



# MACEDONIA'S INFORMATIVE INVENTORY REPORT, 2010

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

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## ABBREVIATIONS USED

<b>CORINAIR</b>	<b>Co-ordination of Information on AIR</b> emissions
<b>CARDS</b>	<b>Community Assistance for Reconstruction Development and Stabilization</b>
<b>ETC/ACC</b>	<b>European Topic Centre on Air and Climate Change</b>
<b>EU</b>	<b>European Union</b>
<b>UNFCCC</b>	<b>United Nations Framework Convention on Climate Change</b>
<b>UNECE/CLRTAP</b>	<b>United Nations Economic Commission for Europe/Convention on Long-range Transboundary Air Pollution</b>
<b>QA/QC</b>	<b>Quality Assurance / Quality Control</b>
<b>EMEP</b>	<b>Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe</b>
<b>SNAP</b>	<b>Selected Nomenclature on Air Pollutants</b>
<b>CollectER</b>	<b>Collect Emission Register</b>
<b>ReportER</b>	<b>Report Emission Register</b>
<b>AE-DEM</b>	<b>Air Emissions Data Exchange Module</b>
<b>NFR</b>	<b>Nomenclature For Reporting</b>
<b>CRF</b>	<b>Common Reporting Format</b>
<b>GHGs</b>	<b>Greenhouse Gases</b>
<b>LPS</b>	<b>Large Point Source</b>
<b>LHV</b>	<b>Low Heating Value</b>
<b>NAPFUE</b>	<b>Nomenclature for Air Pollution of Fuels</b>
<b>IPCC</b>	<b>Intergovernmental Panel on Climate Change</b>
<b>GPG</b>	<b>Good Practice Guidance (of the IPCC)</b>
<b>EEA</b>	<b>European Environment Agency</b>
<b>HM</b>	<b>Heavy Metals</b>
<b>POPs</b>	<b>Persistent Organic Pollutants</b>
<b>RM</b>	<b>Republic of Macedonia</b>
<b>CPAPRM</b>	<b>Cadastre of polluters and air pollutants in Republic of Macedonia</b>
<b>MEPP</b>	<b>Ministry of Environment and Physical Planning</b>
<b>MEIC</b>	<b>Macedonian Environmental Informative Centre</b>
<b>NEAP</b>	<b>National Environmental Action Plan</b>

## EXECUTIVE SUMMARY

The Republic of Macedonia has its obligations towards Geneva Convention on Long-range Transboundary Air Pollution containing emission reduction commitments, due to the signed Convention and its Protocols.

The Macedonian inventory system is under the Ministry of Environment and Physical Planning (MEPP). The executive institution with care of preparing the inventory and IIR and maintenance of databases is TEHNOLAB Ltd from Skopje in cooperation with the The Macedonian Environmental Informative Center (MEIC) within the MEPP.

In 2005 the Ministry of Environment and Physical Planning (MEPP) established National Methodology for Air Emission Inventorying, based on the CORINAIR system. It was a 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.

In 2006, TEHNOLAB Ltd authorized by the MEPP, have prepared first CORINAIR Air Inventory and IIR which covers information on calculated air emissions for 2004. Since then, Macedonia submits annually its Air Emission Inventory under the requirements of CORINAIR methodology.

For 2005, 2006 and 2007, 2009 Republic of Macedonia has reported the air emissions data only for the three main SNAP sectors (1, 2 and 3), without submitting IIR Report. Republic of Macedonia complying with CLRTAP as part of the national legislation has enforced "Rulebook on inventory making and establishment of the level of polluting substances emission in ambient air in tones per year for all types of activities, as well as other data to be delivered to the Environmental Monitoring Programme of Europe (EMEP)". In accordance with the Rulebook (Article 9, paragraph 1, item 2) full inventory and preparation of IIR (Informative Inventory Report) in the Republic of Macedonia is carried out every second year, while each year emissions are calculated for the sectors which have main contribution in the total emissions. Main difficulty concerning process of emissions inventorying and preparation of IIR (Informative Inventory Report) is lack of finances. Consequently, the above mentioned issues explain the fact "Why for some years the Inventory is not prepared in full".

In 2010, MEPP again have engaged Tehnolab Ltd, to prepare complete CORINAIR Air Inventory and IIR for 2008. The emissions have been reported towards CEIP/EMEP, according to the relevant requirements within NFR09 tables and in accordance with the guidelines for the preparation of IIR.

Macedonia, in 2011 has participated on stage 3 in depth review of Air Emission Inventories, and replied promptly and timely on the sent questions by ERT (Expert review team). Also, during the Review process, from 27th June to 1st July 2011 in Copenhagen Denmark, representative from Macedonia (Magdalena Trajkovska Trpevska as nominated expert) provided active support to the ERT in review and preparation of Review reports regarding sector waste, for 5 countries: Belarus, Luxemburg, Croatia, Estonia and Greece.

Review made by ERT responsible for Macedonia, as well as the questions sent, are of great use and importance concerning further development and improvement of Macedonian Air emission Inventory in accordance with EMEP/CORINAIR. Hence, recommendations given from Stage 3 review will be followed in the next Inventories.

This IIR Report (2012) covers information on anthropogenic emissions of air pollutants for 2010, and as well includes data for methods, data sources, completeness of the Inventory, quality assurance and quality control (QA/QC) activities carried out, and sectoral methodologies for emission estimations by category (NFR). The data regarding emissions, activity data and emission factors are presented in separate chapters of this Report. The NFR09 tables are used to report.

Emissions are calculated on the basis of the standard methods and procedures based on EMEP/EEA Air Pollutant Emission Inventory Guidebook "Technical Guidance. For the purpose to prepare National Emission Inventories" (2010) and EMEP/CORINAIR Good Practice Guidance, Good practice for CLRTAP emission inventories.

Since last submission, in this IIR new sources categories and new pollutants have been included. The explanation of changes and differences are given in the chapters below.

Key information on the activities required to create the inventory are National energy balance, Statistical Yearbooks and Annual Reports on Industrial Production, the national database for road vehicles, and the data of individual plants of large polluters of the environment.

Chapter concerning **explanation of key trends** gives an overview of the methodology for the key source analysis by observed pollutants, the results of key sources analysis with an overview of the change in share from 1990 to 2010 and overview and analysis of pollutants time series.

Comparisons are made regarding key categories of SO<sub>2</sub>, NO<sub>x</sub>, CO, NMVOC, NH<sub>3</sub> and TSP, and heavy metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se, and Zn.

For each pollutant are explained any time series inconsistencies, and significant changes in the time trend for pollutants.

**Sectoral emissions in 2010** are presented in separate Chapter respectively as followed:

➤ **Energy (NFR Sector 1)**

In this Sector, emissions from combustion processes (Categories from 1A1 to 1A4) and fugitive emissions from fuels (Categories from 1B1 to 1B2) have been taken into account. 1A5 Other stationary (1A5a and 1A5b) have not been estimated (NE).

This Inventory, in Sector 1, includes emissions of 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.

Compared to the 2008 inventory, in Macedonian inventory for 2010, eight additional categories were included in Energy sector. These are: 1A2c Stationary combustion in manufacturing industries and construction: Chemicals, 1A2d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print, 1A2e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco, 1A3bv Road transport: Gasoline evaporation, 1A3b vi Road transport: Automobile

tyre and brake wear, 1A3bvii Road transport: Automobile road abrasion, 1A4ci Agriculture/Forestry/Fishing: Stationary, and 1B2aiv Refining / storage.

➤ **Industrial processes (NFR Sector 2)**

The sector NFR 2 Industrial process includes emissions that originate from the process (called process emissions). 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 Macedonian inventory for 2010, six additional categories were included in Industrial processes sector, compared to the 2008 inventory: 2A5 Asphalt roofing, 2A7a Quarrying and mining of minerals other than coal, 2A7b Construction and demolition, 2A7c Storage, handling and transport of mineral products, 2C3 Aluminium production, and 2D3 Wood processing.

➤ **Solvent and other product use (NFR Sector 3)**

This chapter describes a methodology for calculating emissions of NMVOC from solvent and solvent-based products. Solvents are chemical compounds, which are used to dissolve substances as paint, glues, ink, rubber, plastic, pesticides or for cleaning purposes (degreasing). After application of these substances or other procedures of solvent use most of the solvents are released into air. Because solvents consist mainly of NMVOC, solvent use is a major source for anthropogenic NMVOC emissions. Once released into the atmosphere NMVOCs react with reactive molecules (mainly HO-radicals) to finally form CO<sub>2</sub>.

In Macedonian inventory for 2010, comparing with previous Inventory one additional category was included: 3D2 Domestic solvent use including fungicides. Calculated emissions from NFR categories> 3A1 Decorative coating application and 3A2 Industrial coating application, are reported independently.

➤ **Agriculture (NFR Sector 4)**

The Agriculture sector is a major source category for ammonia emissions. 99% of total national emission of NH<sub>3</sub> is from the agricultural sector. In Macedonian inventory category 4B animal husbandry and manure management is treated.

Emissions here include enteric fermentations with domestic animals, emissions in manure management in terms of organic and nitrous compounds.

➤ **Land use and land-use change (NFR Sector 5)**

The EMEP / CORINAIR do not suggest methodology for calculation of pollutant emissions regarding this sector.

➤ **Waste (NFR Sector 6)**

Sector WASTE 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 SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO, TSP and heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni) are covered in this sector.

In this chapter explanations of the source of activity data, methodology used and emission factors are presented in separate sub-chapters.

Due to the lack of activity data, emissions from the category 6Ce Small scale waste burning are reported in the inventory as NE.

➤ **Other and natural emissions**

In this chapter table presentations is given regarding NFR categories covered and categories not included in this sector and for which appropriate notation keys are used.

In this sector, emissions of the following pollutants have been included: SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO, NH<sub>3</sub>, and TSP.

Explanations regarding source of activity data, methodology and emission factors used are presented in separate sub-chapters.

*In this IIR recalculations and improvements have been made.*

Concerning recalculations, the following major improvements have been made:

- Calculations for the main pollutants NO<sub>x</sub>, NMVOC, SO<sub>x</sub>, NH<sub>3</sub>, CO and TSP in the time period between 1990-2000 (which have not been covered in the previous submissions).
- Emission calculation for heavy metals Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn in the time period between 1990-2010.
- Recalculations of emissions for 2009.

Recalculations has been undertaken due to availability of new information for activity data concerning certain sectors, use of higher Tier methodology (e.g. Tier 2 and Tier 3), methodology changes because of inconsistencies in time series, increasing accuracy of emission calculations, use of emission factors according to EMEP/EEA Air Pollutant Emission Inventory Guidebook, and etc.

Priorities for future improvements are regarding:

- Methodology improvement for emission calculations in relevant sectors in accordance with EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009
- Increase accuracy of emission calculation by collecting appropriate quantities of data relevant for the sectors.
- Updating the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.
- Calculation of PM<sub>2.5</sub> and PM<sub>10</sub> emissions.
- Recalculation of time series especially for the period between 2000 to 2008

In future Macedonia intend to produce Inventories with significantly better consistency, transparency, accuracy and comparability of the data.

## CHAPTER 1. INTRODUCTION

### 1.0. Introduction

Reporting of emission data to the Executive Body of the Convention on Long-range Transboundary Air Pollution (CLRTAP) is required in order to fulfil obligations regarding strategies and policies in compliance with the implementation of Protocols under the Convention. Parties should use the reporting procedures and are required to submit annual national emissions of SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO and NH<sub>3</sub>, particulate matter, various heavy metals and POPs using the Guidelines for Estimating and Reporting Emission Data under the Convention on Long-range Transboundary Air Pollution.

The United Nations, Economic Commission for Europe (UNECE), adopted in 1979 the Convention on Long-range Transboundary Air Pollution (LRTAP Convention). The LRTAP Convention came into force in 1983 and has been extended by eight specific protocols. Republic of Macedonia has ratified the Convention on 17.11.1991. The Macedonian's status of ratification to the Conventions and Protocols is shown in the text below:

- **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.
- **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).

- **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).
- **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal** The Convention was ratified by means of the Law on Ratification („Official Gazette of R.M. No.49/97).

#### **Protocols on LRTAP:**

- **Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on the Reduction of Sulphur Emissions or Their Transboundary Fluxes by at Least 30%**
- **Protocol to the 1979 convention on Long-Range Transboundary Air Pollution concerning the control of Emissions of Nitrogen Oxides or their transboundary fluxes**
- **Protocol to the 1979 convention on Long-range Transboundary Air Pollution on further reduction of Sulphur Emissions**
- **Protocol to the 1979 convention on Long-range Transboundary Air Pollution on long-term financing of the cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP)**
- **Protocol to the 1979 Convention on Long-range Transboundary Air pollution concerning the control of Emissions of Volatile Organic Compounds or their transboundary fluxes**
- **Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution on Persistent Organic Pollutants (POPs) (1998).**
- **Protocol to the 1979 Convention on Long-Rang Transboundary Air Pollution on Heavy Metals. (1998).**
- **Protocol to the 1979 convention on Long-range Transboundary Air Pollution to abate Acidification, Eutrophication and Ground-level ozone (1999)**

### **1.1. National Inventory background**

The Republic of Macedonia, in accordance with obligations undertaken through the signed international Conventions and Protocols, in 2005 via the Ministry of Environment and Physical Planning (MEPP) established National Methodology for Air Emission Inventorying, based on the CORINAIR system. It was a 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 was 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. In 2006, TEHNOLAB Ltd authorized by the MEPP, have prepared first CORINAIR Air Inventory and IIR which covers information on calculated air emissions for 2004.

For 2005, 2006 and 2007, 2009 according to the requirements of CLRTAP, MEPP of Republic of Macedonia has reported the air emissions data only for the three main SNAP sectors (1, 2 and 3), without submitting IIR Report.

Republic of Macedonia complying with CLRTAP as part of the national legislation has enforced "Rulebook on inventory making and establishment of the level of polluting substances emission in ambient air in tones per year for all types of activities, as well as

other data to be delivered to the Environmental Monitoring Programme of Europe (EMEP)". In accordance with the Rulebook (Article 9, paragraph 1, item 2) full inventory and preparation of IIR (Informative Inventory Report) in the Republic of Macedonia is carried out every second year, while each year emissions are calculated for the sectors which have main contribution in the total emissions. Main difficulty concerning process of emissions inventorying and preparation of IIR (Informative Inventory Report) is lack of finances. Consequently, the above mentioned issues explain the fact "Why for some years the Inventory is not prepared in full".

In 2010, MEPP again have engaged Tehnolab Ltd, to prepare complete CORINAIR Air Inventory and IIR for 2008. The emissions have been reported towards CEIP/EMEP, according the relevant requirements within NFR09 tables and in accordance with the guidelines for the preparation of IIR.

Macedonia, in 2011 has participated on stage 3 in depth review of Air Emission Inventories, and replied promptly and timely on the sent questions by ERT (Expert review team). Also, during the Review process, from 27th June to 1st July 2011 in Copenhagen Denmark, representative from Macedonia (Magdalena Trajkovska Trpevska as nominated expert) provided active support to the ERT in review and preparation of Review reports regarding sector waste, for 5 countries: Belarus, Luxemburg, Croatia, Estonia and Greece, together in cooperation with the representative from Serbia.

Review made by ERT responsible for Macedonia, as well as the questions sent, are of great use and importance concerning further development and improvement of Macedonian Air emission Inventory in accordance with EMEP/CORINAIR. Hence, recommendations given from Stage 3 review will be followed in the next Inventories.

In relation to air emissions inventory submission for 2012, MOEPP have planned financial resources for full inventory and preparation of the report improved in line with Review 3 report recommendations. MOEPP involved Tehnolab Ltd, to carry out the inventory and preparation of IIR for 2010.

This IIR Report (2012) covers information on anthropogenic emissions of air pollutants for 2010, and as well includes data for methods, data sources, completeness of the Inventory, quality assurance and quality control (QA/QC) activities carried out, and sectoral methodologies for emission estimations by category (NFR). The data regarding emissions, activity data and emission factors are presented in separate chapters of this Report. The NFR09 tables are used to report the emission figures.

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

- Guidelines for reporting emission data under the convention on long-range transboundary air pollution, ECE/EB.AIR/97, 27 January 2009
- Recommended Structure for Informative Inventory Report (IIR), Annex VI to ECE/EB.AIR/97 Version: 30 Sept 2009
- EMEP/EEA air pollutant emission inventory guidebook — 2009, Technical report No 6/2009
- UNFCCC IPCC Good Practice Guidance

The structure of the mentioned guidelines has been followed by the authors, in order to achieve transparency, consistency, completeness, accuracy and comparability of reported emission data.



## 1.2. Institutional arrangements

Institutional arrangement for the inventory system currently used in Republic of Macedonia is presented in Figure 1. The Macedonian Environmental Informative Center (MEIC) within the MEPP has the overall responsibility and submits the inventory report to CLRTAP. TEHNOLAB Ltd was engaged by MEPP to develop the Inventory data base and Inventory Report, before it is submitted.

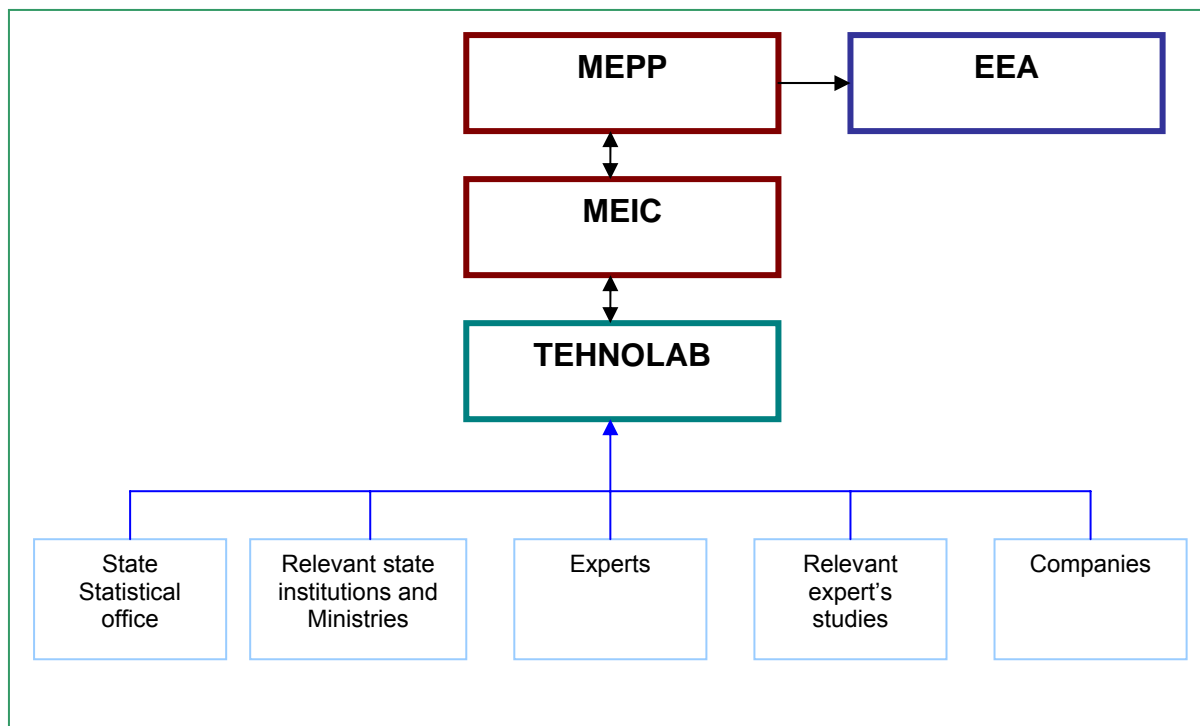


Figure 1 Institutional arrangements

## 1.3. Inventory preparation process

The preparation of the Inventory includes the following stages:

- a) Planning
- b) Preparation
- c) Data 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 NFR (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.

During the Inventory preparation recommendations given from Stage 3 review were followed and were of great use regarding improvements made in this IIR.

- *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 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, we have adopted the position that all such cases in the considered year - 2010 will be treated as "do not occur in the Republic of Macedonia", which has been very helpful in the definition of the completeness of the Inventory, as presented in separate Chapters (from 3.0 to 9.0) of this Report.

- *Data sources*

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

- Statistical Yearbook of Republic of Macedonia 2010
- Energy Balance of the Republic of Macedonia for 2010
- Database on vehicles from the Ministry of Interior of the Republic of Macedonia, for 2010
- Spatial Plan of the Republic of Macedonia
- Data (information) from relevant expert's studies

- *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, 2009.

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 NFR source is the information on activity data. Taking into account the above mentioned difficulties in the collection of data on activity rates, 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 (except for some sectors where higher Tier methodology were used) and the relevant emission factors contained in the EMEP/CORINAIR Emission Inventory Guidebook 2009.

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 NFR sectors are presented in Chapters from 3.0 to 9.0.

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 2010 has been developed in electronic form (MS Access database), using the software tool CollectER. The new NFR tables are used in reporting of the emission figures.

In Annex 2, a table overview of emissions of all pollutants included in this Inventory is presented in NFR09 reporting formats.

### **c) Data management**

In the course of the preparation and development of this Inventory, data management included mainly following steps:

- Preparation of a check list for checking the completeness of input data (data from large point sources, data from statistical service, activity data, emission factors etc.).
- Evaluation of the emission factors of previous year emissions estimations to determine if there is any reason to change them.
- Comparison of the value of input data with the previous year's value. If there are large deviations, the value is checked for any errors such as typing or unit errors. If necessary, the primary data providers are contacted for an explanation.

## **1.4. Methods and data sources**

### **1.4.1. Methodology**

Macedonian air emission inventory is based on the CORINAIR methodology, accordingly providing completeness, consistency and comparability of this Inventory.

CORINAIR (COoRdination of INformation on AIR emissions) is a European air emission inventory programme for national sector-wise emission estimations, harmonized with the IPCC guidelines. In 2009 the EMEP/CORINAIR Guidebook changed name to the EMEP/EEA Guidebook. In this change the Guidebook switched nomenclature from SNAP to NFR.

The CORINAIR calculation principle is to calculate the emissions as activities multiplied by emission factors. Activities are numbers referring to a specific process generating emissions, while an emission factor is the mass of emissions pr unit activity. Information on activities to carry out the CORINAIR inventory is largely based on official statistics. The most consistent emission factors have been used, default factors proposed by international guidelines.

### 1.4.2. Data sources

Activity data needed for emissions calculation are extracted from regular publications and databases of State statistical office and other relevant governmental organizations and ministries. For particular sub-sectors and source categories more detailed data are required than those published in official statistical reports, such as disaggregated energy balance, vehicle fleet etc.). Table 1 presents official activity data sources in relation to the NFR sectors.

**Table 1** Activity data sources

NFR Sector	Data source	Data provider
Energy	- Energy balance - Relevant expert's studies	- Ministry of economy - MEPP
Transport	- Vehicle data base - Statistical yearbook 2010	- Ministry of Interior - State statistical office
Industrial Processes	- Annual Report on Industrial Production 2010	- State statistical office
Solvent and Other Product Use	- Annual Report on Industrial Production 2010	- State statistical office
Agriculture	- Statistical yearbook 2010	- State statistical office
Waste	- Waste management Strategy of the Republic of Macedonia (2008-2020) - NEAP	- MEPP - Public enterprise "Drisla" landfill
Other	- Relevant expert's studies	- Public Enterprise Macedonian Forests - -Skopje and State statistical office

Beside official publications, Tehnolab Ltd sent questionnaires directly to some of the Large Point Sources asking for activity data which are used for emissions calculations in order to check consistency of data provided by different sources.

### 1.5. Key Categories

Identification of key source categories of individual pollutant was made using methodology that follows the quantitative approach 1 described in "IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories". As described in Approach 1, key categories are identified using a predetermined cumulative emissions threshold. Key categories are those which when summed together cumulatively add up to 80% of the total level.

The analysis of key sources in Republic of Macedonia includes pollutants under CLRTAP: pollutants which cause acidification, eutrophication and Ground-level ozone (NO<sub>x</sub>, NMVOC, SO<sub>x</sub>, NH<sub>3</sub> and CO), Particles (TSP) and heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn). Cumulative Table with the key sources for all reported pollutants is Table 2.

