MACEDONIA'S INFORMATIVE INVENTORY REPORT, 2004

Submission under the UNECE Convention on Long - range Transboundary Air Pollution

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MINISTRY OF ENVIRONMENT
AND PHYSICAL PLANNING
Republic of Macedonia

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PROJECT:	**EU CARDS Regional 2002 – Strengthening European Environment Information and Observation Network (EIONET) in the West Balkan Countries**
ORDERED BY:	**MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING OF REPUBLIC OF MACEDONIA**
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CONTENTS

FIGURES

TABLES

ABBREVIATIONS USED

CORINAIR	**Co-or**dination of **In**formation on **AIR** emissions
CARDS	**C**ommunity **A**ssistance for **R**econstruction **D**evelopment and **S**tabilization
ETC/ACC	**E**uropean **T**opic **C**entre on **A**ir and **C**limate **C**hange
EU	**E**uropean **U**nion
UNFCCC	**U**nited **N**ations **F**ramework **C**onvention on **C**limate **C**hange
UNECE/ CLRTAP	**U**nited **N**ations **E**conomic **C**ommission for **E**urope/**C**onvention on **L**ong-range **T**ransboundary **A**ir **P**ollution
QA/QC	**Q**uality **A**ssurance / **Q**uality **C**ontrol
EMEP	Cooperative Programme for **M**onitoring and **E**valuation of the Long-range Transmission of Air **P**ollutants in **E**urope
SNAP	**S**elected **N**omenclature on **A**ir **P**ollutants
CollectER	**Collect** **E**mission **R**egister
ReportER	**Report** **E**mission **R**egister
AE-DEM	**A**ir **E**missions **D**ata **E**xchange **M**odule
NFR	**N**omenclature **F**or **R**eporting
CRF	**C**ommon **R**eporting **F**ormat
GHGs	**G**reen**h**ouse **G**ase**s**
LPS	**L**arge **P**oint **S**ource
LHV	**L**ow **H**eating **V**alue
NAPFUE	**N**omenclature for **A**ir **P**ollution of **Fue**ls
IPCC	**I**ntergovernmental **P**anel on **C**limate **C**hange
GPG	**G**ood **P**ractice **G**uidance (of the IPCC)
EEA	**E**uropean **E**nvironment **A**gency
HM	**H**eavy **M**etals
POPs	**P**ersistent **O**rganic **P**ollutant**s**
RM	**R**epublic of **M**acedonia
CPAPRM	**C**adastre of **p**olluters and **a**ir **p**ollutants in **R**epublic of **M**acedonia
MEPP	**M**inistry of **E**nvironment and **P**hysical **P**lanning
NEAP	**N**ational **E**nvironmental **A**ction **P**lan

INTRODUCTION

The Republic of Macedonia, observing its committments for sustainable management of air quality, and in accordance with obligations undertaken through the signed international Conventions and Protocols, via the Ministry of Environment and Physical Planning (MEPP) initiated the implementation of the project "Establishment of a National Methodology for Air Emission Inventory in the Republic of Macedonia", based on the CORINAIR system. It is part of the implementation of the EMEP Programme, for the purpose of the implementation of the CLRTAP in the Republic of Macedonia, carried out through ETC/ACC with financial support by the CARDS Programme.

The objective of the project is to develop an emission inventorying and reporting system in the Republic of Macedonia that complies with international requirements of the European Union and adaptation towards comparability with the data of the EU Member States.

The objective of this Informative Inventory Report is to provide explanations for the prepared Inventory, by providing information on data sources, emission factors used and methodologies for emission calculation (estimate), completeness of the Inventory, as well as information on QA/QC activities implemented.

During the preparation of this Informative Report, the below listed guidelines were followed:

- *EMEP/LRTAP Guidelines for Estimating and Reporting Emissions data; EB.AIR/GE.1/2002/7*
- *Template for an Informative Inventory Report to LRTAP*
- *EMEP/CORINAIR Emission Inventory Guidebook, "Good practice guidance for CLRTAP emission inventories"*
- *UNFCCC IPCC Good Practice Guidance*

The authors of this Report have tried as much as possible to follow the structure of the mentioned guidelines, in order to achieve transparency, consistency, completeness, accuracy and comparability of reported emission data, taking into consideration the fact that this is the first Inventory prepared in accordance with the above mentioned methodology

The MOEPP of the Republic of Macedonia authorized the company TEHNOLAB Ltd. to carry out the activities aimed at establishing this National Methodology for Air Emission Inventory based on the CORINAIR Programme. In the frames of the assumed responsibilities, TEHNOLAB developed the Air Emission Inventory of the Republic of Macedonia 2004, in the period August 2005 – January 2006, as a National Electronic Database.

1.0. NATIONAL CIRCUMSTANCES

The Republic of Macedonia is situated in the central part of the Balkan Peninsula positioned between 40°50Ä and 42°20Ä North Latitude, and between 20°27Ä East 30" and 23°05Ä East Longitude. It borders Albania to the west (191 km), Greece to the south (262 km), Bulgaria to the east (165 km) and Serbia and Montenegro to the north (231 km). The total length of the border is 849 km, rounding an area of 25,713 km^2. The country has a population of 2.08 million, with 0.44 million in the capital, Skopje. The gross domestic product (GDP) of the Republic of Macedonia is 4,546 million US$ (3,497 million EU€), with 32.1% of GDP derived from industry and 11.3% from agriculture. The main industries are based on natural resources: coal (brown coal), ferrous and non-ferrous metals (chromium, lead, zinc), textiles and wood products.

Figure 1: Geographical position of the Republic of Macedonia on the European Continent

The Republic of Macedonia, as a country in transition, faces similar problems in the environmental sector to those of many other former command economies in Central and Eastern Europe passing through the same process. The Republic of Macedonia has initiated the process of transposition and approximation with the European law, including EU air related regulations, such as Directives, Conventions, Protocols and alike.

1.1. Relevant Conventions and Protocols

In the area of air protection Republic of Macedonia has ratified the following Conventions, Protocols and amendments:

- **United National Framework Convention on Climate Change (New York, 1992).** The Convention was ratified by means of the Law on Ratification („Official Gazette of RM" No. 61/97), and entered into force in the Republic of Macedonia on 28.04.1998.

- **Kyoto Protocol to the United Nations Framework Convention on Climate Change.** The Protocol was ratified by means of the Law on Ratification („Official Gazette of RM" No. 49/04).

- **Convention on Long-Range Transboundary Air Pollution (Geneva, 1979).** The Convention was ratified by means of the Law on Ratification („Official Gazette of the SFRY" No. 11/86). The Convention was taken over by the Republic of Macedonia by means of succession on 17.11.1991.

- **Protocol to the 1979 on Convention on Long-Range Transboundary Air Pollution on Long-Term Financing of the Co-operative Programme for Monitoring and Evaluation of the Long Range Transmission of Air Pollutants in Europe (EMEP, Geneva 1984).** The Protocol was ratified by the Socialist Federal Republic of Yugoslavia („Official Gazette of SFRY No.2/87), and the Republic of Macedonia has taken it over by means of succession.

- **Stockholm Convention on Persistent Organic Pollutants.** The Republic of Macedonia signed the Convention in Stockholm, Sweden, on 22.05.2001. The Convention was ratified by means of the Law on Ratification („Official Gazette of R.M. No.17/04).

- **Vienna Convention for the Protection of the Ozone Layer (Vienna, March 1985).** The Convention was ratified by means of the Law on Ratification („Official Gazette of SFRY No.1/90). The Republic of Macedonia has taken over by means of succession on 10.03.1994.

- **Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, September 1987).** The Protocol was ratified by means of the Law on Ratification („Official Gazette of SFRY No.16/90). The Republic of Macedonia has taken over by means of succession on 10.03.1994.

- **The Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer-London.** The Protocol was ratified by means of the Law on Ratification („Official Gazette of R.M. No.25/98).

- **The Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer-Copenhagen.** The Protocol was ratified by means of the Law on Ratification („Official Gazette of R.M. No.25/98).

- **The Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer-Montreal.** The Protocol was ratified by means of the Law on Ratification („Official Gazette of R.M. No.51/99).

- **The Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer-Beijing, 1991.** The Protocol was ratified by means of the Law on Ratification („Official Gazette of R.M. No.13/02).

Signed:

1. Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants (POPs).

Republic of Macedonia acceded to this Protocol by means of statement (Aarhus, June 1998). It has not ratified it yet.

2. **Protocol to the 1979 Convention on Long-Rang Transboundary Air Pollution on Heavy Metals.**

The Republic of Macedonia acceded to this Protocol by means of statement (Aarhus, June 1998). It has not ratified it yet.

1.1.1. Relevant Environmental Conventions and Treaties

- **Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, February 1991).**The Convention was ratified by means of the Law on Ratification („Official Gazette of R.M. No.44/99).

- **Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention).** The Convention was ratified by means of the Law on Ratification („Official Gazette of R.M. No.40/99).

- **Energy Charter Protocol on energy Efficiency and related Environmental Aspects.** The Protocol was ratified by means of the Law on Ratification of the final document of the European Conference on Energy Character („Official Gazette of R.M. No.16/98).

Signed:

- Protocol on Strategic Environmental Assessment. The Protocol has been adopted on the basis of the Espoo Convention. The Republic of Macedonia signed it in May 2003, in Kiev, Ukraine, at Fifth Ministerial Conference „Environment for Europe".

- Protocol on Pollutant Release and Transfer Registers. The Protocol has been adopted on the basis of the Aarhus Convention. The Republic of Macedonia signed it in May 2003, in Kiev, Ukraine, at Fifth Ministerial Conference „Environment for Europe".

1.2. Institutional arrangements

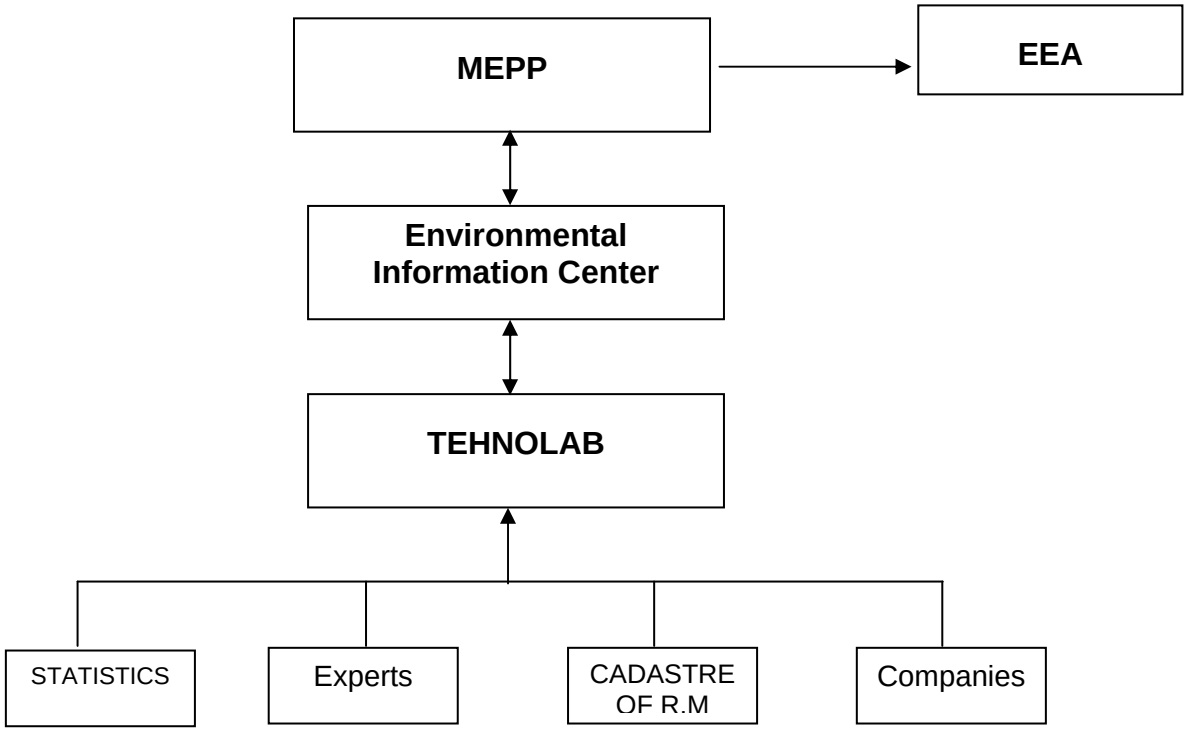

Figure 2: Graphic presentation of institutional arrangements

1.3. Methodology applied in the Inventory development

In the development of the Air Emission Inventory of the Republic of Macedonia 2004, the EMEP/CORINAIR Methodology was applied, thus providing for completeness, consistency and comparability of this Inventory.

