questions

- **Potential emissions.**

Consumption of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6), **is no longer recommended** as a method for estimating HFCs, PFCs, or SF6 emissions. This is because it is likely to grossly overestimate emissions from sources in which stock is growing quickly and emissions are delayed for decades, such as air conditioning and refrigeration equipment, foams, and electrical equipment. However, when considered along with estimates of actual emissions, the potential emissions approach can assist in validation of completeness of sources covered and as a QC check by comparing total domestic consumption as calculated in this 'potential emissions approach' per compound with the sum of all activity data of the various uses. It may also assist in monitoring the growth of banked greenhouse gases and thereby provide an indication of potential future environmental burdens. Thus, the method is included here for reference purposes e.g., to facilitate consistent time series.

Questions

- **Recovery**

Questions

- **Activity data**