**Table 2** Key categories for pollutants in 2010

Pollutant	Key categories (sorted from high to low from left to right)							Total %
NO <sub>x</sub>	1A1a	1A3biii	1A3bi	1A3bii				82,38
	42,75%	23,90%	10,90%	4,83%				
NMVOC	1A4bi	1B1a	1A3bi	3D2	4B1a	1A3bv	4B1b	83,36
	27,35%	21,37%	9,21%	8,17%	7,30%	6,30%	3,67%	
SO <sub>x</sub>	1A1a	1A2a						97,35
	94,36%	2,99%						
NH <sub>3</sub>	4B1a	4B1b	4B8	4B3				85,41
	46,96%	14,44%	12,87%	11,15%				
CO	1A4bi	1A3bi						85,52
	56,67%	28,85%						
TSP	1A4bi	1A1a	2A6					85,78
	33,86%	26,52%	25,40%					
Pb	2C1	1A1a	2C5b					85,38
	67,10%	12,41%	5,87%					
Cd	1A1a	2C1	1A4bi					83,30
	62,46%	12,37%	8,48%					
Hg	1A1a	2C1	1A2fi					92,66
	45,67%	27,70%	19,28%					
As	1A1a	2C1						95,20
	63,54%	31,66%						
Cr	2C1							84,84
	84,84%							
Cu	1A3biii	1A3bi	1A3bii	1A4bi	2C1	1A2a		83,81
	26,83%	24,46%	13,27%	7,41%	6,44%	5,40%		
Ni	1A1a	1A1b	1A4ai	1A2a	1A4bi			82,36
	17,83%	17,72%	17,37%	16,19%	13,24%			
Se	1A1a							98,18
	98,18%							
Zn	2C1	1A4bi	1A2a	1A1a				85,69
	59,85%	13,73%	6,86%	5,26%				

In the process of key categories identification each pollutant was analysed separately. The key sources for each pollutant separately are presented in tables from 3 to 17 in ascending NFR category order.

**Table 3** Key source categories for emissions of NO<sub>x</sub>

NFR sector	Gg	%	%cum
1 A 1 a Public electricity and heat production	12,38	42,75%	42,75%
1 A 3 b iii Road transport: Heavy duty vehicles	6,92	23,90%	66,65%
1 A 3 b i Road transport: Passenger cars	3,16	10,90%	77,56%
1 A 3 b ii Road transport: Light duty vehicles	1,40	4,83%	82,39%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	1,07	3,69%	86,08%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	0,88	3,03%	89,11%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,81	2,79%	91,90%
1 A 4 b i Residential: Stationary plants	0,78	2,68%	94,58%
1 A 4 a i Commercial / institutional: Stationary	0,48	1,66%	96,24%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,35	1,22%	97,46%
1 A 1 b Petroleum refining	0,22	0,77%	98,23%
1 A 3 c Railways	0,19	0,65%	98,88%

NFR sector	Gg	%	%cum
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,10	0,34%	99,22%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,05	0,18%	99,40%
1 A 3 a i (i) International aviation (LTO)	0,05	0,16%	99,56%
4 B 1 a Cattle dairy	0,02	0,07%	99,63%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,02	0,07%	99,70%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,02	0,07%	99,76%
1 B 2 c Venting and flaring	0,02	0,06%	99,82%
4 B 1 b Cattle non-dairy	0,01	0,04%	99,86%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,01	0,04%	99,90%
4 B 8 Swine	0,01	0,03%	99,93%
4 B 9 a Laying hens	0,01	0,02%	99,95%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00	0,01%	99,96%
4 B 3 Sheep	0,00	0,01%	99,98%
4 B 6 Horses	0,00	0,01%	99,99%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00	0,01%	100,00%
6 C a Clinical waste incineration (d)	0,00	0,00%	100,00%
4 B 2 Buffalo	0,00	0,00%	100,00%
3 D 3 Other product use	0,00	0,00%	100,00%

**Table 4** Key source categories for emissions of NMVOC

NFR sector	Gg	%	%cum
1 A 4 b i Residential: Stationary plants	6,883	27,35%	27,35%
1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	5,379	21,37%	48,72%
1 A 3 b i Road transport: Passenger cars	2,319	9,21%	57,94%
3 D 2 Domestic solvent use including fungicides	2,055	8,17%	66,10%
4 B 1 a Cattle dairy	1,836	7,30%	73,40%
1 A 3 b v Road transport: Gasoline evaporation	1,586	6,30%	79,70%
4 B 1 b Cattle non-dairy	0,924	3,67%	83,37%
4 B 8 Swine	0,743	2,95%	86,32%
2 D 2 Food and drink	0,631	2,51%	88,83%
4 B 9 a Laying hens	0,598	2,38%	91,20%
1 A 3 b iii Road transport: Heavy duty vehicles	0,299	1,19%	92,39%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,247	0,98%	93,38%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,240	0,95%	94,33%
1 A 3 b ii Road transport: Light duty vehicles	0,177	0,70%	95,03%
1 B 2 a iv Refining / storage	0,171	0,68%	95,71%
2 C 1 Iron and steel production	0,164	0,65%	96,36%
4 B 3 Sheep	0,156	0,62%	96,98%
1 A 4 a i Commercial / institutional: Stationary	0,124	0,49%	97,47%
1 A 4 b ii Residential: Household and gardening (mobile)	0,112	0,44%	97,91%
6 A Solid waste disposal on land	0,10797	0,43%	98,34%
1 A 1 a Public electricity and heat production	0,093	0,37%	98,71%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	0,069	0,27%	98,99%

NFR sector	Gg	%	%cum
1 B 2 a v Distribution of oil products	0,062	0,25%	99,23%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,050	0,20%	99,43%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,047	0,19%	99,62%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	0,038	0,15%	99,77%
1 A 3 c Railways	0,017	0,07%	99,84%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,013	0,05%	99,89%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,011	0,04%	99,93%
1 A 1 b Petroleum refining	0,007	0,03%	99,96%
2 A 6 Road paving with asphalt	0,005	0,02%	99,98%
1 A 3 a i (i) International aviation (LTO)	0,003	0,01%	99,99%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,001	0,01%	99,99%
1 B 2 c Venting and flaring	0,001	0,00%	100,00%
6 C a Clinical waste incineration (d)	0,00032	0,00%	100,00%
2 A 5 Asphalt roofing	0,00016	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00010	0,00%	100,00%
3 D 3 Other product use	0,00003	0,00%	100,00%
3 A 2 Industrial coating application	5,54E-07	0,00%	100,00%
3 C Chemical products	5,24E-07	0,00%	100,00%
3 A 1 Decorative coating application	2,60E-07	0,00%	100,00%
3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)	6,93E-08	0,00%	100,00%

**Table 5** Key source categories for emissions of SO<sub>x</sub>

NFR sector	Gg	%	%cum
1 A 1 a Public electricity and heat production	78,4623	94,36%	94,36%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	2,4887	2,99%	97,35%
1 A 4 b i Residential: Stationary plants	0,6146	0,74%	98,09%
1 A 4 a i Commercial / institutional: Stationary	0,5796	0,70%	98,79%
1 A 1 b Petroleum refining	0,4570	0,55%	99,34%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	0,2580	0,31%	99,65%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,1350	0,16%	99,81%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,0997	0,12%	99,93%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0197	0,02%	99,95%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,0149	0,02%	99,97%
1 A 3 b i Road transport: Passenger cars	0,0105	0,01%	99,98%
1 A 3 a i (i) International aviation (LTO)	0,0044	0,01%	99,99%
1 A 3 b iii Road transport: Heavy duty vehicles	0,0030	0,00%	99,99%
1 B 2 c Venting and flaring	0,0025	0,00%	100,00%
1 A 3 b ii Road transport: Light duty vehicles	0,0016	0,00%	100,00%
6 C a Clinical waste incineration (d)	0,0006	0,00%	100,00%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	0,0004	0,00%	100,00%
1 A 3 c Railways	0,0004	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,0002	0,00%	100,00%

NFR sector	Gg	%	%cum
1 A 3 b iv Road transport: Mopeds & motorcycles	0,0002	0,00%	100,00%
1 A 4 b ii Residential: Household and gardening (mobile)	0,0001	0,00%	100,00%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,0000	0,00%	100,00%

**Table 6** Key source categories for emissions of NH<sub>3</sub>

NFR sector	Gg	%	%cum
4 B 1 a Cattle dairy	4,590	46,96%	46,96%
4 B 1 b Cattle non-dairy	1,411	14,44%	61,40%
4 B 8 Swine	1,258	12,87%	74,26%
4 B 3 Sheep	1,090	11,15%	85,41%
4 B 9 a Laying hens	0,958	9,80%	95,21%
4 B 6 Horses	0,395	4,04%	99,24%
1 A 3 b i Road transport: Passenger cars	0,032	0,32%	99,57%
1 A 4 b i Residential: Stationary plants	0,028	0,29%	99,85%
4 B 2 Buffalo	0,009	0,10%	99,95%
1 A 3 b iii Road transport: Heavy duty vehicles	0,003	0,03%	99,98%
1 A 3 b ii Road transport: Light duty vehicles	0,001	0,01%	99,99%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction	0,00036	0,00%	100,00%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,00016	0,00%	100,00%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00013	0,00%	100,00%
1 A 3 c Railways	0,00003	0,00%	100,00%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	5,56E-06	0,00%	100,00%
1 A 4 b ii Residential: Household and gardening (mobile)	3,01E-06	0,00%	100,00%

**Table 7** Key source categories for emissions of CO

NFR sector	Gg	%	%cum
1 A 4 b i Residential: Stationary plants	39,427	56,67%	56,67%
1 A 3 b i Road transport: Passenger cars	20,074	28,85%	85,52%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	2,381	3,42%	88,94%
1 A 3 b iii Road transport: Heavy duty vehicles	1,497	2,15%	91,09%
1 A 3 b ii Road transport: Light duty vehicles	1,196	1,72%	92,81%
1 A 4 a i Commercial / institutional: Stationary	1,097	1,58%	94,39%
1 A 3 b iv Road transport: Mopeds & motorcycles	1,030	1,48%	95,87%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,689	0,99%	96,86%
1 A 4 b ii Residential: Household and gardening (mobile)	0,597	0,86%	97,72%
1 A 1 a Public electricity and heat production	0,506	0,73%	98,45%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,256	0,37%	98,81%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,249	0,36%	99,17%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,190	0,27%	99,45%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,127	0,18%	99,63%
1 A 1 b Petroleum refining	0,083	0,12%	99,75%
1 A 3 a i (i) International aviation (LTO)	0,065	0,09%	99,84%
1 A 2 e Stationary combustion in manufacturing industries	0,058	0,08%	99,92%



NFR sector	Gg	%	%cum
and construction: Food processing, beverages and tobacco			
1 A 3 c Railways	0,038	0,06%	99,98%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00712	0,01%	99,99%
1 B 2 c Venting and flaring	0,004	0,01%	100,00%
6 C a Clinical waste incineration (d)	0,00128	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00089	0,00%	100,00%
3 D 3 Other product use	0,00087	0,00%	100,00%
2 A 5 Asphalt roofing	0,00031	0,00%	100,00%

**Table 8** Key source categories for emissions of TSP

NFR sector	Gg	%	%cum
1 A 4 b i Residential: Stationary plants	5,415	33,86%	33,86%
1 A 1 a Public electricity and heat production	4,242	26,52%	60,38%
2 A 6 Road paving with asphalt	4,062	25,40%	85,78%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,383	2,39%	88,17%
2 C 1 Iron and steel production	0,327	2,05%	90,22%
1 A 3 b ii Road transport: Light duty vehicles	0,256	1,60%	91,82%
1 A 3 b iii Road transport: Heavy duty vehicles	0,225	1,40%	93,22%
1 A 4 a i Commercial / institutional: Stationary	0,195	1,22%	94,44%
2 A 1 Cement production	0,169	1,05%	95,49%
2 A 7 b Construction and demolition	0,148322	0,93%	96,42%
2 D 3 Wood processing	0,143	0,89%	97,31%
1 A 3 b i Road transport: Passenger cars	0,089	0,56%	97,87%
2 C 2 Ferroalloys production	0,081	0,51%	98,38%
1 A 3 b vi Road transport: Automobile tyre and brake wear	0,0417	0,26%	98,64%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,035	0,22%	98,86%
1 A 3 b vii Road transport: Automobile road abrasion	0,0349	0,22%	99,08%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,028	0,18%	99,25%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,027	0,17%	99,42%
2A 7 c Storage, handling and transport of mineral products	0,022201	0,14%	99,56%
1 A 1 b Petroleum refining	0,020	0,13%	99,69%
2 A 5 Asphalt roofing	0,01867	0,12%	99,81%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,006	0,04%	99,84%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,006	0,04%	99,88%
1 A 3 c Railways	0,005	0,03%	99,91%
2 C 3 Aluminum production	0,004	0,02%	99,94%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00319	0,02%	99,96%
2 C 5 b Lead production	0,002	0,01%	99,97%
1 A 4 b ii Residential: Household and gardening (mobile)	0,002	0,01%	99,98%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,001	0,01%	99,99%
2 A 2 Lime production	0,00096	0,01%	99,99%
2 A 7 a Quarrying and mining of minerals other than coal	0,000390	0,00%	100,00%

NFR sector	Gg	%	%cum
3 D 3 Other product use	0,00029	0,00%	100,00%
6 C a Clinical waste incineration (d)	0,00023	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00006	0,00%	100,00%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,00003	0,00%	100,00%

**Table 9** Key source categories for emissions of Pb

NFR sector	Mg	%	%cum
2 C 1 Iron and steel production	5,020	67,10%	67,10%
1 A 1 a Public electricity and heat production	0,928	12,41%	79,51%
2 C 5 b Lead production	0,439	5,87%	85,38%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,356	4,76%	90,14%
1 A 4 b i Residential: Stationary plants	0,34832	4,66%	94,79%
1 A 4 b ii Residential: Household and gardening (mobile)	0,10668	1,43%	96,22%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other)	0,08487	1,13%	97,36%
1 A 4 a i Commercial / institutional: Stationary	0,07949	1,06%	98,42%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,05813	0,78%	99,19%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,01586	0,21%	99,41%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,01263	0,17%	99,58%
1 A 1 b Petroleum refining	0,008	0,10%	99,68%
1 A 3 b iii Road transport: Heavy duty vehicles	0,00608	0,08%	99,76%
6 C a Clinical waste incineration (d)	0,00596	0,08%	99,84%
1 A 3 b i Road transport: Passenger cars	0,00367	0,05%	99,89%
1 A 3 b ii Road transport: Light duty vehicles	0,002988	0,04%	99,93%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0029	0,04%	99,97%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00174	0,02%	99,99%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,000771	0,01%	100,00%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00004	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00003	0,00%	100,00%
3 D 3 Other product use	3,57E-07	0,00%	100,00%

**Table 10** Key source categories for emissions of Cd

NFR sector	Mg	%	%cum
1 A 1 a Public electricity and heat production	0,110	62,46%	62,46%
2 C 1 Iron and steel production	0,022	12,37%	74,82%
1 A 4 b i Residential: Stationary plants	0,01496	8,48%	83,30%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,00589	3,34%	86,64%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,006	3,24%	89,88%
2 C 5 b Lead production	0,004	2,18%	92,06%

NFR sector	Mg	%	%cum
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0025	1,40%	93,46%
1 A 1 b Petroleum refining	0,002	1,35%	94,82%
1 A 4 a i Commercial / institutional: Stationary	0,00235	1,33%	96,15%
1 A 3 b iii Road transport: Heavy duty vehicles	0,00187	1,06%	97,21%
1 A 3 b i Road transport: Passenger cars	0,00171	0,97%	98,18%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,00112	0,63%	98,81%
1 A 3 b ii Road transport: Light duty vehicles	0,00093	0,52%	99,34%
6 C a Clinical waste incineration (d)	0,00046	0,26%	99,60%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,00035	0,20%	99,79%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,00024	0,13%	99,93%
1 A 3 c Railways	0,00004	0,02%	99,95%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00004	0,02%	99,97%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00002	0,01%	99,98%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00002	0,01%	99,99%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,00001	0,01%	99,99%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00001	0,00%	100,00%
3 D 3 Other product use	7,14E-07	0,00%	100,00%

**Table 11** Key source categories for emissions of Hg

NFR sector	Mg	%	%cum
1 A 1 a Public electricity and heat production	0,180	45,67%	45,67%
2 C 1 Iron and steel production	0,109	27,70%	73,37%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,07596	19,28%	92,66%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,018	4,66%	97,31%
1 A 4 b i Residential: Stationary plants	0,00421	1,07%	98,38%
6 C a Clinical waste incineration (d)	0,00367	0,93%	99,31%
1 A 4 a i Commercial / institutional: Stationary	0,00122	0,31%	99,62%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0010	0,25%	99,87%
1 A 1 b Petroleum refining	0,000	0,07%	99,94%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,00018	0,05%	99,98%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,00004	0,01%	100,00%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00001	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00001	0,00%	100,00%
3 D 3 Other product use	7,14E-07	0,00%	100,00%
2 C 5 b Lead production	0,000	0,00%	100,00%

**Table 12** Key source categories for emissions of As

NFR sector	Mg	%	%cum
1 A 1 a Public electricity and heat production	0,876202	63,54%	63,54%
2 C 1 Iron and steel production	0,436523	31,66%	95,20%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,019358	1,40%	96,60%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,012508	0,91%	97,51%
2 C 5 b Lead production	0,01225	0,89%	98,40%
1 A 4 b i Residential: Stationary plants	0,010172	0,74%	99,13%
1 A 4 a i Commercial / institutional: Stationary	0,00468	0,34%	99,47%
1 A 1 b Petroleum refining	0,004369	0,32%	99,79%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,00096	0,07%	99,86%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,000678	0,05%	99,91%
6 C a Clinical waste incineration (d)	0,000596	0,04%	99,95%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,000563	0,04%	99,99%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,000108	0,01%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	4,59E-06	0,00%	100,00%
3 D 3 Other product use	1,14E-06	0,00%	100,00%

**Table 13** Key source categories for emissions of Cr

NFR sector	Mg	%	%cum
2 C 1 Iron and steel production	4,910886	84,84%	84,84%
1 A 1 a Public electricity and heat production	0,568108	9,81%	94,65%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,074021	1,28%	95,93%
1 A 4 b i Residential: Stationary plants	0,067307	1,16%	97,10%
1 A 4 a i Commercial / institutional: Stationary	0,051501	0,89%	97,99%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,042152	0,73%	98,71%
1 A 1 b Petroleum refining	0,018914	0,33%	99,04%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,011842	0,20%	99,24%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,011072	0,19%	99,44%
1 A 3 b iii Road transport: Heavy duty vehicles	0,009355	0,16%	99,60%
1 A 3 b i Road transport: Passenger cars	0,00853	0,15%	99,75%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,004994	0,09%	99,83%
1 A 3 b ii Road transport: Light duty vehicles	0,004626	0,08%	99,91%
6 C a Clinical waste incineration (d)	0,002155	0,04%	99,95%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,001367	0,02%	99,97%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,001187	0,02%	99,99%
1 A 3 c Railways	0,000179	0,00%	100,00%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,000105	0,00%	100,00%

NFR sector	Mg	%	%cum
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	4,46E-05	0,00%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	4,39E-05	0,00%	100,00%
1 A 4 b ii Residential: Household and gardening (mobile)	4,29E-05	0,00%	100,00%
3 D 3 Other product use	2,5E-06	0,00%	100,00%

**Table 14** Key source categories for emissions of Cu

NFR sector	Mg	%	% cum
1 A 3 b iii Road transport: Heavy duty vehicles	0,31807	26,83%	26,83%
1 A 3 b i Road transport: Passenger cars	0,29001	24,46%	51,29%
1 A 3 b ii Road transport: Light duty vehicles	0,15730	13,27%	64,56%
1 A 4 b i Residential: Stationary plants	0,08783	7,41%	71,97%
2 C 1 Iron and steel production	0,076	6,44%	78,42%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,064	5,40%	83,81%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,05242	4,42%	88,23%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,04035	3,40%	91,64%
1 A 4 a i Commercial / institutional: Stationary	0,02999	2,53%	94,17%
1 A 1 a Public electricity and heat production	0,024	2,01%	96,17%
1 A 1 b Petroleum refining	0,015	1,28%	97,46%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,00675	0,57%	98,03%
1 A 3 c Railways	0,00609	0,51%	98,54%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,00594	0,50%	99,04%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00357	0,30%	99,34%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0028	0,24%	99,58%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,00151	0,13%	99,71%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00146	0,12%	99,83%
6 C a Clinical waste incineration (d)	0,00119	0,10%	99,93%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00077	0,07%	100,00%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00002	0,00%	100,00%
3 D 3 Other product use	1,07E-06	0,00%	100,00%

**Table 15** Key source categories for emissions of Ni

NFR sector	Mg	%	% cum
1 A 1 a Public electricity and heat production	0,982	17,83%	17,83%
1 A 1 b Petroleum refining	0,976	17,72%	35,55%
1 A 4 a i Commercial / institutional: Stationary	0,95671	17,37%	52,92%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,892	16,19%	69,11%
1 A 4 b i Residential: Stationary plants	0,72959	13,24%	82,36%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,31452	5,71%	88,07%

NFR sector	Mg	%	% cum
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,23611	4,29%	92,35%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,16973	3,08%	95,43%
2 C 1 Iron and steel production	0,153	2,77%	98,21%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0369	0,67%	98,88%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,02753	0,50%	99,38%
1 A 3 b iii Road transport: Heavy duty vehicles	0,01310	0,24%	99,61%
1 A 3 b i Road transport: Passenger cars	0,01194	0,22%	99,83%
1 A 3 b ii Road transport: Light duty vehicles	0,00648	0,12%	99,95%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,00166	0,03%	99,98%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,00046	0,01%	99,99%
1 A 3 c Railways	0,00025	0,00%	99,99%
6 C a Clinical waste incineration (d)	0,00018	0,00%	100,00%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00015	0,00%	100,00%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,00006	0,00%	100,00%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00006	0,00%	100,00%

**Table 16** Key source categories for emissions of Se

NFR sector	Mg	%	% cum
1 A 1 a Public electricity and heat production	2,819	98,18%	98,18%
2 C 1 Iron and steel production	0,022	0,76%	98,94%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,017443	0,61%	99,54%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,004	0,14%	99,69%
1 A 4 b i Residential: Stationary plants	0,00375	0,13%	99,82%
1 A 3 b iii Road transport: Heavy duty vehicles	0,00187	0,07%	99,88%
1 A 3 b i Road transport: Passenger cars	0,00171	0,06%	99,94%
1 A 3 b ii Road transport: Light duty vehicles	0,00093	0,03%	99,97%
1 A 4 a i Commercial / institutional: Stationary	0,00037	0,01%	99,99%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,00024	0,01%	99,99%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,00005	0,00%	100,00%
1 A 3 c Railways	0,00004	0,00%	100,00%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,00002	0,00%	100,00%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00002	0,00%	100,00%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,00002	0,00%	100,00%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,00001	0,00%	100,00%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00001	0,00%	100,00%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00000	0,00%	100,00%

**Table 17** Key source categories for emissions of Zn

NFR sector	Mg	%	% cum
2 C 1 Iron and steel production	4,365	59,85%	59,85%
1 A 4 b i Residential: Stationary plants	1,00113	13,73%	73,57%
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,500	6,86%	80,43%
1 A 1 a Public electricity and heat production	0,384	5,26%	85,69%
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,30233	4,14%	89,84%
1 A 3 b iii Road transport:, Heavy duty vehicles	0,18710	2,57%	92,40%
1 A 3 b i Road transport: Passenger cars	0,17060	2,34%	94,74%
1 A 4 a i Commercial / institutional: Stationary	0,10718	1,47%	96,21%
1 A 3 b ii Road transport: Light duty vehicles	0,09253	1,27%	97,48%
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	0,0693	0,95%	98,43%
1 A 1 b Petroleum refining	0,046	0,63%	99,06%
1 A 2 f ii Mobile Combustion in manufacturing industries and construction:	0,02374	0,33%	99,39%
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	0,01347	0,18%	99,57%
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	0,01148	0,16%	99,73%
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	0,01112	0,15%	99,88%
1 A 3 c Railways	0,00358	0,05%	99,93%
1 A 3 b iv Road transport: Mopeds & motorcycles	0,00210	0,03%	99,96%
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	0,00105	0,01%	99,98%
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	0,00089	0,01%	99,99%
1 A 4 b ii Residential: Household and gardening (mobile)	0,00086	0,01%	100,00%

## 1.6. 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 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, as well as over NFR tables 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 has made assessment of activity data, emission factors and emissions for 2010. 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 and expert's studies. However, the results from the above mentioned comparisons have only confirmed the conclusion that there have been no significant deviations among compared calculations.