EMEP/CORINAIR, as a system, consists of two basic components.

a) The first component consists of EMEP / CORINAIR Guidebook ("the Guidebook"), providing emission estimation methods and all necessary parameters for all relevant source categories at national level. This Guidebook forms the cornerstone of the reporting guidelines under the UNECE / LRTAP Convention and the EU National Emission Ceilings Directive.
The sources of air pollution have been classified by the "Selected Nomenclature for Air Pollution 1997" - SNAP 97, which includes:

- Upper level with 11 main sectors,
- Middle level with 75 subsectors,
- Lower level with 416 source activities.

The main 11 sectors are as follows:

01 COMBUSTION IN ENERGY AND TRANSFORMATION INDUSTRIES

02 NON-INDUSTRIAL COMBUSTION PLANTS

03 COMBUSTION IN MANUFACTURING

04 PRODUCTION PROCESSES

05 EXTRACTION AND DISTRIBUTION OF FOSSIL FUELS AND GEOTHERMALENERGY

06 SOLVENT AND OTHER PRODUCT USE

07 ROAD TRANSPORT

08 OTHER MOBILE SOURCES AND MACHINERY

09 WASTE TREATMENT AND DISPOSAL

10 AGRICULTURE

11 OTHER SOURCES AND SINKS

The first category covers mainly the emissions from fuel combustion in large energy generation plants. Emissions from central heating plants (heating plants by areas) related to fuel combustion are also included in this category (those using waste as fuel, too), together with emissions from refineries, gas and oil based operations and gas extraction. SNAP category 2 concerns emissions from fuel combustion in non-industrial plants. These plants generate heat and energy at lower scale for commercial, institutional and residential use, energy for use in agriculture, forestry and water economy. Category 3 covers all emissions from combustion in industry (for produced energy generation), while category 4 includes emissions produced directly by production processes.

SNAP category 5 refers to all emissions from fissile fuels extraction and distribution (mainly emissions from evaporation) and geothermal energy. The evaporation emissions originating from solvents production and other products are calculated in category 6. The total emission from the transport, i.e. emissions from vehicles in road transport together with emissions from trains, vessels and air traffic are covered in categories 7 and 8. The last SNAP category also covers emissions from motorized equipment in industry, agriculture, forestry, households and farming. Both SNAP categories include emissions from combustion motors only.

Emissions from waste treatment and disposal are calculated in the SNAP category 9. Major part of the emissions in SNAP 9 originate from wastewater treatment and waste dumping sites (evaporations) and shore burning.

Category 10 covers emission from agriculture and forestry, land use and forest mass change. This category comprises many different emission sources. Examples: Crops (with or without fertilizers), cattle and their manure, and change in biomass in different types of organized vegetation. The last category 11 comprises emissions from all natural (not managed) sources, such as forest fires, volcanic eruptions or volatile emissions from vegetation.

According to CORINAIR methodology, emission sources are devided into large point sources (LPS) and area sources.

The large point sources are the main contributors to air pollution, through high number of emission components.

Emissions are calculated on the basis of the following formula:

$$E_{i,j} = A_{i,j} \times EF_{i,j}$$

Where:

E - Emmision
A – data on activity
EF – Emission Factor
i – sector
j –pollutant

b) The second component is a software system, developed by ETC-ACC, presently known under the acronym AE-DEM (Air Emissions Data Exchange Module), consisting of a set of computer programs running under MS Windows and built around an MS Access database structure.
The software system has the following tools:
EstimatER – for emission estimation in individual sectors
CollectER - data collection and storage.
ReporterER – for reporting under NFR and CRF and other Directives.

2.0. THE PROCESS OF INVENTORY PREPARATION

The preparation of the Inventory includes the following stages:

a) Planning
b) Preparation
c) Management

a) Inventory planning
The planning of the Inventory includes organizational aspects, related to: appointment of the team of experts and assistants, description of specific tasks and responsibilities, development of operational procedures of the company with regard to data collection and data calculation on the activity rate and emission factors included in the database of the National Emission Inventory. At the same time, activities have been organized for the purpose of introducing quality assurance and quality control procedures.

b) Inventory preparation
In the context of this Inventory preparation, TEHNOLAB, apart from its own experts, engaged other national experts as well, for the different sectors of SNAP (sectoral experts). Each expert undertook to get involved in the identification of the sources of pollution, definition of the relevant data sources and data collection (activity data). All other activities concerning the Inventory preparation and development have been organized through this approach.

- *Identification of sources of pollution*

In the framework of the Inventory preparation, great attention has been devoted to the identification of the sources of pollution. This was necessary for two basic reasons: the first is based on the geographical position of the Republic of Macedonia (e.g.: there are no sources of pollution of marine or river traffic), as well as on the level of industrial and economic development of the country (there is no domestic air transportation, there are no nuclear power plants, gas turbines, etc.).

The second reason is the specific situation in which the industry of the Republic of Macedonia is found, with companies with terminations in their continuous operations lasting for a year or for several years. Therefore, together with the EEA experts involved in this Project, we have adopted the position that all such cases in the considered year - 2004 will be treated as "do not appear in the Republic of Macedonia", which has been very helpful in the definition of the completeness of the Inventory, as presented under Chapter 3 of this Report.

- *Data sources*

Data from several sources have been used on the different sectors, including:

- Statistical Yearbook 2004
- Energy Balance of the Republic of Macedonia for 2004

- Data (information) from the Cadastre of Air pollution in the Republic of Macedonia
- Database on vehicles from the Ministry of Interior of the Republic of Macedonia, for 2004
- Spatial Plan of the Republic of Macedonia

Data obtained directly from the companies i.e. data used during the development of the "Cadastre of Polluters and Pollutants of the Republic of Macedonia", produced by TEHNOLAB upon the request by the MEPP, has been of significant relevance.

- *Data processing*

The processing of data and methodologies applied in the conducted expert calculations or estimates, as well as the selection of emission factors, have been fully performed by the experts and based mainly on the EMEP/CORINAIR Emission Inventory Guidebook., September 1999. For certain sectors (SNAP categories) for which no guidelines are available in this Guidebook, the Revised 96 IPCC Guidelines, The Factor Information Retrieval (FIRE 6.24) Data System, have been used, as well as independent expert analyses.

The basic approach to the selection of the methodology used in the calculation of emissions and selection of emission factors in the frameworks of each individual SNAP, is the information on activity data. Taking into account the above mentioned difficulties in the collection of data on activity data, as well as the fact that the Republic of Macedonia does not have national emission factors, methodologies used in this Inventory are the simple methodologies and the relevant emission factors contained in the EMEP/CORINAIR Emission Inventory Guidebook.

With regard to the specification of emission factors for certain number of emission sources, mainly for point sources (Facilities), data from the multi-annual measurements of pollutants emission has been used.

Detailed overview and explanation of activity data and emission factors for each of the elaborated SNAPs and separately for each point source (Facilities) are presented in Chapter 3.0.

The final data collection has been done in Excel tbl, specifically created for the purpose of clearer processing and possible corrections prior to their entry into the computer database by means of the software system CollectER developed by the ETC/ACC, known under the acronym AE-DEM (Air Emissions Data Exchange Module), composed of a set of computer programs that may operate through the operational system MS Windows and development of structural data base in MS Access.

The above enables to have an overview over all changes made during the data processing, at any time.

The Inventory of Air Emissions of the Republic of Macedonia for 2004 has been developed in electronic form (MS Access database), using the software tool CollectER. By using the ReportER tool, a set of Excel tables has been generated from the database in CRF and NFR format, as specified in the Implementation Plan.

In Annex 1, a tabular overview of emissions of all pollutants included in this Inventory is presented, for each sector separately.

c) Data management

- *Quality assurance and quality control (QA/QC)*

In the course of the preparation and development of this Inventory, a plan has been developed for the purpose of QA/QC assuring. In this, recommendations from the mentioned guidelines: *EMEP/CORINAIR Emission Inventory Guidebook, "Good practice guidance for CLRTAP emission inventories" and UNFCCC IPCC Good Practice Guidance,* have been used.

Under the plan, apart from the establishment of the team for control, procedures providing for Quality assurance and Quality control and for the Inventory completeness have been introduced. In addition, forms for tabular presentation of collected data (activity data, emission factors), numerical values and measurement units used, verification of the sources of pollution and applied methodological procedures for the calculations or estimates performed, have been introduced.

Using the method of cross-checking, all amendments and corrections in these forms have been made in consent with the sectoral experts and temporary archived in electronic form.

In addition, control has been carried out over the software database for the purpose of identifying errors made during data rewriting, measurement units, conversions and summary results of emissions of polluting substances. In this case, temporary storage in temporary databases has been made again, kept up to the final version of the Inventory.

With regard to the checking of calculations through their comparison with previous calculations, the QC team was not able to accomplish this, because there were no calculations for the previous years produced in accordance with this national methodology. However, in order to observe the principle of control through comparison, the team, for certain sectors of the Inventory and for specific pollutants, carried out comparisons with calculations available in the Inventories completed so far, as well as analyses, studies as the Cadastre of Air Polluters and Pollutants in the Republic of Macedonia.

Ultimately, the results from the said comparisons have only confirmed the conclusion that there have been no significant deviations among compared calculations.

2.1. Completeness

Inventory of Air Emissions of the Republic of Macedonia for 2004, the air emissions have been calculated together with green house gases (GHGs) emissions. The following pollutants have been included:

SO_2 (sulfur dioxide)
NO_X (nitrogen oxides)
NMVOC (non-methagene volatile organic compounds)
CH_4 (methane)
CO (carbon monoxide)
CO_2 (carbon dioxide)
N_2O (nitrous oxide)
NH_3 (ammonium)
TSP (solid particles)
HFC-32; HFC-125; HFC-134a; HFC-143a (fluorohydrocarbons-fluorohydrocarbons-).

This Inventory covers the whole territory of the Republic of Macedonia.

The Inventory elaborates:
- 92 SNAP categories (79 from among area source activities, 13 from among facilities) in all 11 main sectors under the SNAP nomenclature.
- 113 activity data (85 from area source activities, 28 from facilities)
- 472 emission factors (301 from area source activities, 171 from facilities)

As stated above, the Inventory of Air Emissions of the Republic of Macedonia for 2004 is systematized in accordance with the SNAP nomenclature. Under the above listed Conventions, the Republic of Macedonia has undertaken obligations to report to CLRTAP in NFR, and to UNFCCC in CRF formats. Therefore, while carrying out transformations in these formats, i.e. while defining the completeness, the following notation keys have been used:

Table 1: *Definition of* notation keys

Notation key	Definition of notation keys
NO	• *Activity or process does not exist within a country.* • "NO" (Not Occurring) for emissions by sources of compounds that do not occur for a particular compound or source category within the country.
NE	• *Emissions occur but have not been estimated or reported in this submission. .* • "NE" (Not Estimated) for existing emissions by sources of compounds that have not been estimated.
NA	• *The process or activity exists but emissions are considered never to occur.* • "NA"(Not Applicable) is used for activities in a given source category which are believed not to result in significant emissions of a specific compound.
IE	• *Emissions for this activity or process have been estimated and included in the Inventory, but not presented separately for this category of source.* • "IE" (Included Elsewhere) for emissions by sources of compounds are estimated but included elsewhere in the inventory instead of in the expected source category.

Chapter 3 present detailed overview by sectors, for completeness, undertaken data on activity performed, methodological approach and emission factors used .

3. OVERVIEW BY SECTORS

3.1. ENERGY (SECTOR 1)

In this Sector 1, emissions from fuel combustion processes (Categories from **1A1** to **1A5**) and fugitive emissions from fuels (Categories from **1B1** to **1B2**) have been taken into account.

This Inventory, in **Sector 1**, includes emissions from fuel combustion processes from:

- Stationary sources in energy industry, manufacturing industries, heating plants, combustion plants of less than 50 MW power and household fireplaces.

- Mobile sources, such as : road transport, railway transport, mobile machinery in industry, agriculture, forestry and households (gardening).

Fugitive emissions from fuels, i.e. open coal pits and liquid fuels (petrol) distribution, have been covered in this sector, too.

In this sector, emissions of the following pollutants have been included: SO_2, NO_x, NMVOC, CH_4, CO, CO_2, N_2O, NH_3 and TSP.

Explanations on the source of activity data, methodology and emission factors used, are presented in **Chapter 3.1.2.** to **Chapter 3.1.7.** for each of the Categories. The values of pollutants emissions are presented in **Annex 1** by the SNAP nomenclature.

3.1.1. COMPLETNESS

Table 2 presents the completeness of Sector 1, through presentation of those SNAP categories that have been processed in the Inventory, in correlation with EMEP/NFR and UNFCCC/CRF source categories.

Table 2: *SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
1A1	**1A1 Energy industries**	
1A1a	1A1a Public electricity and heat production	010101 Combustion plants≥300MW (boilers) 010202 Combustion plants ≥50<300 MW(boilers) 010203 Combustion plants < 50 MW (boilers)
1A1b	1A1b Petroleum refining	010306 Process furnaces
1A1c	1A1c Manufacture of solid fuels and other energy industry	NE
1A2	**1A2 Manufacturing industries and construction**	
1A2a	1A2a Iron and steel	030103 Combustion plants < 50 MW (boilers) 030302 Reheating furnaces steal and iron
1A2b	1A2b Non-ferrous metals	030103 Combustion plants < 50 MW (boilers) 030324 Nickel production (thermal process)
1A2c	1A2c Chemicals	IE (Included in 1A2f)
1A2d	1A2d Pulp, paper and print	IE (Included in 1A2f)
1A2e	1A2e Food processing, beverages and tobacco	IE (Included in 1A2f)
1A2f	1A2f Other	030311 Cement 030103 Combustion plants < 50 MW (boilers) 0808 Other mobile sources and machinery / Industry
1A3	**1A3 Transport**	
1A3a i (i)	1A3a i Civil aviation (international, LTO)	080502 International airport traffic (LTO cycles - <1000 m)
1A3a i (ii)	1A3a i Civil aviation (international, cruise)	080504 International cruise traffic (>1000 m)
1A3a ii(i)	1A3aii Civil aviation (domestic, LTO)	NA
1A3a ii (ii)	1A3aii Civil aviation (domestic, cruise)	NA
1A3bi	1A3b i R.T., passenger cars	070100 Passenger cars (r)
1A3b ii	1A3b ii R.T., light duty vehicles	070200 Light duty vehicles < 3.5 t (r)
1A3b iii	1A3b iii R.T., heavy duty vehicles	070300 Heavy duty vehicles > 3.5 t and buses
1A3b iv	1A3b iv R.T., Mopeds and motorcycles	070400 Mopeds and Motorcycles < 50 cm3 070500 Motorcycles > 50 cm3
1A3bv	1A3bv R.T., Gasoline evaporation	NE
1A3b vi	1A3b vi R.T., Automobile tyre and brake wear	NE
1A3b vii	1A3b vii R.T., Automobile road abrasion	NE
1A3c	1A3c Railways	080200 Railways
1A3d i	1A3d i International Navigation	NO
1A3d ii	1A3d ii National navigation	NA
1A3e i	1A3e i Pipeline compressors	NE
1A3e ii	1A3e ii Other mobile source and machinery	NE

1A4	**1A4 Other Sectors**	
1A4a	1A4a Commercial/Institutional	020103 Combustion plants < 50 MW (boilers)
1A4b i	1A4b i Residential plants	02 02 05 Other equipments (stoves, fireplaces, cooking,...)
1A4b ii	1A4b ii Household and gardening (mobile)	080900 Household and gardening
1A4c i	1A4c i Stationary	NE
1A4c ii	1A4c ii Off-road vehicles and other machinery	080600 Agriculture 080700 Forestry
1A4c iii	1A4c iii National fishing	NA
1A5	**1A5a Other**	
1A5a	1A5a Other, Stationary (including military)	NE
1A5b	1A5b Other, Mobile (including military)	NE
1B1	**1B1 Fugitive Emissions from solid fuels**	
1B1a	1B1a Coal mining and handing	050101 Open cast mining
1B1b	1B1b Solid fuel transformation	NO
1B1c	1B1c Other	NE
1B2	**1B2 Oil and natural gas**	
1B2a i	1B2ai Exploration production, transport	NE
1B2a iv	1B2a iv Refining/Storage	NE
1B2a v	1B2a v Distribution of oil products	050501 Refinery dispatch station 050502 Transport and depots 050503 Service stations (including refuelling of cars)
1B2a vi	1B2a vi Other	NE
1B2b	1B2b Natural gas	NE
1B2c	1B2c Venting and flaring	090203 Flaring in oil refinery

3.1.2. 1A1 ENERGY INDUSTRIES

Under this Source Category, stationary sources of combustion processes by SNAP 010101, 010202, 010203, 010306 have been processed.

The two largest thermal power plants have been included in the Inventory and elaborated as LPS . They use solid fuel - lignite (fuel ID 105A and 105B), with minor difference in caloric value. Calculations also include the quantity of liquid fuel used for plants starting.

From among the plants for heat production, the 4 biggest have been included as Facilities, and the rest as Area Source. The fuels used are crude oil (fuel ID 203 K), and natural gas (fuel ID 301B).

In this subsector, emissions from the single refinery in the Republic of Macedonia, which uses crude oil (fuel ID 203 K) and refining gas (fuel ID 308B) from their own production, have been calculated.

The fuel identification code (Fuel ID) is presented according to the nomenclature CITEPA – NAPFUE - European Environment Agency / European Topic Centre on Air Emissions NAPFUE 94 version 1.0 dated 21/11/1995
(see ANNEX 3).

3.1.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multipled by the appropriate emission factor which depends on the type of the fuel and technology of combustion.

3.1.2.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector are the fuels.

The source of this data (Activity Data) is mainly the Energy Balance of the Republic of Macedonia, as well as data obtained directly from the companies covered in the process of developing of the *Cadastre of Air Polluters and Pollutants in the Republic of Macedonia, 2004*.

The used quantities of fuels in this subsector have been calculated as a difference of total quantities for 2004 and quantities consumed by other sectors for Area and Facilities.

Table 3 shows fuels included in this subsector of the Inventory, as Activity Data in measurement unit TJ. The table also presents their lower heating value LHV [kJ/g].

Table 3*: Fuel used as Activity Data in subsector 1A1*

SNAP	1A1 Energy industries			
	ID Fuel	Fuel	LHV [kJ/g]	[TJ]
010101	105A	LIGNITE	7.31	47546.7
	105B	LIGNITE	7.42	5216.9
	203K	RESIDUAL OIL	41.00	123.0
010202	203K	RESIDUAL OIL	41.00	3251.3
	301B	NATURAL GAS	50.00	54.7
010203	203K	RESIDUAL OIL	41.00	94.3
	301B	NATURAL GAS	50.00	292.0
010306	203K	RESIDUAL OIL	41.00	640.7
	308B	RAFINERY GAS	48.00	1173.8

3.1.2.3. EMISSION FACTORS

The emission factors for the appropriate pollutants in the elaborated SNAP categories have been taken from CORINAIR Emission Inventory Guidebook. In addition to this, for certain pollutants, emission factors obtained through measurements conducted for many years in these energy plants have been taken, upon prior checking (comparison) with those recommended in CORINAIR Emission Inventory Guidebook.

Table 4 presents an overview of emission factors used in the calculation of emissions in this subsector. The measurement unit used is g/GJ, and kg/GJ for CO_2 pollutant.

Table 4*: Emission Factors used in subsector 1A1*

SNAP	Fuel	1A1 Energy industries								
		SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	kg/GJ	g/GJ	g/GJ	g/GJ
01011	105A	1640	233	30	0.6	4.4	127	0.8	-	82.3
	105B	1887	235	30	0.6	4.4	128	0.8	-	82.3
	203K	976	290	10	5	18	54	8	-	-
01022	203K	980	150	26	4	15	60	7	-	55-100
	301B	-	100	3	2	30	79	2	-	-
01023	203K	976	98	18	5	20	82	23	0.01	120
	301B	-	100	3	2	30	49	2	-	-
01036	203K	976	190	20	2	95	68	8	-	90
	308B	16	90	5	2	24	38	3	-	-

3.1.3. 1A2 MANUFACTURING INDUSTRIES

Under this Source Category, stationary and mobile sources with combustion processes by SNAP 030103, 030302, 030324, 030311, 080800 have been elaborated. These include stationary and mobile sources with combustion processes in production (factory) industry. From among stationary sources, 4 major industrial plants have been elaborated as Facilities, where combustion processes are with contact (reheating of steel, ferrous nickel and cement production). Other industrial plants are included as Area sources with combustion processes in boilers. Mobile sources in this sector have been presented by industrial mobile equipment and machinery.

3.1.3.1. METHODOLOGICAL APPROACH

With regard to stationary sources, the CORINAIR simplified methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multipled by the appropriate emission factor which depends on the type of the fuel and technology of combustion.

3.1.3.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector are the fuels.

The source of this data (Activity Data) is mainly the Energy Balance of the Republic of Macedonia. Part of the data has been obtained directly from the companies covered in the process of developing of the *Cadastre of Air Polluters and Pollutants in the Republic of Macedonia, 2004*.

The used quantities of fuels in this subsector have been calculated as a difference of total quantities for 2004 and quantities consumed by other sectors for Area and Facilities.

Table 5 shows fuels included in this subsector of the Inventory, as Activity Data in measurement unit TJ. The table also presents their lower heating value LHV [kJ/g].

Table 5*: Fuel used as Activity Data in subsector 1A2*

SNAP	1A2 Manufacturing industries and construction			
	ID Fuel	Fuel	LHV [kJ/g]	[TJ]
030103	105B	LIGNIT	7.42	259.2
	203K	RESIDUAL OIL	41.00	3439.5
	301B	NATURAL GAS	50.00	1156.3
030302	203K	RESIDUAL OIL	41.00	1695.8
	301B	NATURAL GAS	50.00	861.4
030324	105A	LIGNIT	7.31	783.0
	110A	PETROLEUM COKE	31.00	142.9
030311	110A	PETROLEUM COKE	31.00	2741.5
080800	2050	DIESEL OIL	43.00	507.4

3.1.3.3. EMISSION FACTORS

The emission factors for the appropriate pollutants in the elaborated SNAP categories have been taken from CORINAIR Emission Inventory Guidebook. In addition to this, for certain pollutants, emission factors obtained through measurements conducted for many years in the four major industrial plants have been taken, upon prior checking (comparison) with those recommended in CORINAIR Emission Inventory Guidebook.

Table 6 presents an overview of emission factors used in the calculation of emissions in this subsector. The measurement unit used is g/GJ, and kg/GJ for CO_2 pollutant.