## 1.7. General uncertainty evaluation

So far, no quantitative uncertainty assessment for any of the pollutants of the Macedonian emission inventory has been made.

## 1.8. General Assessment of Completeness

According to reporting guidelines, in cases when methodological and data gaps exist in the inventory, parties to the Convention are required to inform and explain in a transparent manner the reason of their appearance, also the emission of certain emission sources from the inventory. To accomplish this, Parties have to use designated notation keys. Explanation of the meaning and the purpose of notation keys are presented in the following subchapter. Notation keys are used in NFR emission tables for sectors, sub-sectors from which emissions has not been quantitatively estimated. In Table 18 definition for each notation key used in NFR format is presented.



**Table 18** Definition of Notation Keys

Notation key	Meaning	Purpose	Use of notation key in national inventory
NO	Not occurring	For activities or processes which do not exist in Republic of Macedonia / for emissions by sources of compounds that do not occur for a particular compound or source category;	In some NFR sectors
NE	Not estimated	Where emission occur, but have not been estimated or reported	In some NFR sectors
NA	Not applicable	When activity or process exist, but it is assumed that they do not result with emission / Is used for activities which are believed to result in emission which are insignificant to national totals;	In some NFR sectors
IE	Included elsewhere	Where emissions for mentioned activity or process are calculated and included in inventory, but did not separately presented for this source category / For emissions of pollutants which are calculated, but included elsewhere from expected source category in the inventory;	Not used
C	Confidential	For emissions by sources of compounds which could lead to the disclosure of confidential information	Not used
NR	Not relevant	According to paragraph 9 in the Emission Guidelines, Emission inventory reporting should cover all years from 1980, Onwards, if data are available, Where emissions are not strictly required by the different Protocols, e.g. for some parties emissions of NMVOC prior to 1988	Not used

The Emission Inventory for 2010 covers the whole territory of the Republic of Macedonia. In the Inventory of Air Emissions of the Republic of Macedonia for 2010, the air emissions have been calculated for the following pollutants:

- SO<sub>2</sub> (sulfur dioxide)
- NO<sub>x</sub> (nitrogen oxides)
- NMVOC (non-methagene volatile organic compounds)
- CH<sub>4</sub> (methane)
- CO (carbon monoxide)
- CO<sub>2</sub> (carbon dioxide)
- N<sub>2</sub>O (nitrous oxide)
- NH<sub>3</sub> (ammonium)
- TSP (solid particles)
- Heavy metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn

It is not always possible to specify all sub sectors in detail. Based on that, in the emission tables (NFR), notation keys are used. In the sub chapters 1.8.1 to 1.8.3 sources for which are used different notification keys, are presented.

### 1.8.1. Sources reported as “NE“

**Table 19** Explanation to the Notation Key “NE”

NFR code	Substance(s)	Reason for not estimation
1 A 3 a ii (i) Civil aviation (Domestic, LTO)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO	No activity data available
1 A 3 d ii National navigation (Shipping)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> ,	No activity

NFR code	Substance(s)	Reason for not estimation
	TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	data available
1 A 3 e Pipeline compressors	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1 A 4 a ii Commercial / institutional: Mobile	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1A 4 c iii Agriculture/Forestry/Fishing: National fishing	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1 A 5 a Other stationary (including military)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1 A 5 b Other, Mobile (including military, land based and recreational boats)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 A 3 Limestone and dolomite use	TSP	No activity data available
2 A 4 Soda ash production and use	TSP	No activity data available
2 A 7 d Other Mineral products	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 B 5 a Other chemical industry	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 B 5 b Storage, handling and transport of chemical products	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 C 5 e Other metal production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 C 5 f Storage, handling and transport of metal products	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 D 1 Pulp and paper	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO	No activity data available
2 F Consumption of POPs and heavy metals	Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
2 G Other production, consumption, storage, transportation or handling of bulk products	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
3 B 1 Degreasing	NMVOC, TSP	No activity data available
3 B 2 Dry cleaning	NMVOC, TSP	No activity data available
3 D 1 Printing	NMVOC, TSP	No activity data available
4 B 4 Goats	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 B 7 Mules and asses	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 B 9 b Broilers	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity

NFR code	Substance(s)	Reason for not estimation
		data available
4 B 9 c Turkeys	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 B 9 d Other poultry	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 B 13 Other	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 D 1 a Synthetic N-fertilizers	NO <sub>x</sub> , NMVOC, NH <sub>3</sub> , TSP,	No activity data available
4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products	TSP	No activity data available
4 D 2 b Off-farm storage, handling and transport of bulk agricultural products	TSP	No activity data available
4 D 2 c N-excretion on pasture range and paddock unspecified	TSP	No activity data available
4 F Field burning of agricultural wastes	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
4 G Agriculture other(c)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
6 C e Small scale waste burning	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
7 A Other (included in national total for entire territory)	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No activity data available
1 A 1 a Public electricity and heat production	NH <sub>3</sub>	No EF in Guidebook
1 A 1 b Petroleum refining	NH <sub>3</sub>	No EF in Guidebook
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	NH <sub>3</sub>	No EF in Guidebook
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	NH <sub>3</sub> , Se	No EF in Guidebook
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	NH <sub>3</sub>	No EF in Guidebook
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	NH <sub>3</sub>	No EF in Guidebook
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	NH <sub>3</sub>	No EF in Guidebook
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	NH <sub>3</sub>	No EF in Guidebook
1 A 2 f ii Mobile Combustion in manufacturing industries and construction	Hg, As	No EF in Guidebook
1 A 3 a i (i) International aviation (LTO)	NH <sub>3</sub> , TSP, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
1 A 3 b i Road transport: Passenger cars	Hg, As	No EF in Guidebook
1 A 3 b ii Road transport: Light duty vehicles	Hg, As	No EF in Guidebook
1 A 3 b iii Road transport: Heavy duty vehicles	Hg, As	No EF in Guidebook
1 A 3 b iv Road transport: Mopeds & motorcycles	Hg, As	No EF in Guidebook

NFR code	Substance(s)	Reason for not estimation
1 A 3 b vi Road transport: Automobile tyre and brake wear	Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
1 A 3 b vii Road transport: Automobile road abrasion	Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
1 A 3 c Railways	Pb, Hg, As	No EF in Guidebook
1 A 4 a i Commercial / institutional: Stationary	NH <sub>3</sub>	No EF in Guidebook
1 A 4 b ii Residential: Household and gardening (mobile)	Hg, As	No EF in Guidebook
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	Hg, As	No EF in Guidebook
1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	SO <sub>x</sub> , TSP, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
1 B 2 a iv Refining / storage	SO <sub>x</sub>	No EF in Guidebook
1 B 2 a v Distribution of oil products	SO <sub>x</sub>	No EF in Guidebook
1 B 2 c Venting and flaring	NH <sub>3</sub> , Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 A 1 Cement production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 A 2 Lime production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 A 5 Asphalt roofing	Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 A 6 Road paving with asphalt	NO <sub>x</sub> , SO <sub>x</sub> , CO	No EF in Guidebook
2 C 1 Iron and steel production	NO <sub>x</sub> , SO <sub>x</sub> , NH <sub>3</sub> , CO	No EF in Guidebook
2 C 2 Ferroalloys production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 C 3 Aluminum production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
2 C 5 b Lead production	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , CO	No EF in Guidebook
2 D 2 Food and drink	TSP	No EF in Guidebook
2 D 3 Wood processing	NO <sub>x</sub> , NMVOC, SO <sub>x</sub> , NH <sub>3</sub> , CO, As, Cu	No EF in Guidebook
3 C Chemical products	NO <sub>x</sub> , SO <sub>x</sub> , NH <sub>3</sub> , TSP, CO, Pb, Cd, Hg, As, Cr, Cu, Ni, Se, Zn	No EF in Guidebook
3 D 2 Domestic solvent use including fungicides	TSP	No EF in Guidebook
3 D 3 Other product use	SO <sub>x</sub> , NH <sub>3</sub> , Ni, Se, Zn	No EF in Guidebook
4 B 1 a Cattle dairy	TSP	No EF in Guidebook
4 B 1 b Cattle non-dairy	TSP	No EF in Guidebook
4 B 2 Buffalo	NMVOC, TSP	No EF in Guidebook

NFR code	Substance(s)	Reason for not estimation
4 B 3 Sheep	TSP	No EF in Guidebook
4 B 6 Horses	NM VOC, TSP	No EF in Guidebook
4 B 8 Swine	TSP	No EF in Guidebook
4 B 9 a Laying hens	TSP	No EF in Guidebook
6 A Solid waste disposal on land	NH <sub>3</sub> , TSP, Hg	No EF in Guidebook
6 C a Clinical waste incineration	NH <sub>3</sub> , Se, Zn	No EF in Guidebook

### 1.8.2. Sources reported as “NO”

**Table 20** Explanation to the Notation Key “NO”

NFR code	Substance(s)	Reason for not estimation
1 A 1 c Manufacture of solid fuels and other energy industries	All pollutants	Source does not exist in Macedonia
1 A 3 d i (ii) International inland waterways	All pollutants	Source does not exist in Macedonia
1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation	All pollutants	Source does not exist in Macedonia
1 B 1 c Other fugitive emissions from solid fuels	All pollutants	Source does not exist in Macedonia
1 B 2 a i Exploration, production, transport	All pollutants	Source does not exist in Macedonia
1 B 2 b Natural gas	All pollutants	Source does not exist in Macedonia
2 B 1 Ammonia production	All pollutants	Source does not exist in Macedonia
2 B 2 Nitric acid production	All pollutants	Source does not exist in Macedonia
2 B 3 Adipic acid production	All pollutants	Source does not exist in Macedonia
2 B 4 Carbide production	All pollutants	Source does not exist in Macedonia
2C5a Cooper production	All pollutants	Source does not exist in Macedonia
2 C 5 c Nickel production	All pollutants	Source does not exist in Macedonia
2 C 5 d Zinc production	All pollutants	Source does not exist in Macedonia
2 E Production of POPs	All pollutants	Source does not exist in Macedonia
6 B Waste-water handling	All pollutants	Source does not exist in Macedonia
6 C b Industrial waste incineration (d)	All pollutants	Source does not exist in Macedonia
6 C c Municipal waste incineration (d)	All pollutants	Source does not exist in Macedonia
6 C d Cremation	All pollutants	Source does not exist in Macedonia
6 D Other waste(e)	All pollutants	Source does not exist in Macedonia

### **1.8.2. Use of notification key "NA"**

In Macedonian inventory for 2010, notification key "NA" is used only for emissions of certain pollutants which were already pre-filled in the emission inventory template "Annex IV-Table 1".

## CHAPTER 2. EXPLANATION OF KEY TRENDS

This chapter gives an overview of the methodology for the key source analysis by observed pollutants, the results of key sources analysis with an overview of the change in share from 1990 to 2010 and overview and analysis of pollutants time series.

Comparisons are made regarding key categories of SO<sub>2</sub>, NO<sub>x</sub>, CO, NMVOC, NH<sub>3</sub> and TSP, and heavy metals: Pb, Cd, Hg, As, Cr, Cu, Ni, Se, and Zn.

For each pollutant are explained any time series inconsistencies, and significant changes in the time trend for pollutants.

### 2.1. Used methodology for key source analysis

Identification of key source categories of individual pollutant was made using methodology that follows the quantitative approach 1 described in "IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories". As described in Approach 1, key categories are identified using a predetermined cumulative emissions threshold. Key categories are those which when summed together cumulatively add up to 80% of the total level.

### 2.2. Total National Emissions

National total emissions and trends for 1990 - 2010 for air pollutants in Republic of Macedonia are shown in Table 21.

**Table 21** Total national emissions and trends for time period 1990-2010

Year	Main pollutants					Particulate matter	Priority heavy metals		
	NO <sub>x</sub> Gg	NMVOC Gg	SO <sub>x</sub> Gg	NH <sub>3</sub> Gg	CO Gg	TSP Gg	Pb Mg	Cd Mg	Hg Mg
1990	34,43	31,61	97,25	9,69	115,94	33,04	96,31	0,20	0,24
1991	27,29	27,36	95,82	9,61	96,96	19,13	89,95	0,42	0,57
1992	27,88	29,49	90,87	9,16	104,37	15,74	97,47	0,38	0,53
1993	30,46	30,07	97,12	9,29	107,64	18,80	99,71	0,33	0,47
1994	27,30	26,46	95,91	9,38	98,59	15,97	88,65	0,29	0,42
1995	29,48	28,28	101,90	9,42	100,79	17,56	97,63	0,38	0,55
1996	29,64	29,37	99,84	8,93	109,12	21,33	99,76	0,44	0,63
1997	30,34	30,12	104,19	8,80	104,91	18,55	102,57	0,36	0,52
1998	29,65	30,42	99,73	8,25	99,31	17,76	103,21	0,38	0,54
1999	31,15	29,97	108,27	8,38	106,04	16,71	100,47	0,36	0,51
2000	32,01	31,38	105,59	8,39	116,78	18,69	104,80	0,40	0,55
2001	32,30	31,04	112,74	7,94	94,87	16,80	104,33	0,25	0,32
2002	31,56	29,37	102,85	7,91	92,29	17,35	100,14	0,25	0,30
2003	29,81	27,71	101,35	7,59	93,82	12,26	92,73	0,22	0,27
2004	33,61	25,11	100,75	8,28	94,97	29,91	21,09	0,15	0,24
2005	29,65	25,08	100,29	7,36	87,19	11,92	22,76	0,15	0,28
2006	25,03	25,28	86,39	7,36	87,17	11,42	6,74	0,16	0,28
2007	35,06	26,20	100,08	8,06	97,98	23,86	5,65	0,14	0,24
2008	36,56	27,83	113,57	7,03	97,82	27,32	7,25	0,17	0,39
2009	25,94	22,54	84,78	9,62	67,70	19,48	7,12	0,17	0,30
2010	28,97	25,17	83,15	9,77	69,58	15,99	7,48	0,18	0,39
<b>1990-2010 (%1990)</b>	<b>-16%</b>	<b>-20%</b>	<b>-14%</b>	<b>1%</b>	<b>-40%</b>	<b>-52%</b>	<b>-92%</b>	<b>-10%</b>	<b>65%</b>
<b>1990-2000</b>	<b>-7%</b>	<b>-1%</b>	<b>9%</b>	<b>-13%</b>	<b>1%</b>	<b>-43%</b>	<b>9%</b>	<b>102%</b>	<b>129%</b>

Year	Main pollutants					Particulate matter	Priority heavy metals		
	NO <sub>x</sub> Gg	NMVOG Gg	SO <sub>x</sub> Gg	NH <sub>3</sub> Gg	CO Gg	TSP Gg	Pb Mg	Cd Mg	Hg Mg
(%1990)									
<b>2000-2010 (%2000)</b>	<b>-10%</b>	<b>-20%</b>	<b>-21%</b>	<b>16%</b>	<b>-40%</b>	<b>-14%</b>	<b>-93%</b>	<b>-55%</b>	<b>-28%</b>

The emissions of all pollutants showed downward trend in the period 1990-2010 with an exception of Hg.

**Table 22** Total national emissions and trends for other heavy metals for time period 1990-2010

Year	Other heavy metals					
	As Mg	Cr Mg	Cu Mg	Ni Mg	Se Mg	Zn Mg
1990	1,02	2,45	0,82	5,93	2,69	4,87
1991	2,14	2,43	0,86	4,81	2,90	11,85
1992	1,99	1,59	0,90	4,06	2,79	10,38
1993	1,94	1,29	1,02	5,26	2,84	9,65
1994	1,84	0,94	0,83	3,84	2,92	7,89
1995	1,99	0,94	0,91	4,19	3,07	9,55
1996	2,11	1,12	0,95	5,03	2,97	11,37
1997	2,24	1,27	0,97	5,00	3,10	10,41
1998	2,24	1,48	0,98	5,21	2,93	11,07
1999	2,08	1,44	1,01	6,10	3,20	9,92
2000	2,13	1,82	1,07	6,74	2,99	11,73
2001	1,98	2,13	1,01	6,15	3,35	7,80
2002	1,67	3,02	1,09	10,23	2,94	7,87
2003	1,35	2,41	0,96	7,12	3,02	5,83
2004	1,09	2,49	0,77	4,50	2,93	3,77
2005	1,24	4,32	0,83	5,09	2,89	5,38
2006	1,27	4,34	0,84	5,81	2,95	5,64
2007	1,09	3,27	0,94	6,62	2,74	4,19
2008	1,38	4,85	0,88	6,22	3,18	7,27
2009	1,33	4,59	0,90	5,82	3,11	5,93
2010	1,38	5,79	1,19	5,51	2,87	7,29
<b>1990-2010 (%1990)</b>	<b>35%</b>	<b>136%</b>	<b>44%</b>	<b>-7%</b>	<b>7%</b>	<b>50%</b>
<b>1990-2000 (%1990)</b>	<b>109%</b>	<b>-26%</b>	<b>30%</b>	<b>14%</b>	<b>11%</b>	<b>141%</b>
<b>2000-2010 (%2000)</b>	<b>-35%</b>	<b>218%</b>	<b>11%</b>	<b>-18%</b>	<b>-4%</b>	<b>-38%</b>

The total national emissions are presented in graphical shape in the figure 2.



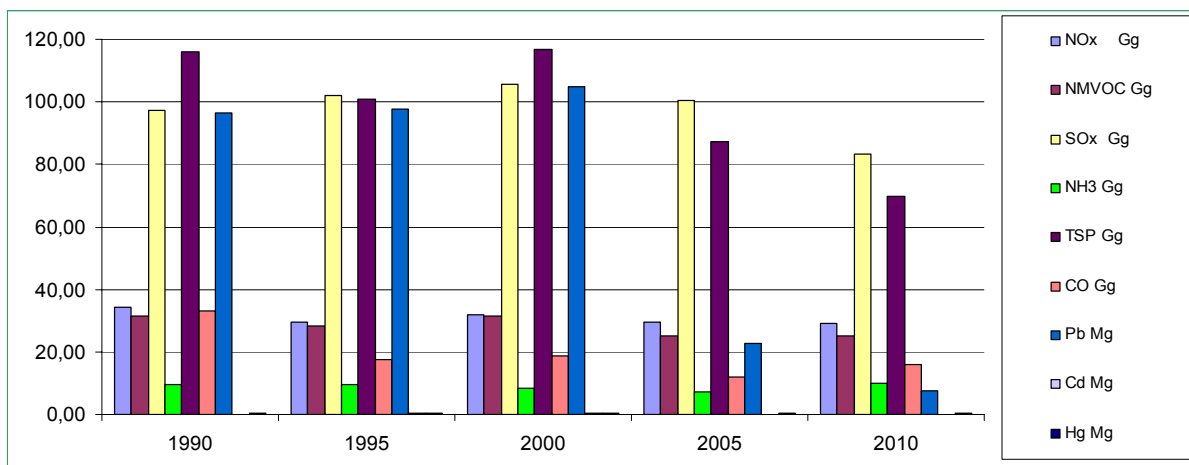


Figure 2 Total national emissions 1990-2010

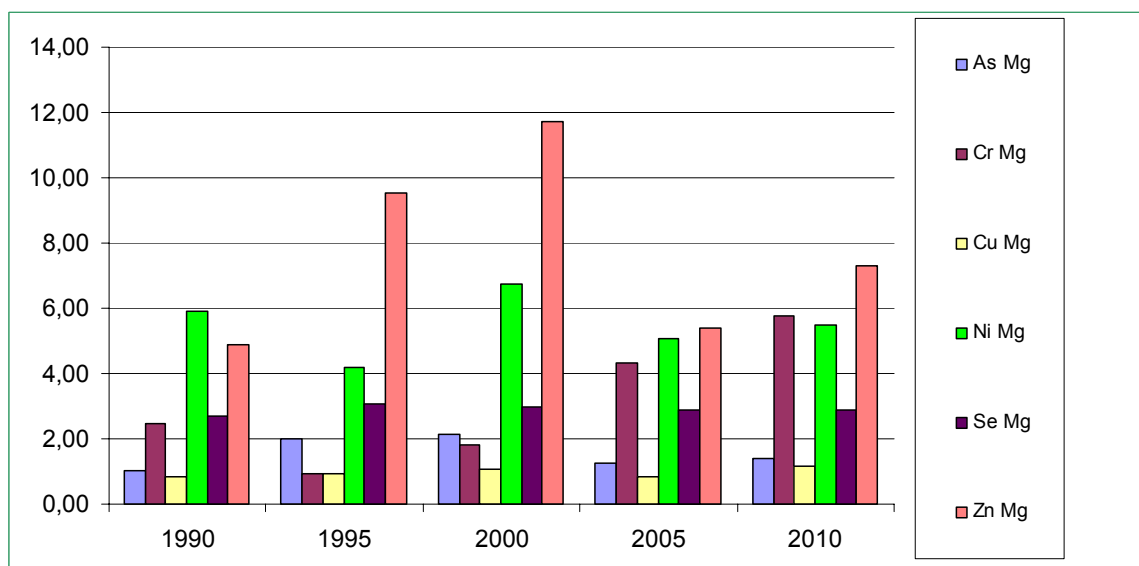


Figure 3 Total national emissions for other heavy metals 1990-2010

### 2.3. Emissions of Large Point Sources (LPS) in 2010

Overview of the total emissions of large point sources (LPSs) is shown in Table 2-2. LPSs emissions reported in the EPR were used, and all other pollutant emissions required under the LRTAP Convention were calculated. The table also shows the share of VTI in total national emissions individual pollutants in 2010.

**Table 23** Emissions from LPS and their contribution to Macedonian total in 2010

LPS	NOx (as NO <sub>2</sub> )	NMVOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	CO	Pb	Cd	Hg
	Gg	Gg	Gg	Gg	Gg	Gg	Gg	Mg	Mg	Mg
001-REK Bitola	10,25779	0,07484	66,91776	NE	NE	NE	0,36232	0,792447	0,092452	0,154087
002-REK Oslomej	1,66987	0,01218	10,16974	NE	NE	NE	0,05898	0,129003	0,015050	0,025084
003-Rafinerija OKTA	0,24066	0,00760	0,45950	NE	NE	NE	0,08733	0,007526	0,002390	0,000263
004-Cementarnica USJE	1,06857	0,06894	0,25784	NE	NE	NE	0,68940	0,000068	0,000006	0,000076
006-Makstil	0,08907	0,01525	0,01788	NE	NE	NE	0,51446	0,759044	0,058742	0,014740
007-Feni Industri	0,24613	0,02217	0,36633	NE	NE	NE	0,08888	0,035893	0,000816	0,000268
008-Mittal Steel	0,02153	0,00077	0,00015	NE	NE	NE	0,00769	0,000062	0,000154	0,000062
009-ESM Energetika	0,05614	0,00095	0,00019	NE	NE	NE	0,02460	0,000126	0,000315	0,000063
011-Toplana ZAPAD	0,20776	0,00222	0,46867	NE	NE	NE	0,00676	0,004735	0,001256	0,000387
012-Toplana ISTOK	0,51600	0,00364	0,86851	NE	NE	NE	0,06644	0,009065	0,003064	0,000863
013-TetekS	0,02050	0,00021	0,12155	NE	NE	NE	0,00098	0,001641	0,000181	0,000298
<b>LPS Total</b>	<b>14,39401</b>	<b>0,20878</b>	<b>79,64811</b>	<b>NE</b>	<b>NE</b>	<b>NE</b>	<b>1,90784</b>	<b>1,739611</b>	<b>0,174426</b>	<b>0,196191</b>
<b>Macedonian Total</b>	<b>28,96716</b>	<b>25,16829</b>	<b>83,15342</b>	<b>9,77473</b>	<b>NE</b>	<b>NE</b>	<b>69,57571</b>	<b>7,481539</b>	<b>0,176490</b>	<b>0,393928</b>
<b>SHARE LCP IN MACEDONIAN TOTAL</b>	<b>49,69%</b>	<b>0,829%</b>	<b>95,78%</b>	<b>0%</b>	<b>NE</b>	<b>NE</b>	<b>2,74%</b>	<b>23,25%</b>	<b>98.83%</b>	<b>49,80%</b>

## 2.4. Key sources and Trends by pollutants

### 2.4.1. Key Sources and Trends for NOx

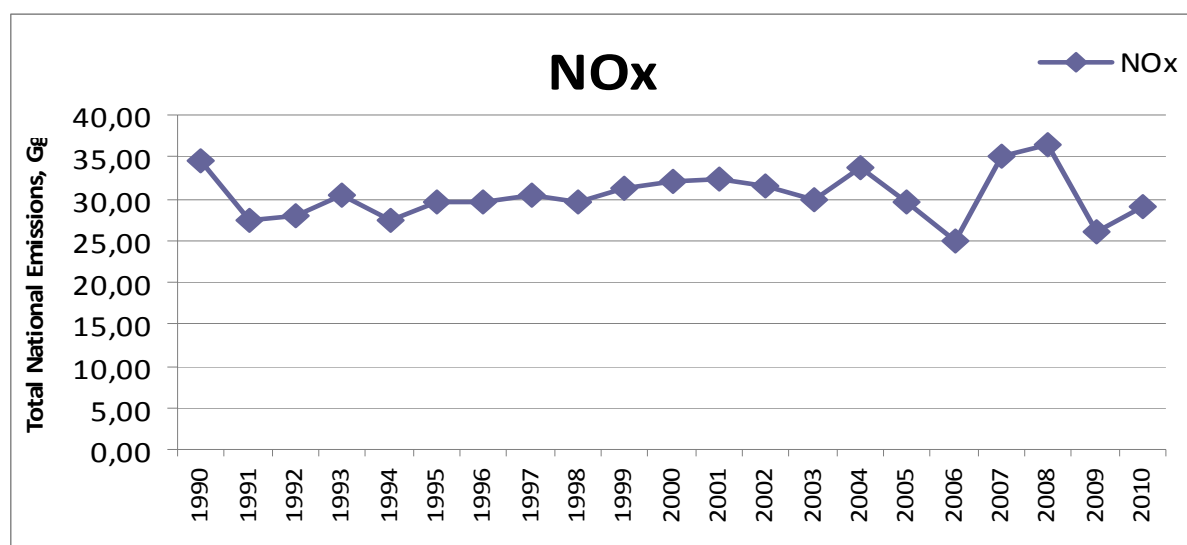
Macedonian NOx emissions decreased by 5,46 Gg in the 1990-2010 period, corresponding to 16% of the national total in 1990 and decreased by 3,04 Gg in the 2000-2010 period, corresponding to 10% of the national total in 2000.