Table 6: *Emission Factors used in subsector 1A2*

SNAP	Fuel	1A2 Manufacturing industries and construction								
		SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	kg/GJ	g/GJ	g/GJ	g/GJ
03013	105B	1590	60	10	5	16	95	9	-	80
	203K	976-980	100-165	3-26	2-5	10-15	50-82	2-23	0.1	55-120
	301B	-	62-100	3-100	2-96	10-30	50-56	2-7	0.5	-
03032	203K	1323	109	4	4	15	78	8	-	50
	301B	-	90	3	3	8	56	2	-	-
03034	105A	364	259	-	-	356	246	-	-	680
	110A	364	259	-	-	356	246	-	-	680
03031	110A	42.3	576.7	15	10	50	102	8	-	-
08080	2050	139.5	1135	165	4	367	73	30.2	0.16	133.3

3.1.4. 1A3 TRANSPORT

Under this Source Category, mobile sources with combustion processes by SNAP 070100, 070200, 070300, 070400, 070500, 080200, 080502, 080504 have been elaborated.

The above include: road transport, railway transport and air transport (international). Other mobile sources, namely domestic air transport and lake transport are insignificant and not taken into account.

Due to the fact that there is no data available on the fuel consumption in road transport separately for driving on highway, in urban and rural environments (as defined in the SNAP classification), grouping and entry in databases have been done at the second level (SNAP subgroups), according to the type of vehicles and type of fuels.

3.1.4.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multipled by the appropriate emission factor which depends on the type of the fuel and type of vehicle.

3.1.4.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector are the fuels.

The quantities of fuels consumed in road transport have been obtained through expert calculations, i.e. estimates. Total fuel quantities, taken from the Energy Balance of the Republic of Macedonia have been distributed to the relevant SNAP subgroups in percentage, depending (as stated above) on the number and type of vehicles in the Republic of Macedonia. The said estimates take into account the vehicles age structure, too. Such data has been obtained from the database of the Ministry of Interior.

The quantities of consumed fuel in railway transport have been obtained by the Public Enterprise *Macedonian Railways.*

The quantities of consumed fuel in airway transport have been taken from the Energy Balance of the Republic of Macedonia, while the number of take-offs and landings has been obtained from the statistics of the Public Enterprise *Airport Skopje.*

Table 7 shows fuels included in this subsector of the Inventory, as Activity Data in measurement unit TJ. The table also presents their lower heating value LHV [kJ/g].

Table 7: *Fuel used as Activity Data in subsector 1A3*

SNAP	1A3 Transport			
	ID Fuel	Fuel	LHV [kJ/g]	[TJ]
070100	2050	DIESEL OIL	43.00	1064.3
	2080	MOTOR GASOLINE	44.00	5260.3
	3030	LPG	46.00	1395.2
070200	2050	DIESEL OIL	43.00	1951.3
	2080	MOTOR GASOLINE	44.00	53.9
070300	2050	DIESEL OIL	43.00	3991.3
	2080	MOTOR GASOLINE	44.00	16.4
070400	2080	MOTOR GASOLINE	44.00	59.5
070500	2080	MOTOR GASOLINE	44.00	32.0
080200	2050	DIESEL OIL	43.00	141.9
080502	207A	JET FUEL	44.00	198.6
080504	207A	JET FUEL	44.00	332.5

3.1.4.3. EMISSION FACTORS

The emission factors for the appropriate pollutants in the elaborated SNAP categories have been taken from CORINAIR Emission Inventory Guidebook.

Table 8 presents an overview of emission factors used in the calculation of emissions in this subsector. The measurement unit used is g/GJ, and kg/GJ for CO_2 pollutant.

Table 8: *Emission Factors used in subsector 1A3*

SNAP	Fuel	1A3 Transport								
		SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	kg/GJ	g/GJ	g/GJ	g/GJ
07010	2050	93	253	73	2	272	73	3.8	-	-
	2080	22.7	212-659	167-3727	7.14-26	1020-9205	72.3	1.3-17.8	-	-
	3030	-	800	574	22.2	2630	66	-	-	-
07020	2050	93	367	108	1.3	407	73	4.4	-	-
	2080	22.7	654.5	1373	17.8	8204.5	72.3	1.3	-	-
07030	2050	93	984	190	5.6	846.5	73	2.8	-	-
	2080	22.7	925	747.7	14.8	7863.6	72.3	0.8	-	-
07040	2080	22.7	60.5	12136	113.6	16614	72.3	1.5	-	-
07050	2080	22.7	179	2454.5	119.5	11954.5	72.3	1.2	-	-
08020	2050	139.5	921	108	2.5	249	74	29	0.16	106.5
08052	207A	22	228	13.8	2.75	325	71.6	2.75	-	-
08054	207A	22.7	234	2.3	-	45.5	71.6	2.3	-	-

3.1.5. 1A4 OTHER SECTORS

Under this Source Category, stationary sources with combustion processes by SNAP 020103, 020205 have been elaborated. These are processes in non-industrial plants, i.e. commercial, institutional and residential buildings, as well as household fireplaces.

In addition to the above, mobile sources of mobile equipment and machinery in agriculture, forestry and households (gardening) belong here, by SNAP 080600, 080700, 080900.

3.1.5.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multipled by the appropriate emission factor which depends on the type of the fuel and type of technology of combustion in stationary sources, and the type of mobile equipment and machinery, respectively.

3.1.5.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector are the fuels.

The source of this data (Activity Data) is the Energy Balance of the Republic of Macedonia.

The quantities of consumed fuel in this subsector have been calculated as a difference of total quantities for 2004 and quantities consumed by other sectors for Area and Facilities.

Table 9 shows fuels included in this subsector of the Inventory, as Activity Data in measurement unit TJ. The table also presents their lower heating value LHV [kJ/g].

Table 9: *Fuel used as Activity Data in subsector 1A4*

SNAP	1A4 Other Sectors			
	ID Fuel	Fuel	LHV [kJ/g]	[TJ]
020103	203K	RESIDUAL OIL	41.00	155.8
	204C	GAS OIL	43.00	5590.0
020205	105B	LIGNIT	7.42	59.4
	111B	WOOD	15.56	7080.0
080600	2050	DIESEL OIL	43.00	881.5
080700	2050	DIESEL OIL	43.00	176.3
080900	2080	MOTOR GASOLINE	44.00	37.4

3.1.5.3. EMISSION FACTORS

The emission factors for the appropriate pollutants in the elaborated SNAP categories have been taken from CORINAIR Emission Inventory Guidebook.

Table 10 presents an overview of emission factors used in the calculation of emissions in this subsector. The measurement unit used is g/GJ, and kg/GJ for CO_2 pollutant.

Table 10: *Emission Factors used in subsector 1A4*

SNAP	Fuel	1A4 Other Sectors								
		SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	kg/GJ	g/GJ	g/GJ	g/GJ
02013	203K	976	98	18	5	20	82	23	0.08	120
	204C	116	50	15	8	48	83	9	1.5	15
02025	105B	1415	60	400	260	3000	91	9	0.45	250
	111B	25	170	480	300	5790	200	11	7	200
08090	2080	18.2	40.2	18477	184.7	35727	72.3	0.045	0.09	-
08060	2050	139.5	1170	169	4	372	73	30	0.16	136.5
08070	2050	139.5	1170	151	4	337	73	30.7	0.16	123.5

3.1.6. 1B1 FUGITIVE EMISSIONS FROM SOLID FUELS

In this subsector, fugitive emissions from open excavation pits of coal (lignite) in the Republic of Macedonia are covered, as well as their disposal sites by SNAP 050101.

3.1.6.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of coal (expressed in measurement unit Gg) is multipled by the appropriate emission factor.

3.1.6.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector is the quantity of solid fissile fuel (coal-lignite) from open excavation pits and disposal sites, expressed in Gg. The source of this data (Activity Data) is the Energy Balance of the Republic of Macedonia.

Table 11 shows the quantity of coal as Activity Data in measurement unit Gg.

Table 11*: Fuel used as Activity Data in subsector 1B1*

SNAP	1B1 Fugitive Emissions from solid fuels	
	Rate Value	Unit
050101	7364.0	Gg

3.1.6.3. EMISSION FACTORS

Emission factors for the two pollutants elaborated in this subsector (CH_4 and CO) have been taken from CORINAIR Emission Inventory Guidebook.

Table 12 shows the values of emission factors for these pollutants. Measurement unit is g/Mg.

Table 12: *Emission factors used in subsector 1B1*

SNAP	1B1 Fugitive Emissions from solid fuels								
	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg
05011	-	-	-	1577	75	-	-	-	-

3.1.7. 1B2 OIL AND NATURAL GAS

In this subsectors, emissions elaborated appear in the storage and distribution of petrol fuels, elaborated by SNAP 050501,050502, 050503 and exhausted gas combustion in the sole Macedonian refinery, SNAP 090203.

3.1.7.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of liquid oil (petrol) is multipled by the appropriate emission factor for each procedure, storage, distribution and reloading at petrol stations.
With regard to emission calculation for emissions from combustion of refining exhausted gas, the CORINAIR simplified methodology has been used as well.

3.1.7.2. INPUT DATA (ACTIVITY DATA)

The input data for emission calculation in this subsector is the quantity of petrol, taken from the Energy Balance of the Republic of Macedonia and the quantity of refining exhausted gas, obtained from the Refinery itself.

Table 13 shows the quantity of petrol as Activity Data in measurement unit Gg and refining gas in measurement unit TJ.

Table 13: *Quantity of petrol and refinery gas as Activity Data in subsector1B2*

SNAP	1B2 Oil and natural gas			
	Rate Value		Unit	
050501	49.3		Gg	
050502	73.9		Gg	
050503	123.2		Gg	
090203	ID Fuel	Fuel	LHV [kJ/g]	TJ
	308B	REFINERY GAS	48	201.1

3.1.7.3. EMISSION FACTORS

Emission factors for the pollutants elaborated in this subsector have been taken from CORINAIR Emission Inventory Guidebook.

Table 14a shows the values of emission factors for NMVOC for each of the elaborated SNAP categories. The measurement unit is presented in g/Mg.

Table 14b shows the values of emission factors for the pollutants calculated in this SNAP. The measurement unit is g/GJ, and kg/GJ for CO_2.

Table 14a: *Emission factors used in subsector 1B2*

SNAP	1B2 Oil and natural gas								
	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg
05051	-	-	310	-	-	-	-	-	-
05052	-	-	740	-	-	-	-	-	-
05053	-	-	2880	-	-	-	-	-	-

Table 14 b*: Emission factors used in subsector 1B2*

SNAP	Fuel	1B2 Oil and natural gas								
		SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	kg/GJ	g/GJ	g/GJ	g/GJ
09023	308B	15	100	5	2	24	68	3	-	-

3.2. INDUSTRIAL PROCESSES (SECTOR 2)

In this Sector 2, the emissions appearing in industrial processes (Categories **2A**, **2B, 2C, 2D, 2G**) have been taken into account. All activities in the industry with no combustion processes have been covered here, in: mineral ores processing industry, chemical industry, metal industry and other industry.

In this sector, emissions of the following pollutants have been covered: SO_2, NO_x, NMVOC, CH_4, CO, CO_2, and TSP.

Explanations of the source of activity data, methodology used and emission factors are presented in **Chapter 3.2.2.** to **Chapter 3.2.6.** for each Category. The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.2.1. COMPLETENESS

In Table 15, completeness of Sector 2 are presented through presentation of the SNAP categories elaborated in this Inventory, in correlation with EMEP/NFR and UNFCCC/CRF sources categories.

Table 15: *SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
2A	**2A MINERAL PRODUKTS**	
2A1	2A1 Cement Production	040612 Cement (decarbonizing)
2A2	2A2 Lime Production	040614 Lime (decarbonizing)
2A 3	2 A3 Limestone and Dolomite Use	040618 Limestone and Dolomite Use
2 A 4	2A4 Soda Ash Production and use	NE
2A 5	2A5 Asphalt Roofing	NE
2A 6	2A6 Road Paving with Asphalt	040611 Road paving with asphalt
2A 7	2A7 Other including non fuel mining and construction	040615 Batteries manufacturing
2B	**2B CHEMICAL INDUSTRY**	
2B1	2B1 Ammonia Production	NO
2B2	2B2 Nitric Acid Production	NO
2B3	2B3 Adipic Acid Production	NO
2B4	2B4 Carbide Production	NO
2B5	2B5 Other	040508 Polyvinylchloride
2C	**2C Metal Production**	
2C	2C Metal Production	040207 Electric furnace steel plant 040208 Rolling mills 040302 Ferro alloys
2D	**2D OTHER PRODUCTION**	
2D1	2D1 Pulp and Paper	NE
2D2	2D2 Food and Drink	040605 Bread 040606 Wine 040607 Beer 040608 Spirits
2G	**2G Other**	060506 Aerosol cans

3.2.2. 2A MINERAL PRODUCTS

In this source category, sources from industrial processes without combustion have been elaborated by SNAP 040611, 040612, 040614, 040615, 040618. The following processes have been covered: cement and lime decarbonizing, limestone use, road paving with asphalt in the Republic of Macedonia and batteries manufacturing. Except the process of cement decarbonizing, involved in the process of the single cement producing plant as Facilities, the remained industrial processes have been treated as Area Source.

3.2.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.
In SNAP 040618, the sectoral expert conducted own calculations.

3.2.2.2. INPUT DATA (ACTIVITY DATA)

The input data for the process asphalt use (SNAP 040611) has been obtained from the *Cadastre of Air Polluters and Pollutants in the Republic of Macedonia,* in measurement unit Gg asphalt produced.

Other values included in this subsector as Activity Data represent the quantities of finished products from the relevant production processes. They have been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

Table 16 shows the quantities of finished products expressed in measurement unit Gg, as input data for individual SNAP sectors.

Table 16: *Quantity of used finished products as Activity Data in subsector 2A*

SNAP	2A Mineral products	
	Rate Value	Unit
040611	351.4	Gg
040612	784.1	Gg
040614	10.3	Gg
040615	1.1	Gg
040618	2.5	Gg

3.2.2.3. EMISSION FACTORS

Data from CORINAIR Emission Inventory Guidebook, from Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories and from FIRE 6.24 have been used in the establishment of the emission factors for emissions calculations.

Table 17 presents values of emission factors for the calculated pollutants. The measurement unit is g/Mg, and kg/Mg for CO_2.

Table 17: *Emission factors used in subsector 2A*

SNAP	2A Mineral products								
	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	kg/Mg	g/Mg	g/Mg	g/Mg
04061	28	38	-	35	15	-	-	-	9400
040612	-	-	-	-	-	498	-	-	234
040614	-	-	-	-	-	785	-	-	3632
040615	-	-	-	-	-	-	-	-	408
040618	-	-	-	-	-	445	-	-	-

3.2.3. 2B CHEMICAL INDUSTRY

In this subsector, SNAP 040508, process of polyvinylchloride, has been elaborated.

3.2.3.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.2.3.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of finished product. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004. This is presented in Table 18, where the measurement unit is Gg.

Table 18: *Quantity of finished products used as Activity Data in subsector 2B*

SNAP	2B Chemical Industry	
	Rate Value	Unit
040508	**3.3**	**Gg**

3.2.3.3. EMISSION FACTORS

The values of emission factors for NO_x and NMVOC have been taken from FIRE 6.24. They are presented in Table 19.

Table 19: *Emission factors used in subsector 2B*

SNAP	2B Chemical Industry								
	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	kg/Mg	g/Mg	g/Mg	g/Mg
04058	-	98	7700	-	-	-	-	-	-

3.2.4. 2C METAL PRODUCTION

This Source Category elaborates SNAP 040207, 040208, 040302. It includes steel production in electric arc furnaces, steel reheating for rolling (slabs and plates) and production of ferrous metals (ferosilicium). All these processes are elaborated in the Inventory as Facilities.

3.2.4.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.2.4.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of finished products. This data has been obtained from companies producing steel, steel plates and ferosilicium. This is presented in Table 20, where the measurement unit is Gg.

Table 20: *Quantity of finished products used as Activity Data in subsector 2C*

SNAP	2C Metal Production	
	Rate Value	Unit
040207	309.1	Gg
040208	319.9	Gg (Steel slabs)
040208	62.7	Gg (Steel plate)
040302	64.8	Gg

3.2.4.3. EMISSION FACTORS

Emission factors for the relevant pollutants in elaborated SNAP categories have been taken from CORINAIR Emission Inventory Guidebook.
With regard to ferosilicium production process, the emission factors obtained through direct measurements carried out for years in these energy plants have been used, upon prior checking (comparison) with the ones recommended in CORINAIR Emission Inventory Guidebook.

Table 21 presents the values of Emission Factors of those pollutants. The measurement unit is g/Mg, and kg/Mg for CO_2.

Table 21: *Emission factors used in subsector 2C*

SNAP	2C Metal Production								
	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3	TSP
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	kg/Mg	g/Mg	g/Mg	g/Mg
04027	70	272	176	-	324	82	-	-	295
04028	-	125	30	-	265	82	-	-	-
04032	5000	74000	-	-	136000	3800	-	-	288000

3.2.5. 2D OTHER PRODUCTION (INDUSTRIAL)

In this Source Category, SNAP 040605, 040606, 040607, 040608 have been elaborated. These are processes in food and beverages (bread, beer, wine, alcohol) production.

3.2.5.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.2.5.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of finished products. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

Table 22 presents quantities of the annual production of bread and baked goods expressed in the measurement unit Gg, and in hl for beverages.

Table 22: *Quantity of finished products used as Activity Data in subsector 2D*

SNAP	2D Other Production	
	Rate Value	Unit
040605	**119**	**Gg**
040606	**726082**	**hl**
040607	**771850**	**hl**
040608	**14850**	**hl**

3.2.5.3. EMISSION FACTORS

In this subsector, the emission of NMVOC is calculated.

Emission factor values for this pollutants have been taken from CORINAIR Emission Inventory Guidebook and they are presented in Table 23, appropriately for each production process. Measurement units are g/Mg and g/hl, respectively.

Table 23: *Emission factors used in subsector 2D*

SNAP	2D Other Production	
	NMVOC	Unit
040605	6037	g/Mg
040606	80	g/hl
040607	35	g/hl
040608	15000	g/hl

3.2.6. 2G OTHER

In this Source Category, SNAP 060506 , use of HFC, N_2O, NH_3, PFC and SF_6 in Aerosol cans, have been elaborated.

Emission of HFC-134a has been calculated.

3.2.6.1. METHODOLOGICAL APPROACH

The establishment of emissions in this SNAP has based on expert calculations.

** For SNAP 060506, sectoral expert delivered the total emission of HFC-134a obtained from MEPP.*

These values have been entered in the Inventory directly, i.e. the total quantity of this pollutant has been taken as emission factor value and in this case the value of the Activity Data is 1.

3.2.6.2. INPUT DATA (ACTIVITY DATA)

The input data for this SNAP is the quantity of HFC-134a used in Aerosol cans.

Data on Activity Data has been obtained from the Ministry of Environment and Physical Planning and presented in Table 24.

Table 24: *Value for Activity Data in subsector 2G OTHER*

SNAP	2G OTHER	
	Rate Value	Unit
060506	1*	no unit

) Please, see explanation in 3.2.6.1. Methodological approach.*

3.2.6.3. EMISSION FACTORS

The values of emission factors have been obtained from the Ministry of Environment and Physical Planning.

The appropriate values of emission factors are presented in Table 25. Measurement unit is Mg /no unit.

Table 25: *Emission factors used in subsector 2G*

	2G OTHER	
SNAP	HFC-134a	Unit
060506	0.95	Mg/no unit*

) Please, see explanation in 3.2.6.1. Methodological approach.*

3.3. SOLVENTS AND OTHER PRODUCTS USE (SECTOR 3)

In Sector 3, emissions appearing in processes involving solvents and other similar chemical products have been taken into account (Categories under **3A, 3C, 3D**).

Activities of all types of paint application, dry cleaning and degreasing, chemical products manufacturing or processing, printing industry and glues manufacturing and use have been covered here.

Emissions of NMVOC have been covered in this sector.

Explanations of the source of activity data, methodology used and emission factors are presented in **Chapter 3.3.2.** to **Chapter 3.3.4.** for each Category. The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.3.1. COMPLETENESS

In Table 26, completeness of Sector 3 are presented through presentation of the SNAP categories elaborated in this Inventory, in correlation with EMEP/NFR and UNFCCC/CRF source categories.

Table 26: *SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
3A	**3A Paint Application**	
3A	3A Paint Application	060100 Paint application
3B	3B Degreasing and Dry Cleaning	IE (Included in 3A)
3C	3C CHEMICAL PRODUCTS, MANUFACTURE AND PROCESSING	060301 Polyester processing 060302 Polyvinylchloride processing 060309 Glues manufacturing 060313 Leather tanning
3D	3D Other including products containing HMs and POPs	060403 Printing industry 060405 Application of glues and adhesives

3.3.2. 3A PAINT APPLICATION

This source category takes into account NMVOC emissions in paint application. Considering the fact that there is no detailed data on the quantity of used paints, on each type of paint and each type of activity, the elaboration has been done with total quantity. Emissions from dry cleaning and degreasing processes have been included here as well.

3.3.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.3.2.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of used paints and solvents. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

Table 27 presents quantities of the used paints in Gg.

Table 27: *Used quantities of paints and other products as Activity Data in subsector 3A*

SNAP	3A Paint Application	
	Rate Value	Unit
060100	5.8	Gg

3.3.2.3. EMISSION FACTORS

In this subsector, the emission of NMVOC is calculated.
Emission factor value for this pollutant has been taken from CORINAIR Emission Inventory Guidebook as an average value. This value is presented in Table 28, where the measurement unit is kg/Mg.

Table 28: *Emission factor used in subsector 3A*

SNAP	3A Paint Application	
	NMVOC	Unit
060100	250	kg/Mg

3.3.3. 3C CHEMICAL PRODUCTS, MANUFACTURE AND PROCESING

In this Source Category, SNAP 060301, 060302, 060309, 060313 have been elaborated. Processes in chemical products manufacturing and processing, such as: polyester, polyvinylchloride, glues and leather tanning belong here.

3.3.3.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.3.3.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of chemical products. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

Table 29 presents quantities of these products in Gg as measurement unit.

Table 29: *Quantity of chemical products used as Activity Data in subsector 3C*

SNAP	3C Chemical Products, Manufacture And Processing	
	Rate Value	Unit
060301	0.06	Gg
060302	0.1	Gg
060309	6.1	Gg
060313	0.01	Gg

3.3.3.3. EMISSION FACTORS

In this subsector, the emission of NMVOC is calculated.
Emission factor values for this pollutant have been taken from CORINAIR Emission Inventory Guidebook as an average value.

Table 30 presents the emission factor value divided to each process, where the measurement unit is kg/Mg.

Table 30: *Emission factor used in subsector 3C*

SNAP	3C Chemical Products, Manufacture and Processing	
	NMVOC	Unit
060301	40	kg/Mg
060302	40	kg/Mg
060309	20	kg/Mg
060313	30	kg/Mg

3.3.4. 3D OTHER INCLUDING PRODUCTS CONTAINING HMs AND POPs

SNAP 060403, 060405 have been elaborated in this Source Category.
These are processes in printing industry, and use of glues and adhesives.

3.3.4.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.3.4.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of chemical products used in printing activity and quantities of glues. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

Table 31 presents quantities of these products in Gg as measurement unit.

Table 31*: Quantities of chemical products used as Activity Data in subsector 3D*

SNAP	3D Other including products containing HMs and POPs	
	Rate Value	Unit
060403	10.3	Gg
060405	0.6	Gg

3.3.4.3. EMISSION FACTORS

In this subsector, the emission of NMVOC is calculated.
Emission factor values for this pollutant have been taken from CORINAIR Emission Inventory Guidebook.