The key and main sources and their contributions to the total NOx emissions for 2010 are presented in Table 24.

**Table 24** Key sources and contributions to total NOx emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010
	NFR name	Gg	
NO <sub>x</sub>	1 A 1 a Public electricity and heat production	12,38	42,75
	1 A 3 b i Road transport: Passenger cars	3,16	10,90
	1 A 3 b ii Road transport: Light duty vehicles	1,40	4,83
	1 A 3 b iii Road transport:, Heavy duty vehicles	6,92	23,90
	<b>Total</b>	<b>23,86</b>	<b>82,38</b>
	<b>Main sources</b>		
	1 Energy	28,91	99,81
	1A Energy – fuel combustion	28,90	99,75
	1B Energy – fugitive emissions from fuels	0,02	0,06
	2 Industrial processes	0,00	0,00
	3 Solvents and other product use	0,00003	0,00009
	4 Agriculture	0,05	0,19
	6 Waste	0,00064	0,00222
	<b>Total</b>	<b>28,96</b>	<b>100 %</b>

The trends of NOx emission for the time period 1990-2010 are showed in the chart 4.



**Figure 4** Emissions of NOx through time period 1990-2010

Chart 4 presents that highest emission of NO<sub>x</sub> occur in 2008 (36,56 Gg), and the lowest emission occur in 2006 (25,03 Gg). Decreasing is a result of activity data variations, as well use of default emission factors taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009, which, compared with the previous used emission factors, have lower values.

#### 2.4.2. Key Sources and Trends for NMVOC

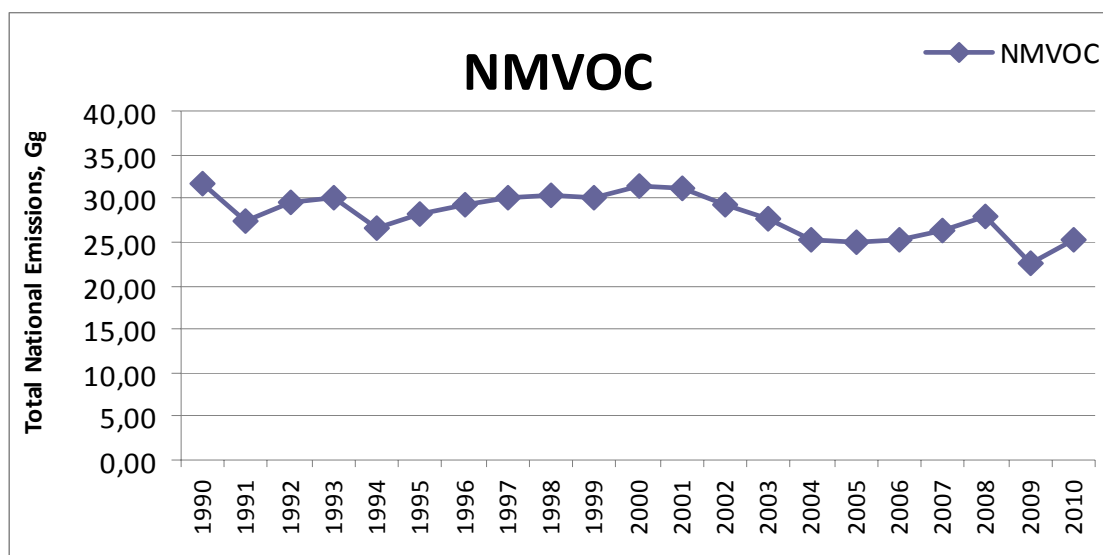
NMVOC emissions in 2010 decreased by 6,45 Gg in the 1990-2010 period, corresponding to 20% of the national total in 1990 and decreased by 6,21 Gg in the 2000-2010 period, corresponding to 20% of the national total in 2000.

The key and main sources and their contributions to the total NMVOC emissions for 2010 are presented in Table 25.

**Table 25** Key sources and contributions to total NMVOC emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Gg		
NMVOC	1 A 3 b i Road transport: Passenger cars	2,319	9,21	
	1 A 3 b v Road transport: Gasoline evaporation	1,586	6,30	
	1 A 4 b i Residential: Stationary plants	6,883	27,35	
	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	5,379	21,37	
	2 D 2 Food and drink	0,631	2,51	
	3 D 2 Domestic solvent use including fungicides	2,055	8,17	
	4 B 1 a Cattle dairy	1,836	7,30	
	4 B 1 b Cattle non-dairy	0,924	3,67	
	4 B 8 Swine	0,743	2,95	
	4 B 9 a Laying hens	0,598	2,38	
	<b>Total</b>	<b>22,955</b>	<b>91,20</b>	
	<b>Main sources</b>			
	1 Energy	17,95	71,31	
	1A Energy – fuel combustion	12,34	49,01	
	1B Energy – fugitive emissions from fuels	5,61	22,30	
	2 Industrial processes	0,80	3,18	
	3 Solvents and other product use	2,06	8,17	
	4 Agriculture	4,26	16,92	
	6 Waste	0,11	0,43	
	<b>Total</b>	<b>25,17</b>	<b>100 %</b>	

The trends of NMVOC emission for the time period 1990-2010 are showed in the chart 5.



**Figure 5** Emissions of NMVOC through time period 1990-2010

From the Chart it can be noted that there are no big amplitude variations in NMVOC emissions from 1990-2010. The highest emissions occur in 1990 (36,61 Gg), and the lowest in 2009 (22,54 Gg). NMVOC total emissions decreased due to use of default emission factors taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009, which have lower value compared with the previous used emission factors.

#### 2.4.3. Key Sources and Trends for SO<sub>x</sub>

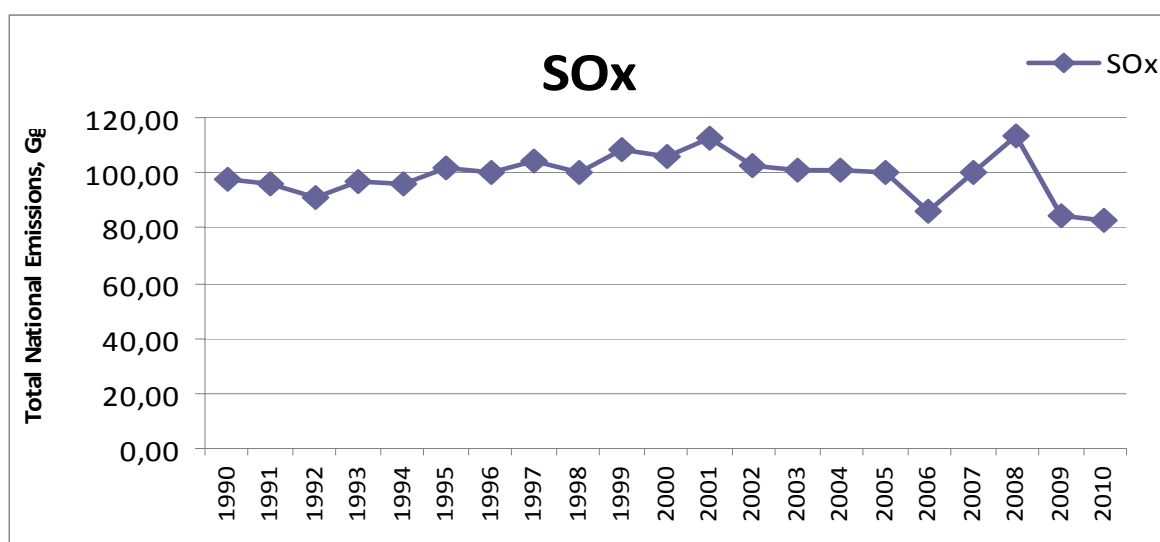
SO<sub>x</sub> emissions decreased by 14,09 Gg in the 1990-2010 period, corresponding to 14% of the national total in 1990 and decreased by 22,44 Gg in the 2000-2010 period, corresponding to 21% of the national total in 2000.

The key and main sources and their contributions to the total SO<sub>x</sub> emissions for 2010 are presented in Table 26.

**Table 26** Key sources and contributions to total SO<sub>x</sub> emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Gg		
SO <sub>x</sub>	1 A 1 a Public electricity and heat production	78,462	94,36	
	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	2,489	2,99	
	<b>Total</b>	<b>80,951</b>	<b>97,35</b>	
	<b>Main sources</b>			
	1 Energy	83,153	99,9992	
	1A Energy – fuel combustion	83,150	99,9962	
	1B Energy – fugitive emissions from fuels	0,00247	0,0029	
	2 Industrial processes	0,000	0,0000	
	3 Solvents and other product use	0,000	0,0000	
	4 Agriculture	0,000	0,0000	
	6 Waste	0,00064	0,0007	
<b>Total</b>	<b>83,153</b>	<b>100 %</b>		

The trends of SO<sub>x</sub> emission for the time period 1990-2010 are showed in the chart 6.



**Figure 6** Emissions of SO<sub>x</sub> through time period 1990-2010

In SO<sub>x</sub> emissions from 1990-2010 there are no big amplitude variations. The lowest emissions are in 2006 (86,39 Gg) and in 2010 (83,15 Gg) as a result of activity data variations. The decline in 2010 is a result of use of fossil fuels with better quality (sulphur content in the fuel is decreased due to use of low sulphur fuels in combustion facilities).

#### 2.4.4. Key Sources and Trends for NH<sub>3</sub>

NH<sub>3</sub> emissions increased by 0,08 Gg in the 1990-2010 period, corresponding to 1% of the national total in 1990 and increased by 1,38 Gg in the 2000-2010 period, corresponding to 16% of the national total in 2000.

The key and main sources and their contributions to the total NH<sub>3</sub> emissions for 2010 are presented in Table 27.

**Table 27** Key sources and contributions to total NH<sub>3</sub> emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Gg		
NH <sub>3</sub>	4 B 1 a Cattle dairy	4,590	46,96	
	4 B 1 b Cattle non-dairy	1,411	14,44	
	4 B 3 Sheep	1,090	11,15	
	4 B 8 Swine	1,258	12,87	
	<b>Total</b>	<b>8,349</b>	<b>85,41</b>	
	<b>Main sources</b>			
	1 Energy	0,064	0,66	
	1A Energy – fuel combustion	0,064	0,66	
	1B Energy – fugitive emissions from fuels	0,000	0,00	
	2 Industrial processes	0,000	0,00	
	3 Solvents and other product use	0,000	0,00	
	4 Agriculture	9,710	99,34	
	6 Waste	0,000	0,00	
	<b>Total</b>	<b>9,775</b>	<b>100 %</b>	

The trends of NH<sub>3</sub> emission for the time period 1990-2010 are showed in the chart 7.

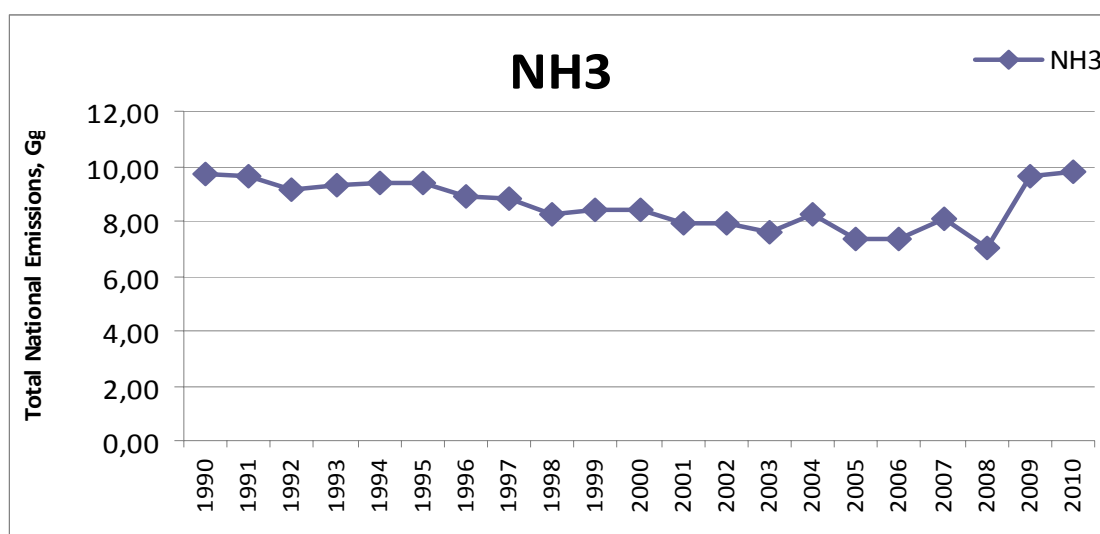


Figure 7 Emissions of NH<sub>3</sub> through time period 1990-2010

From the Chart It can be seen that highest emission of NH<sub>3</sub> occur in 2010 (9,77 Gg), and the lowest emission occur in 2008 (7,03 Gg). Increasing is a result of use of default emission factors taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009, which have higher values compared with the previous used emission factors.

#### 2.4.5. Key Sources and Trends for CO

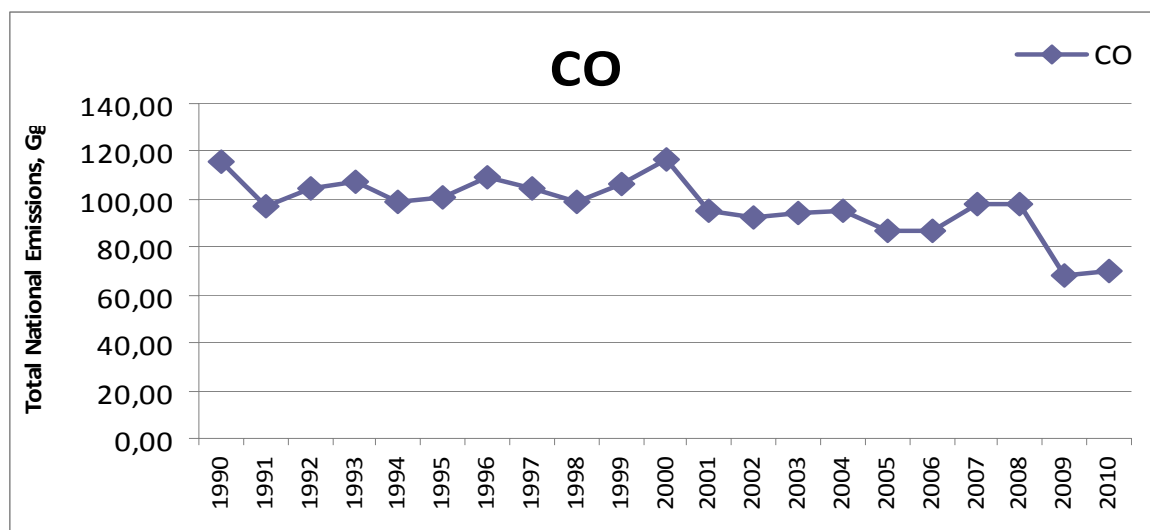
CO emissions decreased by 46,37 Gg in the 1990-2010 period, corresponding to 40% of the national total in 1990 and decreased by 47,20 Gg in the 2000-2010 period, corresponding to 40% of the national total in 2000.

The key and main sources and their contributions to the total CO emissions for 2010 are presented in Table 28.

Table 28 Key sources and contributions to total CO emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Gg		
CO	1 A 3 b i Road transport: Passenger cars	20,074	28,85	
	1 A 4 b i Residential: Stationary plants	39,427	56,67	
	<b>Total</b>	<b>59,501</b>	<b>85,52</b>	
	<b>Main sources</b>			
	1 Energy	69,573	99,9965	
	1A Energy – fuel combustion	69,569	99,9908	
	1B Energy – fugitive emissions from fuels	0,004	0,0057	
	2 Industrial processes	0,00031	0,0004	
	3 Solvents and other product use	0,00087	0,0013	
	4 Agriculture	0,000	0,0000	
6 Waste	0,00128	0,0018		
<b>Total</b>	<b>69,576</b>	<b>100 %</b>		

The trends of CO emission for the time period 1990-2010 are showed in the chart 8.



**Figure 8** Emissions of CO through time period 1990-2010

The highest emission of CO occur in 2000 (116,78 Gg), and the lowest emission occur in 2009 (67,70 Gg). Decreasing is a result of use of default emission factors taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009, which compared with the previous used emission factors, have lower values.

#### 2.4.6. Key Sources and Trends for TSP

TSP emissions decreased by 17,04 Gg in the 1990-2010 period, corresponding to 52% of the national total in 1990 and decreased by 2,70 Gg in the 2000-2010 period, corresponding to 14% of the national total in 2000.

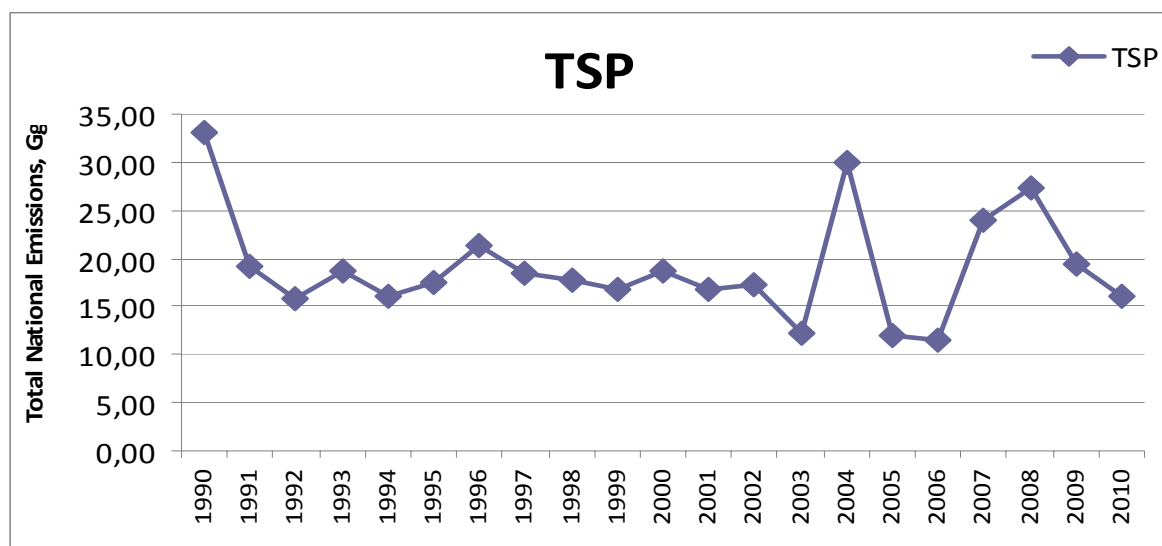
The key and main sources and their contributions to the total TSP emissions for 2010 are presented in Table 29.

**Table 29** Key sources and contributions to total TSP emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Gg		
TSP	1 A 1 a Public electricity and heat production	4,242	26,52	
	1 A 4 b i Residential: Stationary plants	5,415	33,86	
	2 A 6 Road paving with asphalt	4,062	25,40	
	<b>Total</b>	<b>13,718</b>	<b>85,78</b>	
	<b>Main sources</b>			
	1 Energy	11,014	68,8729	
	1A Energy – fuel combustion	11,014	68,8729	
	1B Energy – fugitive emissions from fuels	0,000	0,0000	
	2 Industrial processes	4,977	31,1239	
	3 Solvents and other product use	0,00029	0,0018	
	4 Agriculture	0,000	0,0000	
	6 Waste	0,00023	0,0014	
	<b>Total</b>	<b>15,992</b>	<b>100 %</b>	

The trends of TSP emission for the time period 1990-2010 are showed in the chart 9.





**Figure 9** Emissions of TSP through time period 1990-2010

The variations in TSP total emissions from 1990-2010 are related with activity rates variations through the years in that period, as well as use of emission factors, taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009, with significantly different values in comparison to previous emission factors.

#### 2.4.7. Key Sources and Trends for Pb

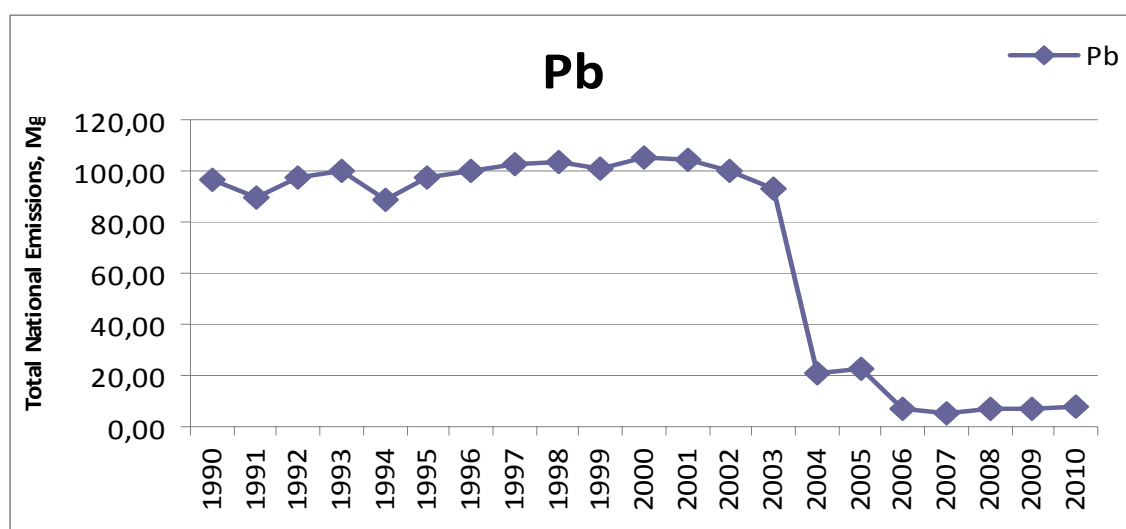
Pb emissions decreased by 88,83 Mg in the 1990-2010 period, corresponding to 92% of the national total in 1990 and decreased by 97,32 Mg in the 2000-2010 period, corresponding to 93% of the national total in 2000.

The key and main sources and their contributions to the total Pb emissions for 2010 are presented in Table 30.

**Table 30** Key sources and contributions to total Pb emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
Pb	1 A 1 a Public electricity and heat production	0,928	12,41	
	2 C 1 Iron and steel production	5,020	67,10	
	2 C 5 b Lead production	0,439	5,87	
	<b>Total</b>	<b>6,388</b>	<b>85,38</b>	
	<b>Main sources</b>			
	1 Energy	2,016	26,95	
	1A Energy – fuel combustion	2,016	26,95	
	1B Energy – fugitive emissions from fuels	0,000	0,00	
	2 Industrial processes	5,459	72,97	
	3 Solvents and other product use	3,57E-07	4,77E-06	
	4 Agriculture	0,000	0,00	
	6 Waste	0,00596	0,08	
	<b>Total</b>	<b>7,482</b>	<b>100 %</b>	

The trends of Pb emission for the time period 1990-2010 are showed in the chart 10.



**Figure 10** Emissions of Pb through time period 1990-2010

The big decline in the trend of Pb emissions from 2003 and 2004 is related with the main source of these emissions – Road transport and Lead production. From 2004 the content of Pb in the gasoline decreased from 0,0006 kg/l to 0,00015 kg/l. Also in 2003 the Pb-Zn smelter “Zletovo” – Veles stopped with the production of lead and zinc. From 2006 in Macedonia, passenger cars can use only unleaded gasoline fuels and accordingly additionally reduced the Pb emissions.

#### 2.4.8. Key Sources and Trends for Cd

Cd emissions decreased by 0,02 Mg in the 1990-2010 period, corresponding to 10% of the national total in 1990 and decreased by 0,22 Mg in the 2000-2010 period, corresponding to 55% of the national total in 2000.

The key and main sources and their contributions to the total Cd emissions for 2010 are presented in Table 31.

**Table 31** Key sources and contributions to total Cd emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
Cd	1 A 1 a Public electricity and heat production	0,110	62,46	
	1 A 4 b i Residential: Stationary plants	0,0149	8,48	
	2 C 1 Iron and steel production	0,022	12,37	
	<b>Total</b>	<b>0,147</b>	<b>83,30</b>	
	<b>Main sources</b>			
	1 Energy	0,150	85,19	
	1A Energy – fuel combustion	0,150	85,19	
	1B Energy – fugitive emissions from fuels	0,000	0,00	
	2 Industrial processes	0,026	14,55	
	3 Solvents and other product use	7,14E-07	4,05E-04	
	4 Agriculture	0	0,00	
	6 Waste	0,00046	0,26	
	<b>Total</b>	<b>0,176</b>	<b>100 %</b>	

The trends of Cd emission for the time period 1990-2010 are showed in the chart 11.

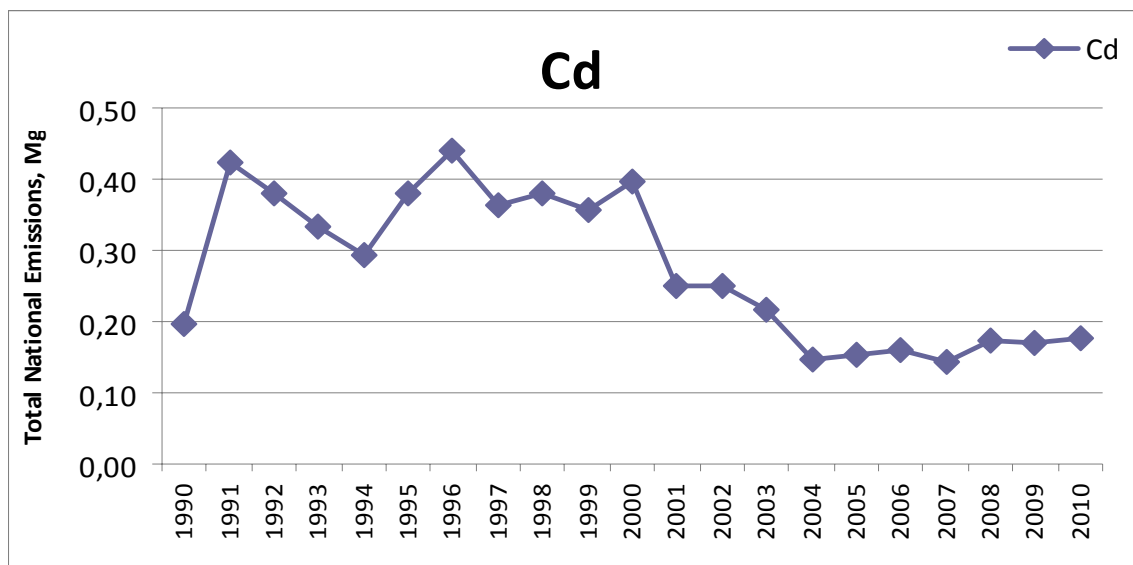


Figure 11 Emissions of Cd through time period 1990-2010

It can be noted that variations in Cd total emissions from 1990-2001 are related with the activity rates and their variations through the years in that period. From 2003 there is a slight decreasing as a result of stopping the production process in the Pb-Zn smelter “Zletovo” – Veles.

#### 2.4.9. Key Sources and Trends for Hg

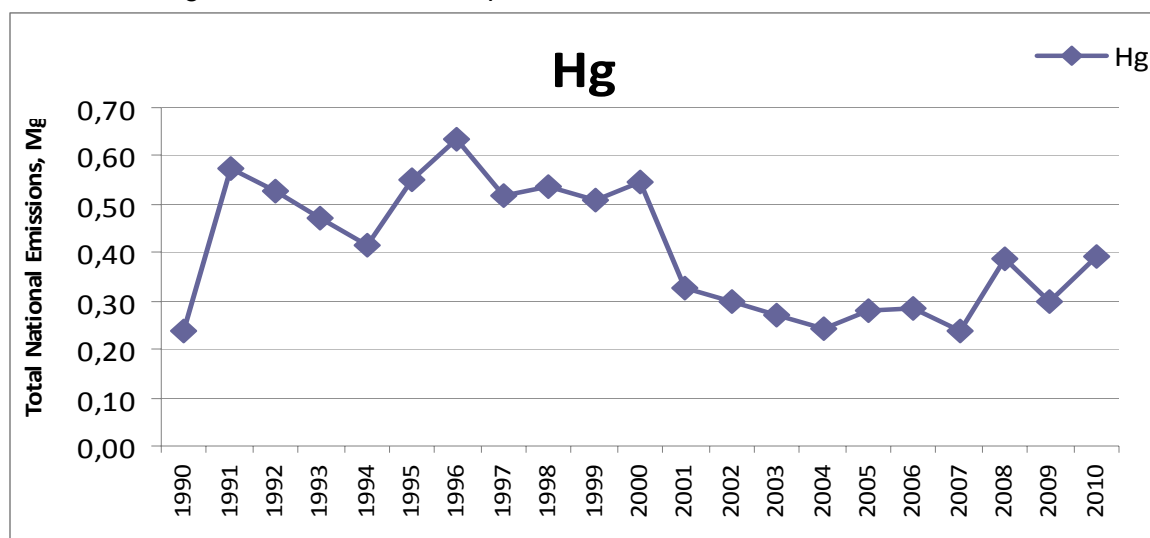
Hg emissions increased by 0,16 Mg in the 1990-2010 period, corresponding to 65% of the national total in 1990 and decreased by 0,15 Mg in the 2000-2010 period, corresponding to 28% of the national total in 2000.

The key and main sources and their contributions to the total Hg emissions for 2010 are presented in Table 32.

Table 32 Key sources and contributions to total Hg emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
Hg	1 A 1 a Public electricity and heat production	0,180	45,67	
	1 A 2 f i Stationary combustion in manufacturing industries and construction: Other	0,07596	19,28	
	2 C 1 Iron and steel production	0,109	27,70	
	<b>Total</b>	<b>0,365</b>	<b>92,66</b>	
	<b>Main sources</b>			
	1 Energy	0,281	71,37	
	1A Energy – fuel combustion	0,281	71,37	
	1B Energy – fugitive emissions from fuels	0,000	0,00	
	2 Industrial processes	0,109	27,70	
	3 Solvents and other product use	7,14E-07	1,81E-04	
	4 Agriculture	0,000	0,00	
	6 Waste	0,00367	0,93	
	<b>Total</b>	<b>0,394</b>	<b>100 %</b>	

The trends of Hg emission for the time period 1990-2010 are showed in the chart 12.



**Figure 12** Emissions of Hg through time period 1990-2010

Variations in Hg total emissions from 1990-2001 are related with the activity rates and their variations through the years in that period. The jump in the Hg total emissions in 2008 is a result of higher activity rate in that year for NFR sectors: 1A2b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals, 1A2fi Stationary combustion in manufacturing industries and construction, 1A4bi Residential: Stationary plants and 2C1 Iron and steel production.

#### 2.4.10. Key Sources and Trends for As

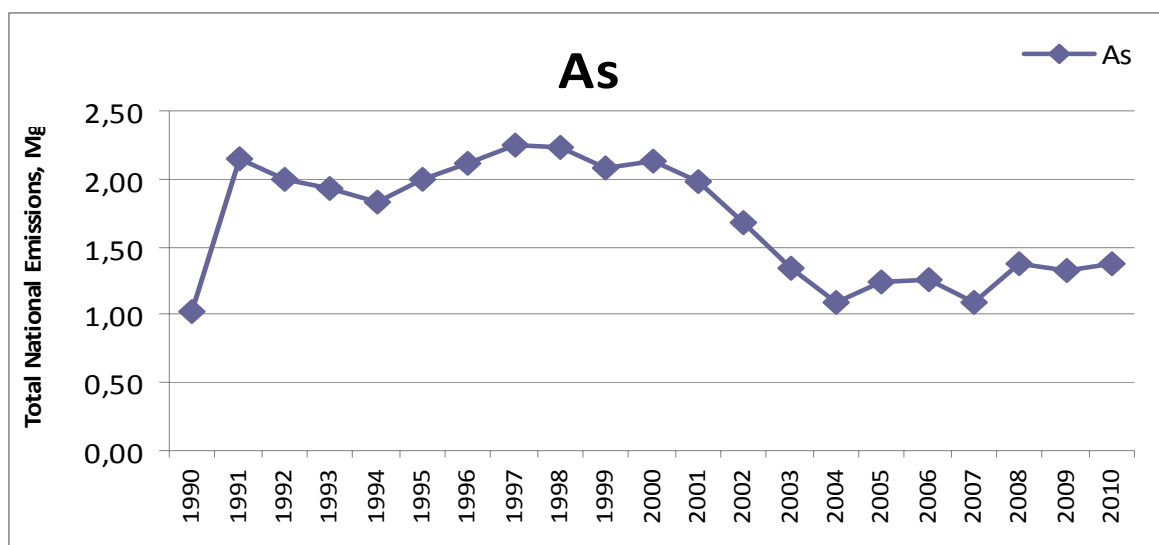
As emissions increased by 0,36 Mg in the 1990-2010 period, corresponding to 35% of the national total in 1990 and decreased by 0,75 Mg in the 2000-2010 period, corresponding to 35% of the national total in 2000.

The key and main sources and their contributions to the total As emissions for 2010 are presented in Table 33.

**Table 33** Key sources and contributions to total As emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
As	1 A 1 a Public electricity and heat production	0,876	63,54	
	2 C 1 Iron and steel production	0,436	31,66	
	<b>Total</b>	<b>1,313</b>	<b>95,20</b>	
	<b>Main sources</b>			
	1 Energy	0,9296	67,41	
	1A Energy – fuel combustion	0,9296	67,41	
	1B Energy – fugitive emissions from fuels	0,0000	0,00	
	2 Industrial processes	0,4488	32,54	
	3 Solvents and other product use	1,14E-06	8,29E-05	
	4 Agriculture	0,0000	0,00	
	6 Waste	0,0006	0,04	
	<b>Total</b>	<b>1,379</b>	<b>100 %</b>	

The trends of As emission for the time period 1990-2010 are showed in the chart 13.



**Figure 13** Emissions of As through time period 1990-2010

The Chart above presents variations in As total emissions from 1990-2010 which are related with the activity rates and their variations through the years in that period. Decreasing in the emissions from 2003 is a result of stopping the production process in the Pb-Zn smelter "Zletovo" – Veles.

#### 2.4.11. Key Sources and Trends for Cr

Cr emissions increased by 3,34 Mg in the 1990-2010 period, corresponding to 136% of the national total in 1990 and increased by 3,97 Mg in the 2000-2010 period, corresponding to 218% of the national total in 2000.

The key and main sources and their contributions to the total Cr emissions for 2010 are presented in Table 34.

**Table 34** Key sources and contributions to total Cr emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
Cr	2 C 1 Iron and steel production	4,911	84,84	
	<b>Total</b>	<b>4,911</b>	<b>84,84</b>	
	<b>Main sources</b>			
	1 Energy	0,8754	15,12	
	1A Energy – fuel combustion	0,8754	15,12	
	1B Energy – fugitive emissions from fuels	0,0000	0,00	
	2 Industrial processes	4,9109	84,84	
	3 Solvents and other product use	2,50E-06	4,32E-05	
	4 Agriculture	0,0000	0,00	
	6 Waste	0,0022	0,04	
	<b>Total</b>	<b>5,788</b>	<b>100 %</b>	

The trends of Cr emission for the time period 1990-2010 are showed in the chart 14.

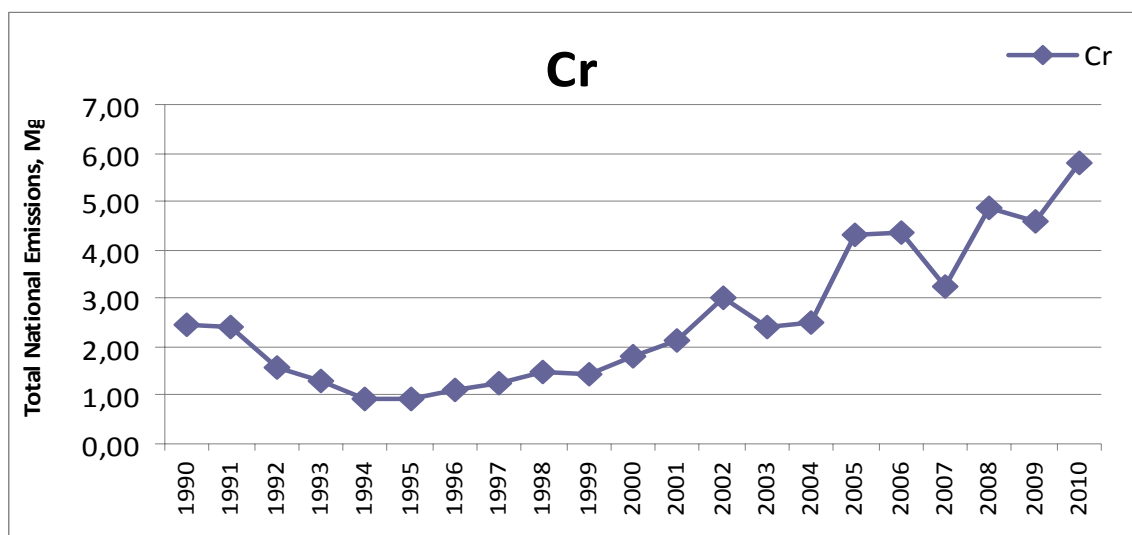


Figure 14 Emissions of Cr through time period 1990-2010

From 17 sectors where occurs emission of chromium, in 9 of them activity date is increasing through the time period.

The largest emission of chromium is in key source sector 2C1 (iron and steel), which accounts for 80% of the total emissions of chromium in 2010. In this sector activity data has upward trend through the time period and therefore the overall trend of emissions of chromium is upwards through the time period.

#### 2.4.12. Key Sources and Trends for Cu

Cu emissions increased by 0,36 Mg in the 1990-2010 period, corresponding to 44% of the national total in 1990 and increased by 0,12 Mg in the 2000-2010 period, corresponding to 11% of the national total in 2000.

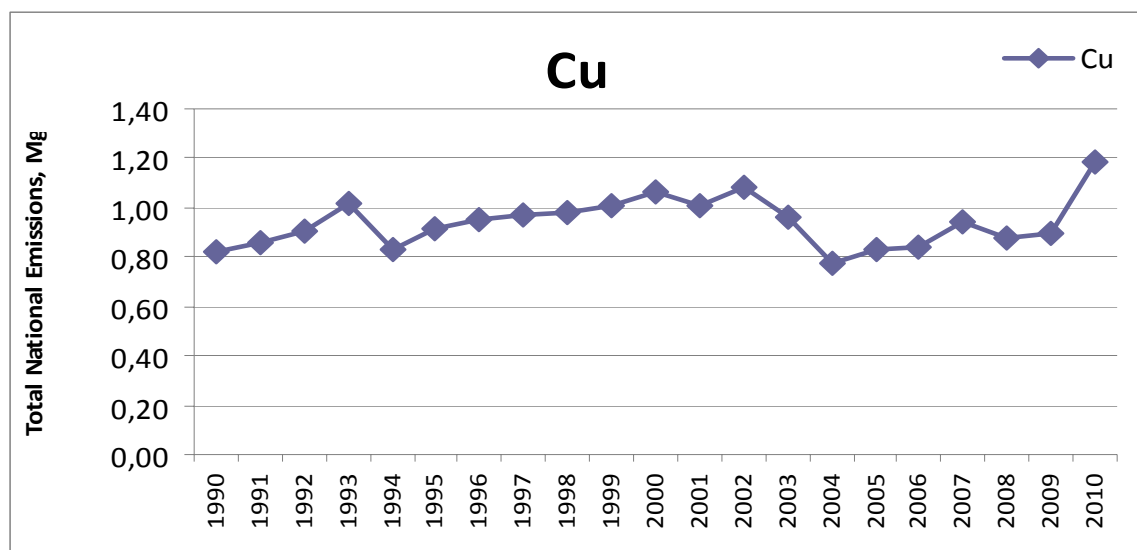
The key and main sources and their contributions to the total Cu emissions for 2010 are presented in Table 35.

Table 35 Key sources and contributions to total Cu emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010	
	NFR name	Mg		
Cu	1A3biii Road transport: Heavy duty vehicles	0,31807	26,83%	
	1A3bi Road transport: Passenger cars	0,29001	24,46%	
	1A3bii Road transport: Light duty vehicles	0,15730	13,27%	
	1A4bi Residential: Stationary plants	0,08783	7,41%	
	2C1 Iron and steel production	0,076	6,44%	
	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,064	5,40%	
	<b>Total</b>	<b>0,994</b>	<b>83,81</b>	
	<b>Main sources</b>			
	1 Energy	1,1079	93,46	
	1A Energy – fuel combustion	1,1079	93,46	
	1B Energy – fugitive emissions from fuels	0,0000	0,00	
2 Industrial processes	0,0764	6,44		

	3 Solvents and other product use	1,07E-06	9,04E-05
	4 Agriculture	0,0000	0,00
	6 Waste	0,0012	0,10
	<b>Total</b>	<b>1,185</b>	<b>100 %</b>

The trends of Cu emission for the time period 1990-2010 are showed in the chart 15.



**Figure 15** Emissions of Cu through time period 1990-2010

Variations of activity rates through the time period are the main reason regarding Cu total emissions variations from 1990-2010. The increased emissions in 2010 are related with increased activity rates for the key category for Cu emissions.

#### 2.4.13. Key Sources and Trends for Ni

Ni emissions decreased by 0,42 Mg in the 1990-2010 period, corresponding to 7% of the national total in 1990 and decreased by 1,23 Mg in the 2000-2010 period, corresponding to 18% of the national total in 2000.

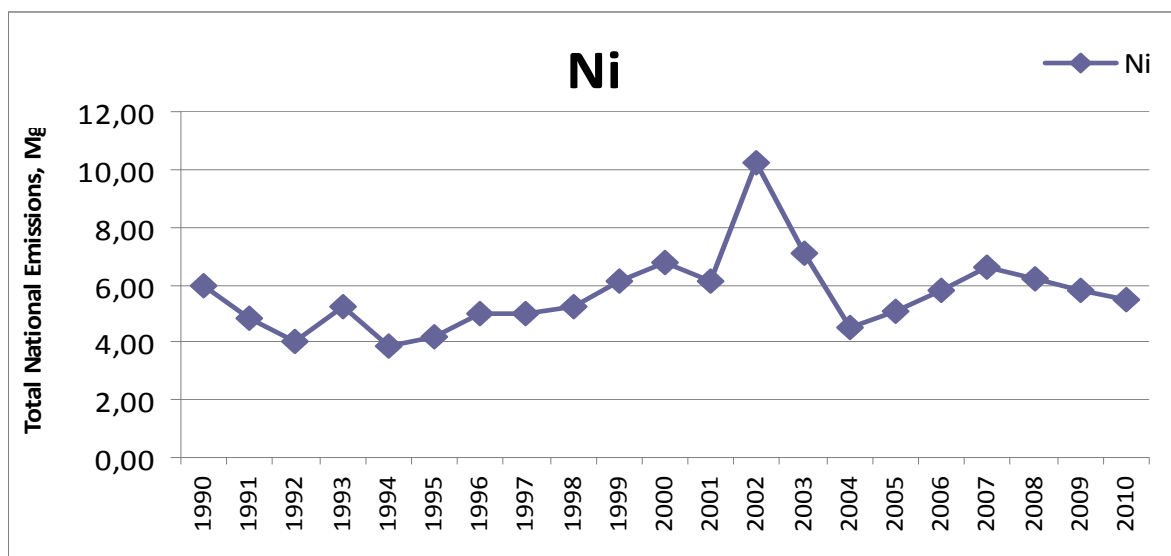
The key and main sources and their contributions to the total Ni emissions for 2010 are presented in Table 36.

**Table 36** Key sources and contributions to total Ni emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010
	NFR name	Mg	
Ni	1A1a Public electricity and heat production	0,982	17,83
	1A1b Petroleum refining	0,976	17,72
	1A4ai Commercial / institutional: Stationary	0,95671	17,37
	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	0,892	16,19
	1A4bi Residential: Stationary plants	0,72959	13,24
	<b>Total</b>	<b>4,537</b>	<b>82,36</b>
	<b>Main sources</b>		
	1 Energy	5,3556	97,22

1A Energy – fuel combustion	5,3556	97,22
1B Energy – fugitive emissions from fuels	0,0000	0,00
2 Industrial processes	0,1528	2,77
3 Solvents and other product use	0,00	0,00
4 Agriculture	0,0000	0,00
6 Waste	0,0002	0,0033
<b>Total</b>	<b>5,509</b>	<b>100 %</b>

The trends of Ni emission for the time period 1990-2010 are showed in the chart 16.



**Figure 16** Emissions of Ni through time period 1990-2010

The jump in emission of Ni in 2002 is result of higher activity rate for liquid fuel in sector 1A4ai commercial / institutional: Stationary. Because this sector is a key category for emissions of Ni, its emissions influence to the total emissions of Ni.

#### 2.4.14. Key Sources and Trends for Se

Se emissions increased by 0,18 Mg in the 1990-2010 period, corresponding to 7% of the national total in 1990 and decreased by 0,12 Mg in the 2000-2010 period, corresponding to 4% of the national total in 2000.

The key and main sources and their contributions to the total Se emissions for 2010 are presented in Table 37.