Table 32 presents the emission factor value for both processes separately, where the measurement unit is kg/Mg.

Table 32 : *Emission factor used in subsector 3D*

SNAP	3D Other including products containing HMs and POPs	
	NMVOC	Unit
060403	661	kg/Mg
060405	150	kg/Mg

3.4. AGRICULTURE (SECTOR 4)

In this Sector 4, emission appearing in agricultural processes have been taken into account (Categories under **4A, 4B, 4C**).

Emissions here include enteric fermentations with domestic animals, emissions in manure management in terms of organic and nitrous compounds, as well as emissions from rice growing fields, without fertilizer use.

This sector covers the emissions of the following pollutants: CH_4, N_2O, and NH_3.

Explanations of the source of activity data, methodology used and emission factors are presented in **Chapter 3.4.2.** to **Chapter 3.4.4.** for each Category. The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.4.1. COMPLETENESS

In Table 33, completeness of Sector 4 are presented through presentation of the SNAP categories elaborated in this Inventory, in correlation with EMEP/NFR and UNFCCC/CRF source categories.

Table 33: *SNAP* categories in correlation with *EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
4A	**4A ENTERIC FERMENTATION**	100401 Dairy cows 100402 Other cattle 100403 Ovines 100404 Fattening pigs 100405 Horses 100412 Sows 100414 Buffalo
4B	**4B MANURE MANAGEMENT**	
4B1	4B1 Cattle	
4B1 a	4B1 a Dairy	100501 Dairy cows
4B1 b	4B1 b Non- Dairy	100502 Other cattle
4B2	4B2 Buffalo	100514 Buffalo
4B3	4B3 Sheep	100505 Sheep
4B4	4B4 Goats	NE
4B5	4B5 Camels and Llamas	NO
4B6	4B6 Horses	100506 Horses
4B7	4B7 Mules and Asses	NE
4B8	4B8 Swine	100503 Fattening pigs 100504 Sows 100903 Solid storage and dry lot 100904 Other
4B9	4B9 Poultry	100507 Laying hens
4B13	4B13 Other	NE
4C	**4C RICE CULTIVATION**	
4C	4C RICE CULTIVATION	100203 Rice field without fertilizers

4D	**4D AGRICULTURAL SOILS**	
4D1	4D1 Direct Soil Emission	NE
4F	**4F FIELD BURNING OF AGRICALTURAL WASTES**	NE
4G	**4G Other**	NE

3.4.2. 4A ENTERIC FERMENTATION

SNAP 100401, 100402, 100403, 100404, 100405, 100412, 100414 have been elaborated under this Source Category.

These include processes taking into account emissions appearing in enteric fermentation, especially in all species of domestic animals: dairy cows, sheep, pigs, horses, fattening pigs, bulls and other cattle.

CH_4 emissions have been processed in this subsector.

3.4.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the emission factor for methane is multipled for each species of domestic animals with the total number of registered heads of that animal species.

3.4.2.2. INPUT DATA (ACTIVITY DATA)

The input data in this subsector is the number of registered heads of each domestic animal species.
This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004. The number values are presented in Table 34 with a measurement unit capita.

Table 34: *Number of heads used as Activity Data in subsector 4A*

SNAP	4A Enteric Fermentation	
	Rate Value	Unit
100401	**163974**	**capita**
100402	**92036**	**capita**
100403	**1224837**	**capita**
100404	**138858**	**capita**
100405	**35812**	**capita**
100412	**29520**	**capita**
100414	**520**	**capita**

3.4.2.3. EMISSION FACTORS

CH_4 emission is calculated in this subsector.

The value of emission factor for this pollutant has been taken from Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 35 presents values of emission factors for each SNAP separately. Measurement unit is kg/capita.

Table 35: *Emission factor used in subsector 4A*

	4A Enteric Fermentation	
SNAP	**CH_4**	**Unit**
100401	81	kg/ capita
100402	56	kg/capita
100403	5	kg/capita
100404	1	kg/capita
100405	18	kg/capita
100412	1	kg/capita
100414	55	kg/capita

3.4.3. 4B MANURE MANAGEMENT

SNAP 100501, 100502, 100503, 100504, 100505, 100506, 100507, 100514, 100903, 100904 have been elaborated in this Source Category.

These are processes that take into account emissions from manure management produced by: diary cows, sheep, pigs, horses, fattening pigs, bulls and other cattle. Special consideration has been given to the aspects of organic compounds and nitrous compounds.

In this subsector, emissions of the following pollutants have been covered: CH_4, N_2O, and NH_3.

3.4.3.1. METHODOLOGICAL APPROACH

Guidelines and emission factors contained in Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories have been used for calculation of emissions in this Source Category. The emission factor for the pollutant related to the manures resulting from individual species of domestic animals is multipled with the number of registered heads of the same animal species.

*** For SNAP 100903 and 100904, sectoral expert delivered the total emissions.*
For N_2O (320 Mg ; 470 Mg) - these have been calculated in accordance with the Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories: Reference manual, Table 4-20, page4.99.
These values have been entered directly in the Inventory, i.e. the total quantity of the pollutant has been taken as an emission factor, and thus the value of the Activity Data in this case is 1.

3.4.3.2 INPUT DATA (ACTIVITY DATA)

The input data in this subsector is the number of registered heads of each domestic animal species. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004. Their number values are presented in Table 36 with a measurement unit capita.

Table 36: *Number of heads used as Activity Data in subsector 4B*

SNAP	4B Manure Management	
	Rate Value	Unit
100501	163974	capita
100502	92036	capita
100503	138858	capita
100504	29520	capita
100505	1224837	capita
100506	35812	capita
100507	2273690	capita
100514	520	capita
100903	1**	no unit
100904	1**	no unit

*)** Please, see explanation in 3.4.3.1. Methodological approach.*

3.4.3.3. EMISSION FACTORS

The value of emission factor for this pollutant has been taken from Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 37 presents values of emission factors for each SNAP separately. Measurement unit is kg/capita.

Table 37: *Emission factor used in subsector 4B*

SNAP	4B Manure Management			
	CH_4	N_2O	NH_3	Unit
100501	6	-	24	kg/capita
100502	4	-	12	kg/capita
100503	4	-	2.5	kg/capita
100504	4	-	14	kg/capita
100505	0.1	-	0.5	kg/capita
100506	1.1	-	5	kg/capita
100507	0.01	-	0.4	kg/capita
100514	3	-	-	kg/capita
100903	-	320*	-	Mg/no unit
100904	-	470*	-	Mg/no unit

*)** Please, see explanation in 3.4.3.1. Methodological approach.*

3.4.4. 4C RICE CULTIVATION

This Source Category elaborates SNAP 100203.

These are processes taking into account emissions from rice cultivation in the Republic of Macedonia.

CH_4 emissions are covered in this subsector.

3.4.4.1. METHODOLOGICAL APPROACH

Guidelines and emission factors contained in Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories have been used for calculation of emissions in this Source Category. Emission factor for the pollutant is multipled by the total area of land under rice.

3.4.4.2. INPUT DATA (ACTIVITY DATA)

The input data in this subsector is the total area of land under rice in the Republic of Macedonia. This data has been taken from the Statistical Yearbook of the Republic of Macedonia 2004.

The number value is presented in Table 38 with a measurement unit ha.

Table 38: *Total area under rice used as Activity Data in subsector 4C*

SNAP	4C Rice Cultivation	
	Rate Value	Unit
100203	1575	ha

3.4..3. EMISSION FACTORS

The value of emission factor for this pollutant has been taken from Revised 1966 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 39 presents its value in a measurement unit kg/ha.

Table 39: *Emission factor used in subsector 4C*

SNAP	4C Rice Cultivation	
	CH_4	Unit
100203	49.8	kg/ha

3.5. LAND USE CHANGE AND FORESTRY (SECTOR 5)

Sector 5 considers emissions appearing in the forests of the Republic of Macedonia (Category **5E**).
Emissions form forest areas under different tree species belong here: European oak, other deciduous oaks, other species of evergreen oaks, beech, different deciduous broadleaf species, Scots pine, other pine species, fir and other conifers.

This sector covers the emissions of NMVOC.

Explanations of the source of activity data, methodology used and emission factors are presented in **Chapter 3.5.2.** The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.5.1. COMPLETENESS

In Table 40, completeness of Sector 5 are presented through presentation of the SNAP categories elaborated in this Inventory, in correlation with EMEP/NFR and UNFCCC/CRF source categories.

Table 40: *SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
5B	**5B Forest and Grassland Conversion**	NE
5E	**5E Other**	111104 European oak 111106 Other deciduous oaks 111109 Other evergreen oaks 111110 Beech 111115 Other deciduous broadleaf species 111207 Scots pine 111210 Other pines 111211 Fir 111215 Other conifers

3.5.2. 5E OTHER

This Source Category elaborates emissions from managed forests with broadleaf tree species, SNAP 111104, 111106, 111109, 111110, 111115 and from managed forests with coniferous trees, SNAP 111207, 111210, 111211, 111215.

NMVOC emissions are covered in this subsector.

3.5.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.5.2.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the forest areas under different tree species in the Republic of Macedonia. The Activity data have been obtained from the Public Enterprise *Macedonian Forests.*

Table 41 presents the values of these areas, expressed in km^2, for each tree species separately.

Table 41: *Areas under different forest species used as Activity Data in subsector 5E*

SNAP	5E Other	
	Rate Value	Unit
111104	1804	km^2
111106	1735	km^2
111109	106	km^2
111110	2597	km^2
111115	1407	km^2
111207	81	km^2
111210	340	km^2
111211	90	km^2
111215	191	km^2

3.5.2.3 EMISSION FACTORS

Emission factors for NMVOC, for each forest tree species, have been taken from the Emission Inventory Guidebook.

Their values are presented in Table 42 with a measurement unit t/km^2.

Table 42: *Emission factors used in subsector 5E*

SNAP	5E Other	
	NMVOC	Unit
111104	9.4	t/km^2
111106	9.4	t/km^2
111109	17.9	t/km^2
111110	8.9	t/km^2
111115	8.9	t/km^2
111207	25.1	t/km^2
111210	25.1	t/km^2
111211	50.1	t/km^2
111215	50.1	t/km^2

3.6. WASTE (SECTOR 6)

Sector 6 considers emissions appearing from waste treatment and disposal. Medical waste incineration, controlled waste disposal in landfills and uncontrolled waste disposal on illegal dump sites belong here.

Emissions of CH_4, SO_2, NOx, CO, TSP are covered in this sector.

Explanations of the source of activity data, methodology used and emission factors are presented in **Chapter 3.6.2** to **Chapter 3.6.3.** The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.6.1. COMPLETENESS

In Table 43, completeness of Sector 6 is presented through presentation of the SNAP categories elaborated in this Inventory, in correlation with EMEP/NFR and UNFCCC/CRF source categories.

Table 43: *SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
6A	**6A Solid Waste Disposal on Land**	090401 Managed Waste Disposal on Land 090402 Unmanaged Waste Disposal Sites
6B	**6B Waste-Water Handling**	NE
6C	**6C Waste Incineration**	090207 Incineration of hospital wastes
6D	**6D Other Waste**	NE

3.6.2. 6A SOLID WASTE DISPOSAL ON LAND

This Source Category includes emissions from solid waste disposal on landfills, SNAP 090401 and uncontrolled solid waste disposal on illegal dump sites, SNAP 090402.

This subsector covers emissions of CH_4.

3.6.2.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.6.2.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of disposed solid waste, separately for legal landfills and separately for illegal dump sites.

The Activity data have been taken from the NEAP.

The values of these quantities, presented in Gg, are shown on Table 44, with measurement unit Gg.

Table 44: *Quantity of disposed solid waste used as Activity Data in subsector 6A*

SNAP	6A Solid Waste Disposal on Land	
	Rate Value	Unit
090401	401.1	Gg
090402	171.9	Gg

3.6.2.3. EMISSION FACTORS

Emission factors for CH_4, for each type of landfills, have been taken from Emission Inventory Guidebook.