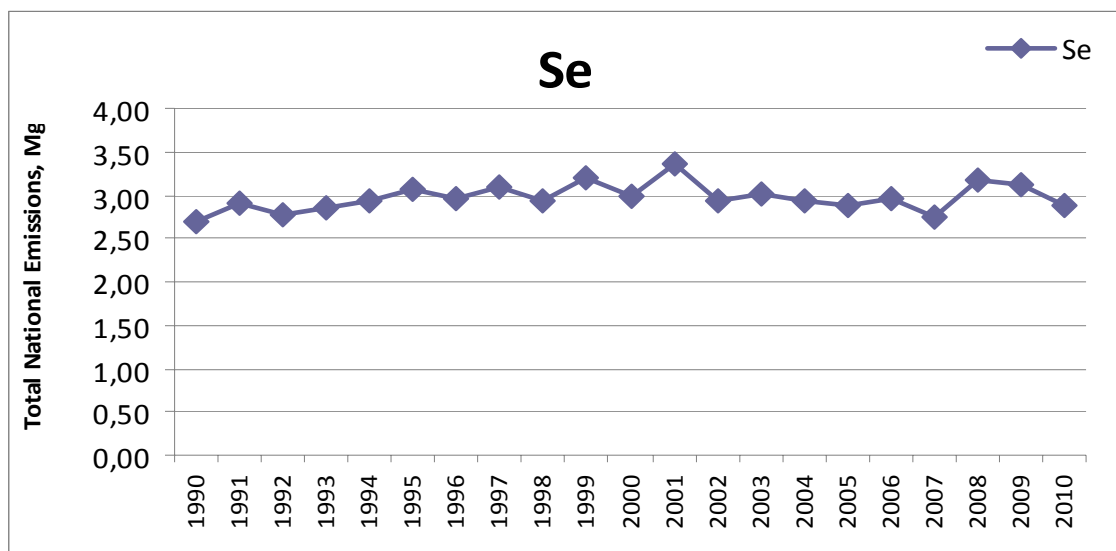
**Table 37** Key sources and contributions to total Se emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010
	NFR name	Mg	
Se	1A1a Public electricity and heat production	2,819	98,18
	<b>Total</b>	<b>2,819</b>	<b>98,18</b>
	<b>Main sources</b>		
	1 Energy	2,8491	99,24
	1A Energy – fuel combustion	2,8491	99,24
	1B Energy – fugitive emissions from fuels	0,0000	0,00



	2 Industrial processes	0,0218	0,76
	3 Solvents and other product use	0,00	0,00
	4 Agriculture	0,0000	0,00
	6 Waste	0,0000	0,00
	<b>Total</b>	<b>2,871</b>	<b>100 %</b>

The trends of Se emission for the time period 1990-2010 are showed in the chart 17.



**Figure 17** Emissions of Se through time period 1990-2010

The main source of Se emissions is energy sector 1A1a Public electricity and heat production. Because of the mainly constant fuel combustion in this sector through the time period, Se emissions have continuous trend.

#### 2.4.15. Key Sources and Trends for Zn

Zn emissions increased by 2,43 Mg in the 1990-2010 period, corresponding to 50% of the national total in 1990 and decreased by 4,44 Mg in the 2000-2010 period, corresponding to 38% of the national total in 2000.

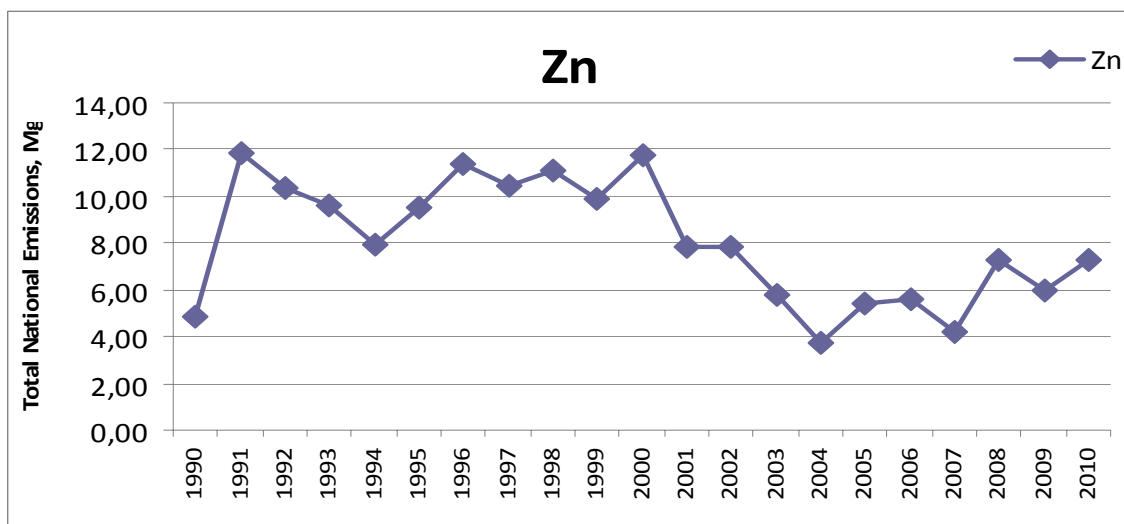
The key and main sources and their contributions to the total Zn emissions for 2010 are presented in Table 38.

**Table 38** Key sources and contributions to total Hg emissions for 2010

Pollutant	Key source during 2010	Emissions in 2010	% of total emission in 2010
	NFR name	Mg	
Zn	2C1 Iron and steel production	4,365	59,85
	1A4bi Residential: Stationary plants	1,00113	13,73
	1A2a Stationary combustion in manufacturing industries and construction: Iron and steel	0,500	6,86
	1A1a Public electricity and heat production	0,384	5,26
	<b>Total</b>	<b>6,250</b>	<b>85,69</b>
	<b>Main sources</b>		
	1 Energy	2,9286	40,15

1A Energy – fuel combustion	2,9286	40,15
1B Energy – fugitive emissions from fuels	0,00	0,00
2 Industrial processes	4,3652	59,85
3 Solvents and other product use	0,00	0,00
4 Agriculture	0,00	0,00
6 Waste	0,00	0,00
<b>Total</b>	<b>7,294</b>	<b>100 %</b>

The trends of Zn emission for the time period 1990-2010 are showed in the chart 18.



**Figure 18** Emissions of Zn through time period 1990-2010

Variations in Zn total emissions from 1990-2010 are related with the activity rates and their variations through the years in that period. From 2003 there is a slight decreasing as a result of stopping the production process in the Pb-Zn smelter “Zletovo” – Veles.

## CHAPTER 3 ENERGY (NFR sector 1)

In this Sector, emissions from combustion processes (Categories from 1A1 to 1A4) and fugitive emissions from fuels (Categories from 1B1 to 1B2) have been taken into account. 1A5 Other stationary (1A5a and 1A5b) have not been estimated (NE).

This Inventory, in Sector 1, includes emissions of 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.

Compared to the 2008 inventory, in Macedonian inventory for 2010, eight additional categories were included in Energy sector. These are: 1A2c Stationary combustion in manufacturing industries and construction: Chemicals, 1A2d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print, 1A2e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco, 1A3bv Road transport: Gasoline evaporation, 1A3b vi Road transport: Automobile tyre and brake wear, 1A3bvii Road transport: Automobile road abrasion, 1A4ci Agriculture/Forestry/Fishing: Stationary, and 1B2aiv Refining / storage.

Table 39 lists NFR categories covered in Energy sector for 2010, while Table 40 categories not included in Energy sector and for which appropriate notation keys are used.

**Table 39** NFR categories covered in Energy sector for 2010

NFR category	Completeness
1 A 1 a Public electricity and heat production	√
1 A 1 b Petroleum refining	√
1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel	√
1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	√
1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals	√
1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	√
1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	√
1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)	√
1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)	√
1 A 3 a i (i) International aviation (LTO)	√
1 A 3 b i Road transport: Passenger cars	√
1 A 3 b ii Road transport: Light duty vehicles	√
1 A 3 b iii Road transport: Heavy duty vehicles	√
1 A 3 b iv Road transport: Mopeds & motorcycles	√
1 A 3 b v Road transport: Gasoline evaporation	√
1 A 3 b vi Road transport: Automobile tyre and brake wear	√
1 A 3 b vii Road transport: Automobile road abrasion	√
1 A 3 c Railways	√

NFR category	Completeness
1 A 4 a i Commercial / institutional: Stationary	√
1 A 4 b i Residential: Stationary plants	√
1 A 4 b ii Residential: Household and gardening (mobile)	√
1 A 4 c i Agriculture/Forestry/Fishing: Stationary	√
1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	√
1 B 1 a Fugitive emission from solid fuels: Coal mining and handling	√
1 B 2 a iv Refining / storage	√
1 B 2 a v Distribution of oil products	√
1 B 2 c Venting and flaring	√
<b>Memo Items</b>	
1 A 3 a i (ii) International aviation (Cruise)	√

**Table 40** NFR categories not included in Energy sector for 2010

NFR category	Notation key used
1 A 1 c Manufacture of solid fuels and other energy industries	NO
1 A 3 a ii (i) Civil aviation (Domestic, LTO)	NE
1 A 3 d i (ii) International inland waterways	NO
1 A 3 d ii National navigation (Shipping)	NE
1 A 3 e Pipeline compressors	NE
1 A 4 a ii Commercial / institutional: Mobile	NE
1A 4 c iii Agriculture/Forestry/Fishing: National fishing	NE
1 A 5 a Other stationary (including military)	NE
1 A 5 b Other, Mobile (including military, land based and recreational boats)	NE
1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation	NO
1 B 1 c Other fugitive emissions from solid fuels	NO
1 B 2 a i Exploration, production, transport	NO
1 B 2 b Natural gas	NO
1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2	NE
<b>Memo Items</b>	
1 A 3 a ii (ii) Civil aviation (Domestic, Cruise)	NE
1 A 3 d i (i) International maritime navigation	NO
1A3 Transport (fuel used)	NE

For the NFR categories that are reported as NE, emissions were not estimated due to the lack of data.

The energy sector is the major contributing sector to the Macedonian national emission inventory. The energy sector contributes by about 99% NO<sub>x</sub>, 71% NMVOC, 99% SO<sub>x</sub>, 99% CO, 26% TSP, 26% Pb, 85% Cd and 71% Hg to the national total in 2010 of these pollutants.

The emission data from this sector are based on calculations based on fuel consumption and emission factors.

The fuel consumption is derived from Macedonian energy balance for 2010 provided by State Statistical Office of Republic of Macedonia.

In this sector, emissions of the following pollutants have been included: SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO, NH<sub>3</sub>, TSP and heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se, and Zn).

Explanations on the source of activity data, methodology and used emission factors are presented in Chapter 3.1 to Chapter 3.7 for each of the Categories.

### 3.1. NFR 1A1 Combustion in energy industries

#### 3.1.1. Completeness

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, with minor difference in caloric value. Calculations also include the quantity of liquid fuel used for plants starting.

The three (3) biggest heat production plants in Republic of Macedonia have been included as LPS. Fuels used are: crude oil and natural gas.

Also, In this sub-sector, emissions from the single refinery in the Republic of Macedonia, which uses crude oil and refinery gas from their own production, have been calculated.

Table 41 presents SNAP categories in correlation with EMEP/NFR for 1A1 sub-sector.

**Table 41** SNAP categories in correlation with EMEP/NFR (1A1)

EMEP/NFR	Title	SNAP
1A1	1A1 Energy industries	
1A1a	1A1a Public electricity and heat production	010101 Combustion plants $\geq 300$ MW (boilers) 010202 Combustion plants $\geq 50 < 300$ 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	NO

In the Air Emission Inventory for 2010 corrections were made according recommendations from Stage 3 in depth review, for e.g. in this case with regard to the use of notation keys.

### 3.1.2. Used methodology

All emissions in this sector are calculated by multiplying fuel consumption by emission factor.

$$Emission (g / year) = Fuel Consumption (GJ/year) * Emission Factor (g / GJ)$$

The fuel consumption is derived from Macedonian energy balance for 2010 provided by State Statistical Office of Republic of Macedonia. The emission factors used are derived from the EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 and for some pollutants in some categories emission factors are based on direct emission measurements.

In the category 1A1a Public electricity and heat production for calculation of NO<sub>x</sub>, NMVOC, TSP, CO and heavy metals emissions, Tier 2 methodology is used, and for SO<sub>x</sub> Tier 3 methodology. In category 1A1b Petroleum refining Tier 2 methodology is used for calculation of emissions from crude oil combustion, and emissions of refinery gas combustion.

### 3.1.3. Activity data

Activity data for emission calculation in this sector are the fuels used.

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.

Table 42 shows fuels included in this sub-sector of the Inventory, as Activity Data in measurement unit t and TJ.

**Table 42** Activity data for 1A1a for 2010

NFR code	Fuel	TJ
1 A 1 a	Lignite	51.191,7
	Crude oil	1.341,0
	Natural gas	1.970,5
1 A 1 b	Crude oil	941,2
	Refinery gas	1.776,0

The trend of fuel consumption in category 1A1, activity data are shown on chart 19.

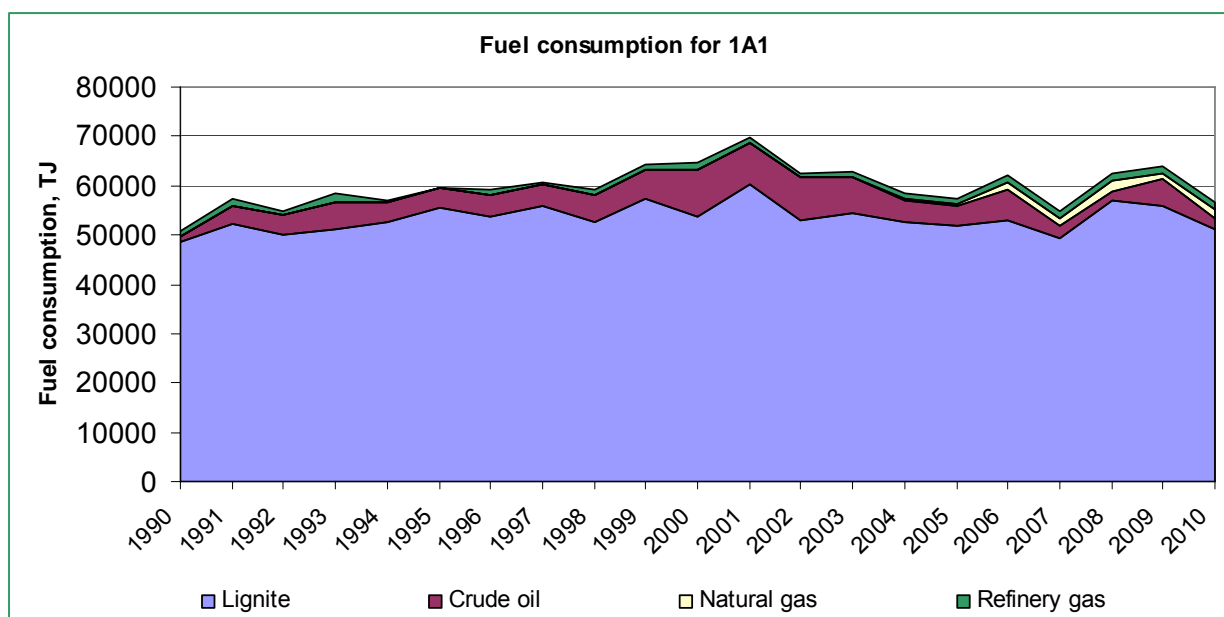


Figure 19 Trend of fuel consumption in category 1A1 activity data

### 3.1.4. Emission factors

The emission factors for the appropriate pollutants in the elaborated NFR categories have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009. 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 EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

In Table 43 and table 44 are shown emission factors used for estimation of emissions for 1A1 sub-sector.

Table 43 Emission factors for NFR sub-sector 1A1

NFR code	Fuel	Pollutants							
		NO <sub>x</sub> (as NO <sub>2</sub> )	NM VOC	SO <sub>x</sub> (as SO <sub>2</sub> )	TSP	CO	Pb	Cd	Hg
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	mg/GJ	mg/GJ	mg/GJ
1A1a	Lignite	233,00	1,70	1.520,00	82,30	8,23	18,00	2,10	3,50
	Crude oil	210,00	2,30	485,00	20,00	7,00	4,90	1,30	0,40
	Natural gas	89,00	1,50	0,30	0,90	39,00	0,20	0,50	0,10
1A1b	Crude oil	125,00	2,30	485,00	20,00	15,00	4,60	1,20	0,11
	Refinery gas	60,00	2,60	0,30	0,89	39,00	1,80	0,71	0,09

Table 44 Emission factors for NFR sub-sector 1A1

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ
1A1a	Lignite	17,00	11,00	0,30	12,00	55,00	4,50
	Crude oil	4,30	2,70	5,70	273,00	2,20	94,00
	Natural gas	0,09	0,70	0,40	1,00	0,01	14,00
1A1b	Crude oil	4,00	15,00	12,00	1.030,00	/	49,00
	Refinery gas	0,34	2,70	2,20	3,60	/	/

### 3.2. NFR 1A2 Manufacturing industries and construction (combustion)

#### 3.2.1. Completeness

Under this Source Category, stationary and mobile sources with combustion processes (by SNAP 030103, 030313, 030319, 030326, 080800) have been elaborated. These include stationary and mobile sources with combustion processes in production industry. From among stationary sources, five (5) major industrial plants have been elaborated as LPS, where combustion processes are with contact (reheating of steel, ferrous nickel and cement production). Other industrial plants are included as sources with combustion processes in boilers. Mobile sources in this sector have been presented by industrial mobile equipment and machinery.

Table 44 presents SNAP categories in correlation with EMEP/NFR for 1A2 sub-sector.

**Table 44** SNAP categories in correlation with EMEP/NFR (1A2)

EMEP/NFR	Title	SNAP
1A2	1A2 Manufacturing industries and construction	
1A2a	1A2a Stationary combustion in manufacturing industries and construction: Iron and steel	030103 Combustion plants < 50 MW (boilers) 030302 Reheating furnaces steel and iron
1A2b	1A2b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	030103 Combustion plants < 50 MW (boilers) 030324 Nickel production (thermal process)
1A2c	1A2c Stationary combustion in manufacturing industries and construction: Chemicals	030103 Combustion plants < 50 MW (boilers)
1A2d	1A2d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	030103 Combustion plants < 50 MW (boilers)
1A2e	1A2e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	030103 Combustion plants < 50 MW (boilers)
1A2fi	1A2f I Stationary combustion in manufacturing industries and construction: Other	030103 Combustion plants < 50 MW (boilers) 030313 Asphalt concrete plants 030319 Bricks and tiles 030326 Other
1 A 2 f ii	1 A 2 f ii Mobile Combustion in manufacturing industries and construction	080800 Other mobile sources and machinery – Industry

The difference between this and last submission is that a split was performed in the activity data for categories 1A2c-1A2e, consequently the emissions are reported independently.

#### 3.2.2. Used methodology

With regard to stationary sources, the CORINAIR simplified Tier 1 methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multiplied by the appropriate emission factor which depends on the type of the fuel and technology of combustion.



Concerning SNAP 030311 included in NFR category 1A2fi Tier 2 methodology was used, Rate Value expressed in Gg is multiplied by the appropriate emission factor.

### 3.2.3. Activity data

The input data for emission calculation in this sub-sector are the fuels, and for SNAP 030311 included in 1A2fi is quantity of clinker in cement plant.

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.

Table 45 shows fuels included in this sub-sector of the Inventory, as Activity Data in measurement unit TJ. Table 46 presents the activity data in Gg (for SNAP 030311 included in NFR 1A2fi).

**Table 45** Fuel used as Activity Data in subsector 1A2

NFR code	Fuel	TJ
1 A 2 a	Brown Coal	2.245,6
	Heavy fuel	3.314,0
	Natural gas	1.076,4
	Biomass	82,0
1 A 2 b	Heavy fuel	1,6
	LPG	32,9
1 A 2 c	Heavy fuel	123,3
	Natural gas	4.880,2
1 A 2 d	Heavy fuel	105,9
	Biomass	1,8
1 A 2 e	Brown Coal	8,5
	Heavy fuel	907,3
	Natural gas	94,7
	Biomass	7,3
1 A 2 fi	Heavy fuel	1.174,7
	LPG	91,6
	Biomass	0,9
1 A 2 f ii	Diesel	1.020,7

**Table 46** Activity Data in subsector 1A2

NFR code	SNAP	Activity data	Gg
1A2fi	030311	Clinker	689,4

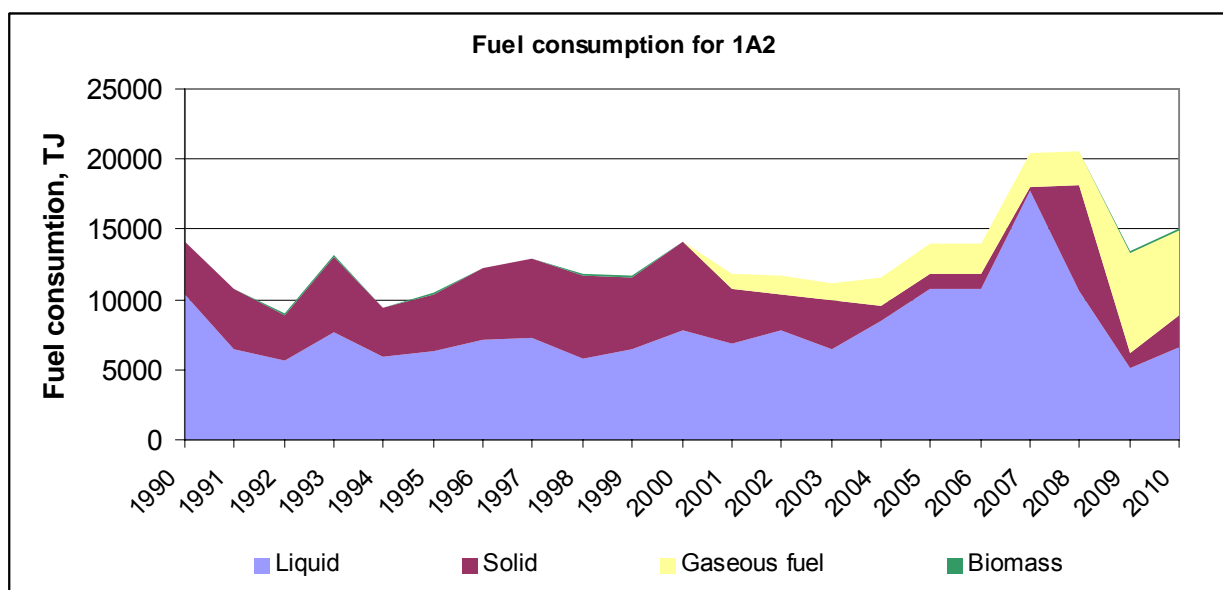


Figure 20 Trend of fuel consumption in category 1A2 activity data

### 3.2.4. Emission factors

The emission factors for the appropriate pollutants in the elaborated NFR categories have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009. 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 EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

Table 47, Table 48, Table 49 and Table 50 presents an overview of emission factors used in the calculation of emissions in this subsector.

Table 47 Emission factors for sub-sector 1A2

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NM VOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	mg/GJ	mg/GJ	mg/GJ
1A2a	Brown Coal	173,00	88,80	900,00	/	124,00	931,00	134,00	1,80	7,90
	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	Natural gas	70,00	2,50	0,50	/	0,50	25,00	0,20	0,50	0,20
	Biomass	150,00	146,40	38,40	/	156,40	1.596,00	24,80	1,80	0,70
1A2b	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	LPG	70,00	2,50	0,50	/	0,50	25,00	0,20	0,50	0,20
1A2c	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	Natural gas	70,00	2,50	0,50	/	0,50	25,00	0,20	0,50	0,20
1A2d	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10

NFR code	Fuel	Pollutants								
		NOx (as NO <sub>2</sub> )	NMVOOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	mg/GJ	mg/GJ	mg/GJ
	Biomass	150,00	146,40	38,40	/	156,40	1.596,00	24,80	1,80	0,70
1A2e	Brown Coal	173,00	88,80	900,00	/	124,00	931,00	134,00	1,80	7,90
	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	Natural gas	70,00	2,50	0,50	/	0,50	25,00	0,20	0,50	0,20
	Biomass	150,00	146,40	38,40	/	156,40	1.596,00	24,80	1,80	0,70
1A2fi	Heavy fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	LPG	70,00	2,50	0,50	/	0,50	25,00	0,20	0,50	0,20
	Biomass	150,00	146,40	38,40	/	156,40	1.596,00	24,80	1,80	0,70
1A2fii	Diesel	860,47	37,21	38,40	0,35	27,91	186,05	0,76	0,23	/

**Table 48** Emission factors for sub-sector 1A2

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ
1A2a	Brown Coal	4,00	13,50	17,50	13,00	1,80	200,00
	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	Natural gas	0,09	0,70	0,40	1,00	0,01	14,00
	Biomass	1,40	6,50	4,60	2,00	0,50	113,60
1A2b	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	LPG	0,09	0,70	0,40	1,00	0,01	14,00
1A2c	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	Natural gas	0,09	0,70	0,40	1,00	0,01	14,00
1A2d	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	Biomass	1,40	6,50	4,60	2,00	0,50	113,60
1A2e	Brown Coal	4,00	13,50	17,50	13,00	1,80	200,00
	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	Natural gas	0,09	0,70	0,40	1,00	0,01	14,00
	Biomass	1,40	6,50	4,60	2,00	0,50	113,60
1A2fi	Heavy fuel	1,00	12,80	7,20	260,00	/	8,00
	LPG	0,09	0,70	0,40	1,00	0,01	14,00
	Biomass	1,40	6,50	4,60	2,00	0,50	113,60
1A2fii	Diesel	/	1,16	39,5	1,63	0,233	23,3

**Table 49** Emission factors for SNAP 030311 included in 1A2fi category

NFR code	Activity data	Pollutants						
		NOx (as NO <sub>2</sub> )	NMVOOC	SOx (as SO <sub>2</sub> )	CO	Pb	Cd	Hg
		g/Mg	g/Mg	g/Mg	g/Mg	mg/Mg	mg/Mg	mg/Mg
1A2fi	clinker	1550,00	100,00	374,00	689,40	0,10	0,01	0,11

**Table 50** Emission factors for SNAP 030311 included in 1A2fi category

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/Mg	mg/Mg	mg/Mg	mg/Mg	mg/Mg	mg/Mg
1A2fi	clinker	0,03	0,04	0,06	0,05	0,03	0,42

### 3.3. NFR 1A3 Transport

#### 3.3.1. Completeness

The sector 1A3 Transport includes fuel combustion and fuel evaporation in road transport, civil aviation, railways and navigation transportation.