Their values are presented in Table 45.

Table 45: *Emission factors used in subsector 6A*

SNAP	6A Solid Waste Disposal on Land	
	CH_4	Unit
090401	36	kg/Mg
090402	0.3	g/Mg

3.6.3. 6C WASTE INCINERATION

This Source Category elaborates emissions from medical waste incineration, SNAP 090207.

The following emissions are covered here: SO_2, NOx, CO, TSP.

3.6.3.1. METHODOLOGICAL APPROACH

The CORINAIR simplified methodology for emission calculation has been used: the quantity of Activity Data is multipled by the appropriate emission factor.

3.6.3.2. INPUT DATA (ACTIVITY DATA)

The input data for this subsector is the quantity of incinerated medical waste.

The Activity data have been taken from the NEAP.

The values of these quantities, presented in Gg, are shown on Table 46.

Table 46: *Quantities of incinerated medical waste used as Activity Data in subsector 6C*

6C Waste Incineration		
SNAP	**Rate Value**	**Unit**
090207	**0.4**	**Gg**

3.6.3.3. EMISSION FACTORS

Emission factors have been taken from Emission Inventory Guidebook.

Their values, presented in kg/Mg, are presented in Table 47.

Table 47: *Emission factors used in subsector 6C*

SNAP	6C Waste Incineration				
	SO_2	NOx	CO	TSP	Unit
090207	1.1	1.8	1.5	2.3	kg/Mg

3.7. OTHER (SECTOR 7)

Emissions in this sector have not been calculated in the Inventory.

3.7.1. COMPLETENESS

Table 48*: SNAP categories in correlation with EMEP/NFR and UNFCCC/CRF*

EMEP/NFR	UNFCCC / CRF	SNAP 97 items
7	**7 Other**	NE

3.8. SNAP SOURCE CATEGORIES NOT INCLUDED IN PREVIOUS SECTORS

Taking into consideration that the above presented sectors do not cover all SNAP categories elaborated in the Inventory, those are presented separately in this Chapter. Table 49 presents the following SNAP categories.

Table 49: *SNAP categories not covered by the above elaborated sectors*

SUBGRUP	SNAP
0605 (Use of HFC, N2O, NH3, PFC and SF6)	**060502** Refrigeration and air conditioning equipments
1103 (Forest and other vegetation fires)	**110301** Man-induced
1104 (Natural grassland and other vegetation)	**110401** Grassland
1107 (Animals)	**110702** Mammals **110703** Other animals

Explanations of the source of activity data, methodology used and emission factors for the relevant subgroups are presented in **Chapter 3.8.1** to **Chapter 3.8.4.** The values of pollutants emissions are presented in **Annex 1** in accordance with the SNAP nomenclature.

3.8.1. SNAP 060502 (COOLING AND AIR CONDITIONING EQUIPMENT)

The following emissions have been elaborated in this SNAP, resulting from the use of HFC, N_2O, NH_3, PFC and SF_6 in cooling and air conditioning equipment.

Emissions of HFC-32, HFC-125, HFC-134a, HFC-143a are covered.

3.8.1.1. METHODOLOGICAL APPROACH

Emissions in this SNAP have been determined on the basis of expert calculations.

**** For SNAP 060502 sectoral expert delivered the total emissions of HFC-32, HFC-125, HFC-134a, HFC-143a as obtained from MEPP.*
These values have been entered directly in the Inventory, i.e. the total quantity of the pollutant has been taken as an emission factor, and thus the value of the Activity Data in this case is 1.

3.8.1.2. INPUT DATA (ACTIVITY DATA)

The input data in this subsector is the quantity of used HFC-32, HFC-125, HFC-134a, HFC-143a, in cooling and air conditioning equipment.

Activity Data has been obtained from the Ministry of Environment and Physical Planning, and presented in Table 50.

Table 50: *Value of Activity Data in SNAP 060502*

SNAP	Rate Value	Unit
060502	**1**[***]	**No unit**

*)*** Please, see explanation in 3.8.1.1. Methodological approach.*

3.8.1.3. EMISSION FACTORS

Emission factors values have been obtained from the Ministry of Environment and Physical Planning.

The relevant values of emission factors are presented in Table 51.

Table 51: *Emission factors used in SNAP 060502*

SNAP	HFC-32	HFC-125	HFC-134a	HFC-143a	Unit
060502	0.8	4.8	8.6	0.4	Mg/no unit***

*)*** Please, see explanation in 3.8.1.1. Methodological approach.*

3.8.2. SNAP 110301 (FOREST AND OTHER VEGETATION FIRES - CAUSED BY MAN)

In this SNAP, emissions from forest man caused fires have been elaborated.

SO_2, NOx, NMVOC, CH_4, CO, CO_2, N_2O, NH_3 emissions have been covered.

3.8.2.1. METHODOLOGICAL APPROACH

Emissions in this SNAP have been determined by expert calculations.

The CORINAIR methodology for emissions calculation has been used: the appropriate emission factor is multipled by the total area of burnt forest.

3.8.2.2. INPUT DATA (ACTIVITY DATA)

The input data in this SNAP is the total area of burnt forest presented in ha as measurement unit.

Activity Data has been obtained from *Public Enterprise Macedonian Forests*-Skopje, and presented in Table 52.

Table 52: *Area of burnt forest as value used for Activity Data in SNAP 110301*

SNAP	Rate Value	Unit
110301	**891**	**ha**

3.8.2.3. EMISSION FACTORS

Values of emission factors have been taken from the Emission Inventory Guidebook B1103-6.

The appropriate values of emission factors are presented in Table 53 in a measurement unit kg/ha.

Table 53: *Emission factors used in SNAP 110301*

SNAP	SO_2	NO_x	NMVOC	CH_4	CO	CO_2	N_2O	NH_3
	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha
110301	43	189	496	354	5434	81000	6	43

3.8.3. SNAP 110401 (NATURAL MEADOWS AND OTHER VEGETATION, MEADOWS)

In this SNAP, the emissions of NMVOC and N_2O from natural meadows have been elaborated.

3.8.3.1. METHODOLOGICAL APPROACH

Emissions determination in this SNAP has been made by using the CORINAIR methodology for emissions calculations: the appropriate emission factor is multipled by the total area of meadows.

3.8.3.2. INPUT DATA (ACTIVITY DATA)

The input data in this SNAP is the area of natural meadows presented in ha.

Activity rate data has been taken from the Spatial Plan of the Republic of Macedonia (2004) and presented in Table 54.

Table 54: *Area of natural meadows as value used for Activity Data in SNAP 110401*

SNAP	Rate Value	Unit
110401	**630000**	**ha**

3.8.3.3. EMISSION FACTORS

Values of emission factors have been taken from the Emission Inventory Guidebook B1104.

The appropriate values of emission factors are presented in Table 55 in a measurement unit kg/ha.

Table 55: *Emission factors used in SNAP 110401*

SNAP	NMVOC	N_2O	Unit
110401	4.7	1.3	kg/ha

3.8.4. SNAP 110702 and 110703 (ANIMALS – MAMMALS AND OTHER ANIMALS)

In SNAP 110702 AND SNAP 110703, emissions from mammals and other animals have been elaborated. For SNAP 110702, emissions of CH_4 and NH_3 have been presented, and for SNAP 110703, the emission of NH_3 is presented.

3.8.4.1. METHODOLOGICAL APPROACH

Determination of emissions in this SNAP is based on the expert calculations and estimates.

The CORINAIR methodology for emissions calculation has been used: the appropriate emission factors for individual mammalian species are multipled by the total number of that species of mammals (grouped by size).

3.8.4.2. INPUT DATA (ACTIVITY DATA)

Activity data has been obtained by expert estimates, concerning the number of mammals and other animals (the total values of activity data includes data on the number of deer, doe, bear, wild boar, chamois, fox, wolf, hare and people, residents of the Republic of Macedonia. Data on the number of residents in the Republic of Macedonia has been taken from the Spatial Plan of the Republic of Macedonia (2004), and expert estimate is the number of people on the territory of the Republic of Macedonia (citizens and foreigners).

Table 56 presents values of activity data for SNAP 110702 and SNAP 110703. The measurement unit is capita.

Table 56*: Number of mammals and other animals as value used for Activity Data in SNAP 110702 and 110703*

SNAP	Rate Value	Unit
110702	**2046450**	**capita**
110703	**10000000**	**capita**

3.8.4.3. EMISSION FACTORS

The values of the appropriate emission factors have been taken from Emission Inventory Guidebook, and their value is presented in Table 57 in measurement unit kg/capita.

Table 57: *Emission factors used in SNAP 110702 and 110703*

SNAP	CH_4	NH_3	Unit
110702	0.3	0.07	kg/capita
110703	-	0.1	kg/capita

SYMBOLS OF CHEMICAL SUBSTANCES

SO_2	Sulphur dioxide
NOx	Nitrogen oxides
NMVOC	Non Methane Volatile Organic Compounds
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
N_2O	Nitrous oxide
NH_3	Ammonia
TSP	Total Suspended Particulate
HFC-32	Fluorinated hydrocarbons, hydrofluorocarbons
HFC-143a	
HFC-125	
HFC-134a	

MEASUREMENT UNITS AND SYMBOLS FOR PREFIXES

Measurement unit for:	Symbol	Name	Conversion
weight	g	gram	1 g = 1 g
weight	kg	kilogram	1 kg = 1000 g
weight	Mg	mega gram	1 Mg = 1000 kg
weight	Gg	gigagram	1 Gg = 1000 Mg
length	m	meter	1 m = 1 m
length	km	kilometer	1 km = 1000 m
area	m^2	square meter	1 m^2 = 1 m^2
area	ha	hectare	1 ha = 10000 m^2
area	km^2	square kilometer	1 km^2 = 1000000 m^2
volume (liquids)	l	Liter	1 l = 1 l
volume (liquids)	hl	hectoliter	1 hl = 100 l = 0.1 m^3
heat	J	Jull	1 J = 1 J
heat	kJ	kilojoule	1 kJ = 1000 J
heat	MJ	megajoule	1 MJ = 1000 kJ
heat	GJ	gigajoule	1 GJ = 1000 MJ
heat	TJ	terajoule	1 TJ = 1000 GJ
head (living beings)	"capita"	capita	

Symbols for prefix	Prefix	Factor
P	peta	10^{15}
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
h	hekta	10^{2}
da	deka	10^{1}
d	deci	10^{-1}
c	centi	10^{-2}
m	mili	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}

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ANNEX 1: Overview of Emissions by SNAP Categories