In the Table 51 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 1A3.

**Table 51** SNAP categories in correlation with EMEP/NFR (1A3)

EMEP/NFR	Title	SNAP
1A3	1A3 Transport	
1A3a i (i)	1A3a i International aviation (LTO)	080502 International airport traffic (LTO cycles - <1000 m)
1A3a i (ii)	1A3a i (ii) International aviation (Cruise)	080504 International cruise traffic (>1000 m)
1A3a ii(i)	1A3a ii (i) Civil aviation (domestic, LTO)	NE
1A3a ii (ii)	1A3a ii Civil aviation (Domestic, Cruise)	NE
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 cm <sup>3</sup> 070500 Motorcycles > 50 cm <sup>3</sup>
1A3bv	1A3bv R.T., Gasoline evaporation	070600
1A3b vi	1A3b vi R.T., Automobile tyre and brake wear	070700
1A3b vii	1A3b vii R.T., Automobile road abrasion	070800
1A3c	1A3c Railways	080200 Railways
1A3d I (i)	1A3d i (i) International maritime navigation	NO
1 A 3 d i (ii)	1 A 3 d i (ii) International inland waterways	NO
1A3d ii	1A3d ii National navigation (Shipping)	NE
1A3e	1A3e Pipeline compressors	NE

Comparing with the previous submissions, in Macedonian inventory for 2010 several improvement were made regarding this sector:

- According recommendations from Review 3 stage of Macedonian Inventory for 2008, in this inventory, TSP and NH<sub>3</sub> emissions from road transport are calculated and reported in sector 1A3b.
- In Macedonian inventory for 2010 three additional sectors are included: 1A3bv Road transport: Gasoline evaporation, 1A3bvi Road transport: Automobile tyre and brake wear and 1A3bvii Road transport: Automobile road abrasion.

### 3.3.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multiplied by the appropriate emission factor which depends on the type of the fuel and type of vehicle.

### 3.3.3. Activity data

The input data for emission calculation in this sub-sector are the fuels. The data have been obtained from Energy Balance of Republic of Macedonia and Statistical Yearbook for 2010.

Also 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 have been obtained from the statistics of the Public Enterprise *Airport Skopje*.

In Table 52 shows fuels included in this sub-sector of the Inventory, as Activity Data in measurement unit TJ.

**Table 52** Consumption of fuel in sector 1A3 as activity data for 2010

NFR code	Fuel	TJ
1A3ai(i)	Aviation gasoline	199,1
1A3bi	Gasoline	5.315,3
	Diesel	2.141,1
	LPG	2.634,4
1A3bii	Gasoline	54,5
	Diesel	3.925,4
1A3biii	Gasoline	16,2
	Diesel	8.045,4
1A3biv	Gasoline	92,5
1A3bv	Gasoline	5.691,1
1A3c	Diesel	153,9

### 3.3.4. Emission factors

Default emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are used.

In the Tables from Table 53 to 59 are shown emission factors used for estimation of emissions grouped by sub-sectors.

**Table 53** Emission factors for aviation transport

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NM <sub>VOC</sub>	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/kg fuel	g/kg fuel	g/kg fuel	g/kg fuel	g/kg fuel	g/kg fuel	mg/GJ	mg/GJ	mg/GJ
1A3ai(i)	Aviation gasoline	228,7	14,00	22,00	/	/	325,10	/	/	/

**Table 54** Emission factors for passenger transport

NFR code	Fuel	Pollutants								
		NOx (as NO <sub>2</sub> )	NMVOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/kg fuel	g/kg fuel	ppm	g/kg fuel	g/kg fuel	g/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel
1A3bi	Gasoline	14,50	14,00	40	0,173	0,037	132,00	0,017	0,01	/
	Diesel	11,00	1,10	8	0,018	1,70	4,70	0,0325	0,01	/
	LPG	15,00	10,00	/	0,173	/	68,00	/	0,01	/
1A3bii	Gasoline	24,00	14,00	40	0,14	0,03	155,00	0,017	0,01	/
	Diesel	15,00	1,75	8	0,014	2,80	11,00	0,0325	0,01	/
1A3biii	Diesel	37,00	1,60	8	0,015	1,20	8,00	0,0325	0,01	/
1A3biv	Gasoline	9,50	114,00	40	0,063	2,70	490,00	0,017	0,01	/

**Table 55** Emission factors for passenger transport

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel
1A3bi	Gasoline	/	1,70	0,05	0,07	0,01	1,00
	Diesel	/	1,70	0,05	0,07	0,01	1,00
	LPG	/	/	/	/	/	/
1A3bii	Gasoline	/	1,70	0,05	0,07	0,01	1,00
	Diesel	/	1,70	0,05	0,07	0,01	1,00
1A3biii	Diesel	/	1,70	0,05	0,07	0,01	1,00
1A3biv	Gasoline	/	1,70	0,05	0,07	0,01	1,00

**Table 56** Emission factor for 1A3bv category

NFR code	Pollutant	Temperature	Type of vehicle	Emission factor
				g/vehicle*days
1A3bv	NMVOC	from -10°C to 5°C	Motorcycles	1,70
			Passenger cars	7,70
			Heavy duty vehicles	11,70
		from 0°C to 15°C	Motorcycles	2,30
			Passenger cars	10,80
			Heavy duty vehicles	16,60
		from 10°C to 25°C	Motorcycles	3,00
			Passenger cars	14,80
			Heavy duty vehicles	22,60

**Table 57** Emission factors for 1A3bvi and 1A3bvii categories

NFR code	Pollutant	Type of vehicle	Emission factor
			g/km
1A3bvi	TSP	Motorcycles	0,0083
		Passenger cars	0,0182
		Heavy duty vehicles	0,0532
1A3bvii	TSP	Motorcycles	0,0060
		Passenger cars	0,0150
		Heavy duty vehicles	0,0455

**Table 58** Emission factors for railway transport (1A3c category)

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NM VOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		kg/t fuel	kg/t fuel	%	kg/t fuel	kg/t fuel	kg/t fuel	g/t fuel	g/t fuel	g/t fuel
1A3c	Diesel	52,40	4,65	0,005	0,007	1,52	10,70	/	0,01	/

**Table 59** Emission factors for railway transport (1A3c category)

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		g/t fuel	g/t fuel	g/t fuel	g/t fuel	g/t fuel	g/t fuel
1A3c	Diesel	/	0,05	1,70	0,07	0,01	1,00

### 3.4. NFR 1A4 Other sectors

#### 3.4.1. Completeness

Under this Source Category 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 also.

In the Table 60 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 1A4.

**Table 60** SNAP categories in correlation with EMEP/NFR (1A4)

EMEP/NFR	Title	SNAP
1A4	1A4 Small combustion	
1A4a i	1A4a i Commercial / institutional: Stationary	020103 Combustion plants < 50 MW (boilers)
1 A 4 a ii	1 A 4 a ii Commercial / institutional: Mobile	NE
1A4b i	1A4b i Residential: Stationary plants	02 02 05 Other equipments (stoves, fireplaces, cooking,...)
1A4b ii	1A4b ii Residential: Household and gardening (mobile)	080900 Household and gardening
1A4c i	1A4c i Agriculture/Forestry/Fishing: Stationary	020302 Agriculture— Combustion plants < 50 MW
1A4c ii	1A4c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	080600 Agriculture 080700 Forestry
1A4c iii	1A4c iii National fishing	NE

In Macedonian inventory for 2010 several improvement were made in this sector compared with the last submission:

- Emissions for 1A4ci Agriculture/Forestry/Fishing: Stationary are estimated.
- The notation key for category 1A4ciii Agriculture/Forestry/Fishing: National fishing is changed from NA to NE, because this source exists but there is no relevant data.

### 3.4.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: fuel quantity (expressed in heat units) is multiplied 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.

### 3.4.3. Activity data

The activity data for emission calculation in this sub-sector are the fuels.

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

Table 61 shows fuels included in this sub-sector of the Inventory, as Activity Data in measurement unit TJ.

**Table 61** Activity data for 1A4 sub-sector for 2010

NFR code	Fuel	TJ
1 A 4 a i	Lignite	48,8
	Diesel	2.247,3
	Heavy fuel	804,3
	LPG	273,1
	Natural gas	28,6
	Biomass	560,9
1 A 4 b i	Lignite	68,2
	Heavy fuel	1.476,3
	LPG	418,7
	Biomass	7.352,1
1 A 4 b ii	Gasoline	37,8
1 A 4 c i	Heavy fuel	706,4
	Biomass	42,1
1 A 4 c ii	Gasoline	15,4
	Diesel	23,2

### 3.4.4. Emission factors

The emission factors for the appropriate pollutants in the elaborated NFR categories have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

Tables from 62 to 65 presents an overview of emission factors used in the calculation of emissions in this subsector.

**Table 62** Emission factors for 1A4ai, 1A4bi, 1A4ci categories

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NMVOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	mg/GJ	mg/GJ	mg/GJ
1A4ai	Lignite	173,00	88,80	900,00	/	124,00	931,00	134,00	1,80	7,90
	Liquid fuel	100,00	10,00	140,00	/	27,50	40,00	16,00	0,30	0,10
	Biomass	150,00	146,40	38,40	/	156,00	1.600,00	24,80	1,80	0,70
	Natural gas	70,00	2,50	0,50	/	0,50	25,00	0,98	0,52	0,23



1A4bi 1A4ci	Lignite	110,00	484,00	900,00	/	444,00	4600	130,00	1,50	5,10
	Liquid fuel	68,00	15,50	140,00	/	6,00	46,00	15,50	1,50	0,03
	Biomass	74,50	925,00	20,00	3,80	730,00	5300	40,00	1,40	0,50
	LPG	57,00	10,50	0,50	/	0,50	31,00	0,984	0,515	0,234

**Table 63** Emission factors for other heavy metals for 1A4ai, 1A4bi, 1A4ci categories

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ	mg/GJ
1A4ai	Lignite	4,00	13,50	17,50	13,00	1,80	200,00
	Liquid fuel	1,00	7,20	7,20	260,00	/	8,00
	Biomass	1,40	4,60	4,60	2,00	0,50	114,00
	Natural gas	0,09	0,40	0,40	0,98	0,01	13,60
1A4bi 1A4ci	Lignite	2,50	11,20	22,30	12,70	1,00	220
	Liquid fuel	0,90	15,50	7,90	240	/	8,50
	Biomass	1,00	2,90	8,60	4,40	0,50	130
	LPG	0,0937	0,656	0,398	0,984	0,0112	13,60

**Table 64** Emission factors for 1A4bii, 1A4cii categories

NFR code	Fuel	Pollutants								
		NOx (as NO <sub>2</sub> )	NMVOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/t fuel	g/t fuel	ppm	g/t fuel	g/t fuel	g/t fuel	kg/l fuel	mg/kg fuel	mg/kg fuel
1A4bii	Gasoline	4.941,0	129.899,5	40,0	3,5	1.959,5	695.580,5	0,00013	0,01	/
1A4cii	Diesel	32.068,0	2.693,0	8,0	8,0	1.357,0	9.386,5	/	0,01	/

**Table 65** Emission factors for other heavy metals for 1A4bii, 1A4cii categories

NFR code	Fuel	Pollutants					
		As	Cr	Cu	Ni	Se	Zn
		mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel	mg/kg fuel
1A4bii	Gasoline		0,05	1,70	0,07	0,01	1,00
1A4cii	Diesel		0,05	1,70	0,07	0,01	1,00

### 3.5. NFR 1B1 Fugitive emissions from solid fuels

#### 3.5.1. Completeness

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

In the Table 66 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 1B1.

**Table 66** SNAP categories in correlation with EMEP/NFR (1B1)

EMEP/NFR	Title	SNAP
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 fugitive emissions from solid fuels	NO

In Macedonian inventory for 2010 improvement was made in this sector compared with the last submission:

- For sector 1B1a Fugitive emission from solid fuels: Coal mining and handling, the emission of NMVOC was calculated.

### 3.5.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of coal (expressed in measurement unit Gg) is multiplied by the appropriate emission factor.

### 3.5.3. Activity data

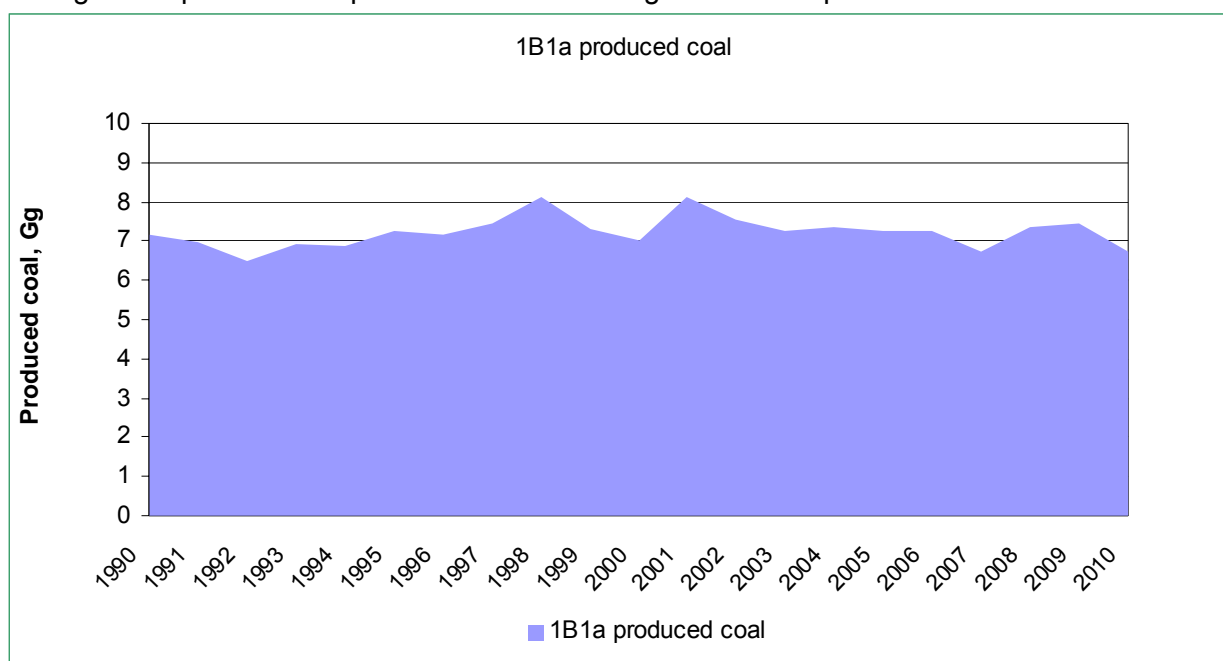
The activity data for emission calculation in this sub-sector is the quantity of solid fissile fuel (coal-lignite) from open excavation pits and disposal sites, expressed in Gg. The source of this data (Activity Data) is the Energy Balance of the Republic of Macedonia.

Table 67 shows the quantity of coal as Activity Data in measurement unit Gg.

**Table 67** Activity data for 1B1 category

NFR sector	Fuel	Measurement unit	Quantity
1B1a	Coal	Mt	6,7

The figure 21 presents the production of coal in Gg for the time period 1990-2010.

**Figure 21** Production of coal as activity data for 1B1a category

### 3.5.4. Emission factors

The emission factors used are derived from the EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

Emission factor used for estimation of emissions of NMVOC for this category is presented in Table 68.

**Table 68** Emission factors for 1B1a category

NFR sector	Pollutant	Fuel	Unit	Emission Factor
1B1a	NMVOC	Coal	g/Mg	800

## 3.6. NFR 1B2 Oil and natural gas

### 3.6.1. Completeness

In this sub-sector, 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.

In the Table 69 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 1B2.

**Table 69** SNAP categories in correlation with EMEP/NFR (1B2)

EMEP/NFR	Title	SNAP
1B2	1B2 Oil and natural gas	
1B2a i	1B2ai Exploration production, transport	NO
1B2a iv	1B2a iv Refining/Storage	040101 Petroleum Products Processing 040103 Sulphur Recovery Plants 040104 Storage and Handling of Products in Refinery
1B2a v	1B2a v Distribution of oil products	050501 Refinery dispatch station 050502 Transport and depots 050503 Service stations (including refuelling of cars)
1B2b	1B2b Natural gas	NO
1B2c	1B2c Venting and flaring	090203 Flaring in oil refinery

In Macedonian inventory for 2010 improvement was made in this sector compared with the last submission

- Emissions for NFR sector 1B2a iv for the first time are calculated in 2010.

### 3.6.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of liquid oil (petrol) is multiplied 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.

### 3.6.3. Activity data

The input data for emission calculation in this sub-sector 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.

In Table 70 are shown the activity data and the measurement units.

**Table 70** Activity data for NFR sector 1B

NFR sector	Fuel	Measurement unit	Quantity
1B2a iv	Crude oil	Mt	853
1B2a v	Various gasoline	Mt	309,8
1B2c	Refinery gas	TJ	164,5

### 3.6.4. Emission factors

Emission factors for the pollutants elaborated in this sub-sector have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

In Tables 71 and 72 are shown emission factors used for estimation of emissions of NMVOC grouped by sub-sectors.

**Table 71** Emission factors for 1B2 sector

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NMVOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg
1B2aiv	Various gasoline	/	200,00	/	/	/	/	/	/	/
1B2a v	Crude oil	/	200,00	/	/	/	/	/	/	/

**Table 72** Emission factors for 1B2 sector (fuel-refinery gas)

NFR code	Fuel	Pollutants								
		NO <sub>x</sub> (as NO <sub>2</sub> )	NMVOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO	Pb	Cd	Hg
		g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ	g/GJ
1B2aiv	Refinery gas	100,00	5,00	15,00	/	/	24,00	/	/	/
1B2av	Refinery gas	100,00	5,00	15,00	/	/	24,00	/	/	/
1B2c	Refinery gas	100,00	5,00	15,00	/	/	24,00	/	/	/

### 3.7. Planned improvements

Future planned improvements in Energy sector are:

- To Increase accuracy of emission calculation for this NFR sector by checking existing and collecting new available data on the quantities of fuels if available, especially for the transport sector,
- To update the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook,
- To calculate PM10 and PM2,5 emissions.

## CHAPTER 4 INDUSTRIAL PROCESSES (NFR Sector 2)

The sector NFR 2 Industrial process includes emissions that originate from the process (called process emissions). 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 Macedonian inventory for 2010, six additional categories were included in Industrial processes sector, compared to the 2008 inventory: 2A5 Asphalt roofing, 2A7a Quarrying and mining of minerals other than coal, 2A7b Construction and demolition, 2A7c Storage, handling and transport of mineral products, 2C3 Aluminium production, and 2D3 Wood processing.

In the table 73 are listed NFR categories covered in Industrial processes sector for 2010, and in Table 74 are presented the categories not included in Industrial processes sector and for which appropriate notation keys are used.

**Table 73** NFR categories covered in Industrial processes sector for 2010

NFR sector	Completeness
2 A 1 Cement production	√
2 A 2 Lime production	√
2 A 5 Asphalt roofing	√
2 A 6 Road paving with asphalt	√
2 A 7 a Quarrying and mining of minerals other than coal	√
2 A 7 b Construction and demolition	√
2A 7 c Storage, handling and transport of mineral products	√
2 C 1 Iron and steel production	√
2 C 2 Ferroalloys production	√
2 C 3 Aluminum production	√
2 C 5 b Lead production	√
2 D 2 Food and drink	√
2 D 3 Wood processing	√

**Table 74** NFR categories not included in Industrial processes sector for 2010

NFR category	Notation key used
2 A 3 Limestone and dolomite use	NE
2 A 4 Soda ash production and use	NE
2 A 7 d Other Mineral products	NE
2 B 1 Ammonia production	NO
2 B 2 Nitric acid production	NO
2 B 3 Adipic acid production	NO
2 B 4 Carbide production	NO
2 B 5 a Other chemical industry	NE
2 B 5 b Storage, handling and transport of chemical products	NE
2 C 5 a Copper production	NO
2 C 5 c Nickel production	NO
2 C 5 d Zinc production	NO
2 C 5 e Other metal production	NE
2 C 5 f Storage, handling and transport of metal products	NE
2 D 1 Pulp and paper	NE
2 E Production of POPs	NO
2 F Consumption of POPs and heavy metals (e.g. electrician and scientific equipment)	NE
2 G Other production, consumption, storage, transportation or handling of bulk products	NE

For the NFR sectors that are reported as NE, emissions were not estimated due to the lack of data.

In this sector, emissions of the following pollutants have been included: SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO, NH<sub>3</sub>, TSP and heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni, Se, and Zn).

Explanations on the source of activity data, methodology and used emission factors are presented in Chapter 4.1 to Chapter 4.4 for each of the Categories.

#### 4.1. NFR 2A Mineral industry

##### 4.1.1. Completeness

In the Table 75 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 2A.

**Table 75** SNAP categories in correlation with EMEP/NFR (2A)

EMEP/NFR	Title	SNAP
<b>2A</b>	<b>2A MINERAL INDUSTRY</b>	
2A1	2A1 Cement Production	040612 Cement (decarbonising)
2A2	2A2 Lime Production	040614 Lime (decarbonising)
2A 3	2 A3 Limestone and Dolomite Use	NE
2 A 4	2A4 Soda Ash Production and use	NE
2A 5	2A5 Asphalt Roofing	040610 Asphalt Roofing Materials
2A 6	2A6 Road Paving with Asphalt	040611 Road paving with asphalt
2 A 7 a	2 A 7 a Quarrying and mining of minerals other than coal	040616 Extraction of Mineral Ores
2 A 7 b	2 A 7 b Construction and demolition	040624 Public works and

		building sites
2 A 7 c	2A 7 c Storage, handling and transport of mineral products	040900 Storage, handling and transport of mineral products
2A 7d	2A7 Other including non fuel mining and construction	NE

The chapter includes information on methodologies, activity data, and emission factors for 2A NFR sector.

The Macedonian inventory for 2010 in this sub-sector is improved with four additional calculated emissions for categories:

- 2A5 Asphalt roofing
- 2A7a Quarrying and mining of minerals other than coal
- 2A7b Construction and demolition
- 2A7c Storage, handling and transport of mineral products

#### 4.1.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor. Tier 2 methodology has been used for calculation of emissions from 2A7c category.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

#### 4.1.3. Activity data

Activity Data values in this sector represent the quantities of final products from the relevant production processes. The data has been obtained from the relevant companies.

Table 76 shows the quantities of final products expressed in appropriate measurement unit, as input data for individual NFR categories.

**Table 76** Activity data for 2A

NFR code	Production	Measurement unit	Quantity
2A1	Cement	kt	766
2A2	Lime	kt	1,6
2A5	Bitumen product	kt	31,1
2A6	Asphalt	kt	290,1
2A7a	Different minerals	Mt	5,6
2A7b	Floor space constructed/demolished	m <sup>2</sup>	915.569,0
2A7c	Different minerals	Mt	2,2

#### 4.1.4. Emission factors

Data from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 have been used for emissions calculations.

Table 77 presents values of emission factors for the calculated pollutants in this sub-sector.