Overview of Emissions by SNAP Categories

SNAP	SO2 [Mg]	NOX [Mg]	NMVOC [Mg]	CH4 [Mg]	CO [Mg]	CO2 [Gg]	N2O [Mg]	NH3 [Mg]	TSP [Mg]
Total:	100797.35	33736.11	124087.63	57199.97	99734.61	11917.94	2045.25	8824.30	29920.95
01	91863.51	13099.03	1690.10	50.07	384.47	7020.82	77.46	0.00	4674.76
0101	87941.05	12340.04	1584.14	32.27	234.37	6712.84	43.19	0	4342.45
010101	87941.05	12340.04	1584.14	32.27	234.37	6712.84	43.19	0	4342.45
0102	3278.31	531.61	87.27	14.17	61.06	219.80	25.62	0.00	274.64
010202	3186.27	493.17	84.70	13.11	50.41	197.76	22.87	0	263.32
010203	92.04	38.44	2.57	1.06	10.65	22.04	2.75	0.00	11.32
0103	644.15	227.38	18.68	3.63	89.04	88.17	8.65	0	57.67
010306	644.15	227.38	18.68	3.63	89.04	88.17	8.65	0	57.67
02	1061.50	1501.93	3508.80	2184.93	41442.72	1898.15	132.31	57.97	1533.39
0201	800.50	294.77	86.65	45.50	271.44	476.75	53.89	8.39	102.55
020103	800.50	294.77	86.65	45.50	271.44	476.75	53.89	8.39	102.55
0202	260.99	1207.16	3422.14	2139.43	41171.28	1421.40	78.41	49.59	1430.84
020205	260.99	1207.16	3422.14	2139.43	41171.28	1421.40	78.41	49.59	1430.84
03	6449.69	2743.69	210.48	145.17	552.13	1054.51	122.74	0.50	1208.75
0301	3769.87	660.50	159.99	108.39	53.11	366.59	85.52	0.50	424.06
030103	3769.87	660.50	159.99	108.39	53.11	366.59	85.52	0.50	424.06
0303	2679.82	2083.19	50.49	36.78	499.02	687.91	37.22	0	784.69
030302	2243.49	262.37	9.37	9.37	32.33	180.51	15.29	0	84.79
030311	115.96	1581.01	41.12	27.41	137.07	279.63	21.93	0	0
030313	0	0	0	0	0	0	0	0	70.28
030324	320.36	239.81	0	0	329.62	227.77	0	0	629.61
04	355.48	4932.95	1107.78	12.30	9004.06	697.53	0	0	22278.40
0402	21.64	124.07	56.29	0	184.93	51.58	0	0	91.20
040207	21.64	84.09	54.41	0	100.16	25.35	0	0	91.20
040208	0	39.99	1.88	0	84.77	26.23	0	0	0

0403	324	4795.20	0	0	8812.80	246.24	0	0	18662.40
040302	324	4795.20	0	0	8812.80	246.24	0	0	18662.40
0405	0	0.32	25.08	0	0	0	0	0	0
040508	0	0.32	25.08	0	0	0	0	0	0
0406	9.84	13.35	1026.41	12.30	6.33	399.71	0	0	3524.80
040605	0	0	718.55	0	0	0	0	0	0
040606	0	0	58.09	0	0	0	0	0	0
040607	0	0	27.01	0	0	0	0	0	0
040608	0	0	222.75	0	0	0	0	0	0
040611	9.84	13.35	0	12.30	6.33	0	0	0	3303.32
040612	0	0	0	0	0	390.48	0	0	183.48
040614	0	0	0	0	0	8.12	0	0	37.57
040615	0	0	0	0	0	0	0	0	0.43
040618	0	0	0	0	0	1.11	0	0	0
05	0	0	424.90	11613.03	552.30	0	0	0	0
0501	0	0	0	11613.03	552.30	0	0	0	0
050101	0	0	0	11613.03	552.30	0	0	0	0
0505	0	0	424.90	0	0	0	0	0	0
050501	0	0	15.28	0	0	0	0	0	0
050502	0	0	54.71	0	0	0	0	0	0
050503	0	0	354.90	0	0	0	0	0	0
07	774.72	9200.58	8824.09	188.08	40927.16	995.60	45.18	0	0
0701	218.39	4497.25	6968.11	151.41	34811.49	550.10	25.21	0	0
070100	218.39	4497.25	6968.11	151.41	34811.49	550.10	25.21	0	0
0702	182.69	751.42	284.80	3.50	1236.74	146.34	8.66	0	0
070200	182.69	751.42	284.80	3.50	1236.74	146.34	8.66	0	0
0703	371.56	3942.58	770.61	22.59	3507.66	292.55	11.19	0	0
070300	371.56	3942.58	770.61	22.59	3507.66	292.55	11.19	0	0
0704	1.35	3.60	721.95	6.76	988.33	4.30	0.09	0	0
070400	1.35	3.60	721.95	6.76	988.33	4.30	0.09	0	0
0705	0.73	5.73	78.62	3.83	382.93	2.32	0.04	0	0

070500	0.73	5.73	78.62	3.83	382.93	2.32	0.04	0	0
08	250.74	2068.80	969.19	14.07	2024.73	165.49	52.61	0.28	224.85
0802	19.80	130.69	15.33	0.35	35.33	10.50	4.12	0.02	15.11
080200	19.80	130.69	15.33	0.35	35.33	10.50	4.12	0.02	15.11
0805	11.92	123.08	3.51	0.55	79.66	38.02	1.31	0	0
080502	4.37	45.27	2.74	0.55	64.54	14.22	0.55	0	0
080504	7.55	77.81	0.76	0	15.13	23.80	0.76	0	0
0806	122.97	1031.36	148.97	3.53	327.92	64.35	26.45	0.14	120.32
080600	122.97	1031.36	148.97	3.53	327.92	64.35	26.45	0.14	120.32
0807	24.59	206.27	26.62	0.71	59.41	12.87	5.41	0.03	21.77
080700	24.59	206.27	26.62	0.71	59.41	12.87	5.41	0.03	21.77
0808	70.78	575.90	83.72	2.03	186.22	37.04	15.32	0.08	67.64
080800	70.78	575.90	83.72	2.03	186.22	37.04	15.32	0.08	67.64
0809	0.68	1.50	691.04	6.91	1336.19	2.70	0.00	0.00	0
080900	0.68	1.50	691.04	6.91	1336.19	2.70	0.00	0.00	0
09	3.40	20.73	1.01	14448.48	5.34	13.68	0.60	0	0.82
0902	3.40	20.73	1.01	0.40	5.34	13.68	0.60	0	0.82
090203	3.02	20.11	1.01	0.40	4.83	13.68	0.60	0	0
090207	0.38	0.62	0	0	0.52	0	0	0	0.82
0904	0	0	0	14448.07	0	0	0	0	0
090401	0	0	0	14448.02	0	0	0	0	0
090402	0	0	0	0.05	0	0	0	0	0
10	0	0	0	27696.35	0	0	790	7383.98	0
1002	0	0	0	78.44	0	0	0	0	0
100203	0	0	0	78.44	0	0	0	0	0
1004	0	0	0	25401.69	0	0	0	0	0
100401	0	0	0	13281.89	0	0	0	0	0
100402	0	0	0	5154.02	0	0	0	0	0
100403	0	0	0	6124.18	0	0	0	0	0
100404	0	0	0	138.86	0	0	0	0	0
100405	0	0	0	644.62	0	0	0	0	0

100412	0	0	0	29.52	0	0	0	0	0
100414	0	0	0	28.60	0	0	0	0	0
1005	0	0	0	2216.22	0	0	0	7383.98	0
100501	0	0	0	983.84	0	0	0	3935.38	0
100502	0	0	0	368.14	0	0	0	1104.43	0
100503	0	0	0	555.43	0	0	0	347.14	0
100504	0	0	0	118.08	0	0	0	413.28	0
100505	0	0	0	122.48	0	0	0	563.43	0
100506	0	0	0	39.39	0	0	0	179.06	0
100507	0	0	0	27.28	0	0	0	841.27	0
100514	0	0	0	1.56	0	0	0	0	0
1009	0	0	0	0	0	0	790	0	0
100903	0	0	0	0	0	0	320	0	0
100904	0	0	0	0	0	0	470	0	0
11	38.31	168.40	98866.64	847.49	4841.69	72.17	824.35	1381.56	0
1103	38.31	168.40	441.94	315.41	4841.69	72.17	5.35	38.31	0
110301	38.31	168.40	441.94	315.41	4841.69	72.17	5.35	38.31	0
1104	0	0	2979.90	0	0	0	819	0	0
110401	0	0	2979.90	0	0	0	819	0	0
1107	0	0	0	532.08	0	0	0	1343.25	0
110702	0	0	0	532.08	0	0	0	143.25	0
110703	0	0	0	0	0	0	0	1200	0
1111	0	0	70799.60	0	0	0	0	0	0
111104	0	0	16957.60	0	0	0	0	0	0
111106	0	0	16309	0	0	0	0	0	0
111109	0	0	1897.40	0	0	0	0	0	0
111110	0	0	23113.30	0	0	0	0	0	0
111115	0	0	12522.30	0	0	0	0	0	0
1112	0	0	24645.20	0	0	0	0	0	0
111207	0	0	2033.10	0	0	0	0	0	0
111210	0	0	8534	0	0	0	0	0	0
111211	0	0	4509	0	0	0	0	0	0
111215	0	0	9569.10	0	0	0	0	0	0

	NMVOC [Mg]	HFC-32 [Mg]	HFC-125 [Mg]	HFC-134a [Mg]	HFC-143a [Mg]
06	8484.66	0.79	4.78	9.51	0.36
0601	1449	0	0	0	0
060100	1449	0	0	0	0
0603	129.21	0	0	0	0
060301	2.40	0	0	0	0
060302	5.32	0	0	0	0
060309	121.16	0	0	0	0
060313	0.33	0	0	0	0
0604	6906.45	0	0	0	0
060403	6823.50	0	0	0	0
060405	82.95	0	0	0	0
0605	0	0.79	4.78	9.51	0.36
060502	0	0.79	4.78	8.56	0.36
060506	0	0	0	0.95	0

ANNEX 2: Nomenclature of Fuels

CITEPA - NAPFUE nomenclature
European Environment Agency / European Topic Centre on Air Emissions
NAPFUE 94 version 1.0 dated 21/11/1995

solid fuels

NAPFUE CODE	FUEL IDENTIFICATION
101	COKING COAL (GHV > 23 865 kJ/kg)
102	STEAM COAL (GHV > 23 865 kJ/kg)
103	SUB-BITUMINOUS (17 435 kJ/kg < GHV < 23 865 kJ/kg)
104	PATENT FUELS (from hard/sub-bituminous coal)
105	BROWN COAL / LIGNITE (GHV < 17 435 kJ/kg)
106	BROWN COAL BRIQUETTES
107	COKE OVEN COKE FROM HARD COAL
108	COKE OVEN COKE FROM BROWN COAL
109	GAS COKE
110	PETROLEUM COKE
111	WOOD AND SIMILAR WOOD WASTES
112	CHARCOAL
113	PEAT
114	MUNICIPAL WASTES
115	INDUSTRIAL SOLID WASTES
116	WOOD WASTES (except wastes similar to wood)
117	AGRICULTURAL WASTES (corncobs, straw, etc.)
118	SEWAGE SLUDGE
119	REFUSE DERIVED FUELS
120	OIL-SHALE
121	OTHER SOLID FUELS (tar, benzol, pitch, etc.)

liquid fuels

NAPFUE CODE	FUEL IDENTIFICATION
201	CRUDE OIL
202	*Item not used*
203	RESIDUAL OIL
204	GAS OIL
205	DIESEL OIL FOR ROAD TRANSPORT
206	KEROSENE
207	JET FUEL
208	MOTOR GASOLINE
209	AVIATION GASOLINE
210	NAPHTA
211	SHALE-OIL
212	GASOLINE ENGINE WASTE OIL
213	DIESEL ENGINE WASTE OIL
214	WASTE SOLVENTS
215	BLACK LIQUOR
216	MIXTURE OF FUEL OIL AND COAL
217	REFINERY FEEDSTOCKS AND ADDITIVES
218	OTHER LIQUID WASTES
219	LUBRICANTS
220	WHITE SPIRIT
221	PARAFFIN WAXES
222	BITUMEN
223	BIO-ALCOHOL
224	OTHER PETROLEUM PRODUCTS (grease, aromatics, etc.)
225	OTHER LIQUID FUELS

gaseous fuels

NAPFUE CODE	FUEL IDENTIFICATION
301	NATURAL GAS (except liquefied natural gas)
302	NATURAL GAS LIQUIDS
303	LIQUEFIED PETROLEUM GASES (LPG)
304	COKE OVEN GAS
305	BLAST FURNACE GAS
306	MIXTURE OF COKE OVEN AND BLAST FURNACE GASES
307	WASTE GAS (especially chemical industry)
308	REFINERY AND PETROCHEMICAL GAS (not condensable)
309	BIOGAS
310	GAS FROM WASTE TIPS
311	GAS WORKS GAS
312	STEEL PLANT FURNACE GAS
313	HYDROGEN
314	OTHER GASEOUS FUEL