**Table 77** Emission factors for 2A sector

NFR code	Pollutants		
	NMVOG	CO	TSP
	g/Mg	g/Mg	g/Mg
2A1	/	/	220
2A2	/	/	590
2A5	5	10	600
2A6	16	/	14000
2A7a	/	/	0,07
2A7c	/	/	10
	Pollutants		
	NMVOG	CO	TSP
	g/ m <sup>2</sup>	g/ m <sup>2</sup>	g/ m <sup>2</sup>
2A7b	/	/	162

## 4.2. NFR 2B Chemical industry

The NFR categories: 2B1 Ammonia production, 2B2 Nitric acid production, 2B3 Adipic acid production and 2B4 Carbide production in Macedonian inventory are reported as NO, due to the fact that in Macedonia this kind of production does not exist.

The NFR categories: 2B5a Other chemical industry and 2B5b Storage, handling and transport of chemical products are reported as NE due to the lack of official data.

## 4.3. NFR 2C Metal industry

### 4.3.1. Completeness

In the Macedonia national emission inventory from this sector are reported the following categories: 2C1 Iron and steel production, 2C2 Ferroalloys production, 2C3 Aluminium production and 2C5b Lead production.

In the Table 78 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 2C.

**Table 78** SNAP categories in correlation with EMEP/NFR (2C)

EMEP/NFR	Title	SNAP
2C	2C Metal Production	
2 C 1	2 C 1 Iron and steel production	040207 Electric furnace steel plant 040208 Rolling mills 040302 Ferro alloys
2 C 2	2 C 2 Ferroalloys production	040302 Ferro alloys
2 C 3	2 C 3 Aluminum production	040301 Aluminum production (electrolysis)
2 C 5 a	2 C 5 a Copper production	NO
2 C 5 b	2 C 5 b Lead production	040309 Lead production
2 C 5 c	2 C 5 c Nickel production	NO



EMEP/NFR	Title	SNAP
2C	2C Metal Production	
2 C 5 d	2 C 5 d Zinc production	NO
2 C 5 e	2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)	NE
2 C 5 f	2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)	NE

#### 4.3.2. Used methodology

CORINAIR simplified Tier 1 methodology regarding emission calculation has been used for 2C1 and 2C2 categories: the quantity of Activity Data is multiplied by the appropriate emission factor.

Tier 2 methodology has been used with regard to emission calculation for 2C3 and 2C5b categories.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

#### 4.3.3. Activity data

Quantity of final products is input data for this sub-sector. This data has been obtained from companies producing steel, steel plates, ferrosilicium and lead batteries.

Table 79 presents the activity data used for calculation of the emissions from metal industry in 2010.

**Table 79** Activity data for 2C sector

NFR code	Production	Measurement unit	Quantity
2C1	Steel	kt	1.091,3
2C2	Ferroalloys	kt	81,2
2C3	Aluminum	kt	1,9
2C5b	Lead (batteries)	kt	3,5

#### 4.3.4. Emission factors

Emission factors for the relevant pollutants in elaborated NFR categories have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

In Table 80 are shown emission factors used for estimation of emissions grouped by sub-sectors.

**Table 80** Emission factors for sector 2C

NFR code	Pollutants										
	NMVOC	TSP	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	g/GJ	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg
2C1	150	300	4,6	0,02	0,1	0,4	4,5	0,07	0,14	0,02	4,0
2C2	/	1000	/	/	/	/	/	/	/	/	/
2C3	/	2000	/	/	/	/	/	/	/	/	/
2C5b	/	500	0,000126	1,1	/	3,5	/	/	/	/	/

#### 4.4. NFR 2D Other production industry

##### 4.4.1. Completeness

In the Table 81 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 2D.

**Table 81** SNAP categories in correlation with EMEP/NFR (2D)

EMEP/NFR	Title	SNAP
2D	Other production industry	
2D1	2D1 Pulp and Paper	NE
2D2	2D2 Food and Drink	040605 Bread 040606 Wine 040607 Beer 040608 Spirits
2 D 3	2 D 3 Wood processing	040620 Wood processing

The Macedonian inventory for 2010 in this sub-sector is improved with additional calculated emission for category

- 2D3 Wood processing

##### 4.4.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

##### 4.4.3. Activity data

The input data for this sub-sector is the quantity of final products. This data has been taken from the Statistical Yearbook of the Republic of Macedonia.

Table 82 presents the activity data used for calculation of the emissions in 2D sub-sector.

**Table 82** Activity data for 2D sub-sector in 2010

NFR code	Production	Measurement unit	Quantity
2D2	Food and drinks	kt	315,4
2D3	Wood processing	kt	142,8

##### 4.4.4. Emission factors

Emission factor values have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 and they are presented in Table 83 appropriately for each NFR categories.

**Table 83** Emission factors for 2D sector

NFR code	Pollutant	
	NMVOG	TSP
	g/Mg	g/Mg
2D2	2.000	/
2D3	/	1.000

#### 4.5. Planned Improvements

Future planned improvements in Industrial processes sector are:

- To increase accuracy of emission calculation for this NFR sector by checking existing and collecting new available data on the quantities of production if is available.
- To update the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook.

## CHAPTER 5 SOLVENTS AND OTHER PRODUCTS USE (NFR Sector 3)

In Sector 3, emissions appearing in processes involving solvents and other similar chemical. This chapter describes a methodology for calculating emissions of NMVOC from solvent and solvent-based products. Solvents are chemical compounds, which are used to dissolve substances as paint, glues, ink, rubber, plastic, pesticides or for cleaning purposes (degreasing). After application of these substances or other procedures of solvent use most of the solvents are released into air. Because solvents consist mainly of NMVOC, solvent use is a major source for anthropogenic NMVOC emissions. Once released into the atmosphere NMVOCs react with reactive molecules (mainly HO-radicals) to finally form CO<sub>2</sub>.

In Macedonian inventory for 2010, comparing with previous Inventory one additional category was included: 3D2 Domestic solvent use including fungicides. Calculated emissions from NFR categories: 3A1 Decorative coating application and 3A2 Industrial coating application, are reported independently.

In the table 84 are listed NFR categories covered in Solvent and Other Product use sector for 2010, and in Table 85 are the categories not included in this sector and for which appropriate notation keys are used.

**Table 84** NFR categories covered in "Solvent and Other Product use" sector for 2010

NFR category	Completeness
3 A 1 Decorative coating application	√
3 A 2 Industrial coating application	√
3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)	√
3 C Chemical products	√
3 D 2 Domestic solvent use including fungicides	√
3 D 3 Other product use	√

**Table 85** NFR categories not included in "Solvent and Other Product use" sector for 2010

NFR category	Notation key used
3 B 1 Degreasing	NE
3 B 2 Dry cleaning	NE
3 D 1 Printing	NE

NE notation keys have been used in this NFR category due to the lack of data.

In this sector, NMVOC emissions have been included, and regarding 3D3 category emissions of the following pollutants have been calculated: NO<sub>x</sub>, CO, TSP and heavy metals (Pb, Cd, Hg, As, Cr, and Cu).

Explanations on the source of activity data, methodology and used emission factors are presented in Chapter 5.1 to Chapter 5.4 for each of the Categories.

### 5.1. NFR 3A Paint application

#### 5.1.1. Completeness

This source category takes into account NMVOC emissions in paint application.

In the Table 86 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 3A.

**Table 86** SNAP categories in correlation with EMEP/NFR (3A)

EMEP/NFR	Title	SNAP
3A	3A Paint Application	
3 A 1	3 A 1 Decorative coating application	060102 Paint application : car repairing 060103 Paint application : construction and buildings 060104 Paint application : domestic use (except 060107) 060107 Paint application : wood 060109 Other non industrial paint application
3 A 2	3 A 2 Industrial coating application	060108 Other industrial paint application
3 A 3	3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)	060100 Paint application

### 5.1.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor. The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 5.1.3. Activity data

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

In the table 87 is presented the activity data used for calculation of the emissions from paint application.

**Table 87** Activity data for category 3A

NFR code	Used application	Measurement unit	Quantity
3A1	Paint	Kt	1,7
3A2	Paint	Kt	1,4
3A3	Solvent	kt	0,3

### 5.1.4. Emission factors

In this sub-sector, the emission of NMVOC is calculated. Emission factor values for this pollutant have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

These values are presented in Table 88.

**Table 88** Emission factors for 3A sector

NFR code	Pollutant
	NMVOC
	g/kg
3A1	150
3A2	400
3A3	200

## 5.2. NFR 3B Degreasing and Dry Cleaning

The NFR categories: 3B1 Degreasing and 3B2 Dry cleaning are reported as NE due to the lack of official data.

## 5.3. NFR 3C Chemical products

### 5.3.1. Completeness

Processes in chemical products manufacturing and processing, such as: polyester, polyvinylchloride, glues and leather tanning, pharmacy products belong here.

In the Table 89 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 3C.

**Table 89** SNAP categories in correlation with EMEP/NFR (3A)

EMEP/NFR	Title	SNAP
3C	3C CHEMICAL PRODUCTS	060301 Polyester processing 060302 Polyvinylchloride processing 060306 Pharmaceutical products manufacturing 060309 Glues manufacturing 060310 Asphalt blowing 060313 Leather tanning

### 5.3.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor. The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 5.3.3. Activity data

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

In the table 90 is presented the activity data used for calculation of the emissions from chemical products.

**Table 90** Activity data for category 3C for 2010

NFR code	Chemical products	Measurement unit	Quantity
3C	Glues	kt	46,009
	Polyester and polyvinylchloride	kt	3,400
	Pharmacy	kt	2,994
	<b>Sum</b>	<b>kt</b>	<b>52,4</b>

#### 5.3.4. Emission factors

In this sub-sector, the emission of NMVOC is calculated. Emission factor value for this pollutant has been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009. In Table 91 is shown emission factor used for estimation of emissions for 3C category.

**Table 91** Emission factors for 3C category

NFR code	Pollutant	Measurement unit	Emission factor
3C	NMVOC	g/kg	10

## 5.4. 3D Other product use

### 5.4.1. Completeness

Table 92 presents SNAP categories in correlation with EMEP/NFR for sub-sector 3D.

**Table 92** SNAP categories in correlation with EMEP/NFR (3D)

EMEP/NFR	Title	SNAP
3D	3D Other product use	
3 D 1	3 D 1 Printing	NE
3 D 2	3 D 2 Domestic solvent use including fungicides	060408 Domestic solvent use (other than paint application)
3 D 3	3 D 3 Other product use	060405 Application of glues and adhesives

Macedonian national inventory for 2010 in this sub-sector is improved with calculated emissions from source:

- 3D2 Domestic solvent use including fungicides

### 5.4.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation from 3D2 category has been used. Tier 2 methodology for emission calculation from 3D3 category has been used.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 5.4.3. Activity data

National population figures published by State Statistical Office 2010 are used as activity data in 3D2 category.

Activity data for category 3D3 is quantity of used tobacco.

Table 93 presents quantities used as activity data for calculation of the emissions from 3D sub-sector.

**Table 93** Activity data for 3D category for 2010

NFR code	Activity data	Measurement unit	Quantity
3D2	Population	1000 head	2.055
3D3	Tobacco	t	7.143,7

### 5.4.4. Emission factors

Emission factor values have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009. (Table 94 and Table 95)

**Table 94** Emission factors for 3D2 category

NFR code	Pollutant
	NM VOC
	kg/person
3D2	1



**Table 95** Emission factors for 3D3 category

NFR code	Pollutant									
	NOx	NMVOG	TSP	CO	Pb	Cd	Hg	As	Cr	Cu
	g/Mg	g/Mg	g/Mg	g/Mg	mg/Mg	mg/Mg	mg/Mg	mg/Mg	mg/Mg	mg/Mg
3D3	3,5	4,8	40	122	0,05	0,1	0,1	0,16	0,35	0,15

### 5.5. Planned improvements

Future planned improvements in "Solvent and Other Product use" sector are:

- To increase accuracy of emission calculation for this NFR sector by checking existing and collecting new available data on the quantities of used solvent-based products if available.
- To update the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook.

## CHAPTER 6 AGRICULTURE (NFR Sector 4)

The Agriculture sector is a major source category for ammonia emissions. 99% of total national emission of NH<sub>3</sub> is from the agricultural sector. In Macedonian inventory category 4B animal husbandry and manure management is treated.

Emissions here include enteric fermentations with domestic animals, emissions in manure management in terms of organic and nitrous compounds.

In the table 96 NFR categories covered in Agriculture sector for 2010 are presented, while in Table 97 presents the categories which are not included in this sector and for which appropriate notation keys are used.

**Table 96** NFR categories covered in Agriculture sector for 2010

NFR category	Completeness
4 B 1 a Cattle dairy	√
4 B 1 b Cattle non-dairy	√
4 B 2 Buffalo	√
4 B 3 Sheep	√
4 B 6 Horses	√
4 B 8 Swine	√
4 B 9 a Laying hens	√

**Table 97** NFR categories not included in Agriculture sector for 2010

NFR category	Notation key used
4 B 4 Goats	NE
4 B 7 Mules and asses	NE
4 B 9 b Broilers	NE
4 B 9 c Turkeys	NE
4 B 9 d Other poultry	NE
4 B 13 Other	NE
4 D 1 a Synthetic N-fertilizers	NE
4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products	NE
4 D 2 b Off-farm storage, handling and transport of bulk agricultural products	NE
4 D 2 c N-excretion on pasture range and paddock unspecified	NE
4 F Field burning of agricultural wastes	NE
4 G Agriculture other(c)	NE

NE notation keys have been used in this NFR category due to the lack of data.

This sector covers NH<sub>3</sub>, NO<sub>x</sub> and NMVOC emissions.

Explanations of the source of activity data, methodology used and emission factors are presented in Chapter 6.1.1 to 6.1.4 for each category.

### 6.1. NFR 4B Animal husbandry and Manure management

#### 6.1.1. Completeness

In Macedonian inventory emissions for categories 4B1a Cattle dairy, 4B1b Cattle non-dairy, 4B2 Buffalo, 4B3 Sheep, 4B6 Horses, 4B8 Swine and 4B9a Laying hens are reported.

These are processes that take into account emissions from manure management produced by: dairy 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 the Table 98 are presented SNAP categories in correlation with EMEP/NFR for sub-sector 4B.

**Table 98** SNAP categories in correlation with EMEP/NFR (4B)

EMEP/NFR	Title	SNAP
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
4B6	4B6 Horses	100506 Horses
4B7	4B7 Mules and Asses	NE
4B8	4B8 Swine	100503 Fattening pigs 100504 Sows
4B9a	4 B 9 a Laying hens	100507 Laying hens
4 B 9 b	4 B 9 b Broilers	NE
4 B 9 c	4 B 9 c Turkeys	NE
4 B 9 d	4 B 9 d Other poultry	NE
4B13	4B13 Other	NE

### 6.1.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the emission factor for the pollutant related to the manures resulting from individual species of domestic animals is multiplied with the number of registered heads of the same animal species.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 6.1.3. Activity data

The input data in this sub-sector is the number of registered heads of each domestic animal species. All activity data is derived from Statistical Yearbook for 2010 prepared by State Statistical Office. Their number values are presented in Table 99 with a measurement unit 1000 capita.

**Table 99** Activity data for sector 4B for 2010

NFR code	Animal	Measurement unit	Quantity
4B1a	Cattle dairy	1000 capita	135,0
4B1b	Cattle non-dairy	1000 capita	124,9
4B2	Buffalo	1000 capita	1,04
4B3	Sheep	1000 capita	778,4
4B6	Horses	1000 capita	26,7
4B8	Swine	1000 capita	190,6
4B9a	Laying hens	1000 capita	1.994,9

#### 6.1.4. Emission factors

The values of emission factors have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

In Table 100 are shown emission factors used for estimation of emissions grouped by sub-sectors.

**Table 100** Emission factors for 4B category

NFR code	Pollutants		
	NO <sub>x</sub>	NMVOG	NH <sub>3</sub>
	kg/capita	kg/capita	kg/capita
4B1a	0,154	14	34
4B1b	0,094	7	11,3
4B2	0,043	/	9
4B3	0,005	0,20	1,4
4B6	0,131	/	14,8
4B8	0,045	3,9	6,6c
4B9a	0,003	0,3	0,48

#### 6.2. Planned improvements

Future planned improvements in Agriculture sector are:

- To increase accuracy of emission calculation for this NFR sector by collecting appropriate quantities of data relevant for the Agriculture sector.
- To update the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook.

### CHAPTER 7 LAND USE CHANGE AND FORESTRY (NFR Sector 5)

The EMEP / CORINAIR do not suggest methodology for calculation of pollutant emissions regarding this sector.

### CHAPTER 8 WASTE (NFR SECTOR 6)

Sector WASTE 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 SO<sub>2</sub>, NO<sub>x</sub>, NMVOG, CO, TSP and heavy metals (Pb, Cd, Hg, As, Cr, Cu, Ni) are covered in this sector.

Explanations of the source of activity data, methodology used and emission factors are presented in Chapter 8.1 and Chapter 8.2

In the table 101 NFR categories covered in Waste sector for 2010 are listed, while in Table 102 the categories not included in this sector and for which appropriate notation keys are used.

**Table 101** NFR categories covered in Waste sector for 2010

NFR category	Completeness
6 A Solid waste disposal on land	√
6 C a Clinical waste incineration (d)	√

**Table 102** NFR categories not included in Waste sector for 2010

NFR category	Notation key used
6 B Waste-water handling	NO
6 C b Industrial waste incineration (d)	NO
6 C c Municipal waste incineration (d)	NO
6 C d Cremation	NO
6 C e Small scale waste burning	NE
6 D Other waste(e)	NO

Due to the lack of activity data, emissions from the category 6Ce Small scale waste burning are reported in the inventory as NE.

## 8.1. NFR 6A Solid waste disposal on land

### 8.1.1. Completeness

Table 103 presents SNAP categories correlation with EMEP/NFR for 6A sub-sector.

**Table 103** SNAP categories correlation with EMEP/NFR (6A)

EMEP/NFR	Title	SNAP
6A	6A Solid Waste Disposal on Land	090401 Managed Waste Disposal on Land 090402 Unmanaged Waste Disposal Sites

### 8.1.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor. The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 8.1.3. Activity data

Amount of landfill gas is relevant activity data for NFR 6A sector. In Table 104 activity data for 6A category is presented.

**Table 104** Activity data for 6A category

NFR code	Activity	Measurement unit	Quantity
6A	Landfill gas	m <sup>3</sup>	19.110.101,9

### 8.1.4. Emission factors

Emission factors have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

Their values are presented in Table 105.

**Table 105** Emission factors for 6A category

NFR code	Pollutant
	NMVOC
	g/m <sup>3</sup>
6A	6,56

## 8.2. NFR 6C Waste incineration

### 8.2.1. Completeness

Table 106 presents SNAP categories correlation with EMEP/NFR for 6C sub-sector.

**Table 106** SNAP categories correlation with EMEP/NFR (6C)

EMEP/NFR	Title	SNAP
6 C a	6 C a Clinical waste incineration (d)	090207 Incineration of hospital wastes
6 C b	6 C b Industrial waste incineration (d)	NO
6 C c	6 C c Municipal waste incineration (d)	NO
6 C d	6 C d Cremation	NO
6 C e	6 C e Small scale waste burning	NE
6 D	6 D Other waste(e)	NO

Compared to the last submission, the Macedonian inventory for 2010 in this sub-sector is improved with:

- Calculated emissions for all pollutants for sector 6Ca for which emission factors are available in EMEP/EEA emission inventory guidebook 2009.
- Notation keys for the sources from 6C are revised and where the source does not exist in Macedonia, NO notation key is used.

### 8.2.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 8.2.3. Activity data

The activity data for source category 6Ca Clinical waste are from annual report of company "Drisla" where clinical waste incineration is operating.

In Table 107 is presented the activity data for 6Ca category.

**Table 107** Activity data for 6Ca category

NFR code	Activity	Measurement unit	Quantity
6Ca	Clinical waste	Gg	0,5

### 8.2.4. Emission factors

Emission factors have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

Their values are presented in Table 108.

**Table 108** Emission factors for 6Ca category

NFR code	Pollutant											
	NO <sub>x</sub>	NMVOC	SO <sub>x</sub>	TSP	CO	Pb	Cd	Hg	As	Cr	Cu	Ni
	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg	g/Mg
6Ca	1400	700	1400	500	2800	13	1	8	1,3	4,7	2,6	0,4

### 8.3. Planned improvements

Future planned improvements in Waste sector are:

- To increase accuracy of emission calculation for this NFR sector by checking existing and collecting new available data on the quantities of waste if available.
- To update the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook.

## CHAPTER 9 OTHER AND NATURAL EMISSIONS (NFR Sector 7 and NFR Sector 11)

In the table 109 NFR categories covered in Other and natural emissions sector for 2010 are listed, while in Table 110 the categories not included in this sector and for which appropriate notation keys are used.

**Table 109** NFR categories covered in Other and natural emissions sector for 2010

NFR category	Completeness
11B Forest fires	√

**Table 110** NFR categories not included in Other and natural emissions sector for 2010

NFR category	Notation key used
7 A Other (included in national total for entire territory)	NE
7 B Other not included in national total of the entire territory	NE
11A Volcano	NO
11C Other natural emissions	NE

In this sector, emissions of the following pollutants have been included: SO<sub>2</sub>, NO<sub>x</sub>, NMVOC, CO, NH<sub>3</sub>, and TSP.

Explanations regarding source of activity data, methodology and emission factors used are presented in Chapter 9.1.

### 9.1. NFR 11B Forest fires

#### 9.1.1. Completeness

Forest fires (NFR 11B) are classified as natural emissions although they may be caused by the intentional or unintentional human activity. These emissions are reported as memo items and are not included in the national total amount of pollutant emissions.

Table 111 presents SNAP categories correlation with EMEP/NFR for 11B category.

**Table 111** SNAP categories in correlation with EMEP/NFR (11B)

EMEP/NFR	Title	SNAP
11	11 Natural sources	
11B	11B Forest fires	110301 Forest and other vegetation fires-Man induced

### 9.1.2. Used methodology

The CORINAIR simplified Tier 1 methodology for emission calculation has been used: the quantity of Activity Data is multiplied by the appropriate emission factor.

The derived emission factors from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009 are the default values given in the Guidebook.

### 9.1.3. Activity data

The activity data for category 11B is derived from State Statistical Yearbook for 2010. In The Table 112 is presented activity data for 11B category for 2010.

**Table 112** Activity data for 11B category

NFR code	Activity	Measurement unit	Quantity
11B	Forest fires	ha	4.725

### 9.1.4. Emission factors

Values of emission factors have been taken from EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.

The appropriate values of emission factors for 11B category are presented in Table 113.

**Table 113** Emission factors for sector 11B

NFR code	Pollutant					
	NO <sub>x</sub>	NMVOC	SO <sub>x</sub>	NH <sub>3</sub>	TSP	CO
	kg/ha	kg/ha	kg/ha	kg/ha	g/ha	kg/ha
11B	100	300	20	20	0,000232	3000

## CHAPTER 10 RECALCULATIONS AND IMPROVEMENTS

This chapter gives an overview of recalculations and future planned improvements.

### 10.1. Recalculations

In this Inventory report, with regard to the recalculations, the following major improvements have been made:

- Calculations for the main pollutants NO<sub>x</sub>, NMVOC, SO<sub>x</sub>, NH<sub>3</sub>, CO and TSP in the time period between 1990-2000 (which have not been covered in the previous submissions).
- Emission calculation for heavy metals Pb, Cd, Hg, As, Cr, Cu, Ni, Se and Zn in the time period between 1990-2010.
- Recalculations of emissions for 2009.

Recalculations has been undertaken due to availability of new information for activity data concerning certain sectors, use of higher Tier methodology (e.g. Tier 2 and Tier 3),



methodology changes because of inconsistencies in time series, increasing accuracy of emission calculations, use of emission factors according to EMEP/EEA Air Pollutant Emission Inventory Guidebook, and etc.

## 10.2. Planned Improvements

In future Macedonia intend to produce Inventories with significantly better consistency, transparency, accuracy and comparability of the data.

Planned improvements which will be covered in the future submissions are the following:

- Methodology improvement for emission calculations in relevant sectors in accordance with EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009
- Increase accuracy of emission calculation by collecting appropriate quantities of data relevant for the sectors.
- Updating the emission factors in accordance with the new EMEP/EEA Air Pollutant Emission Inventory Guidebook 2009.
- Calculation of PM<sub>2.5</sub> and PM<sub>10</sub> emissions.
- Recalculation of time series especially for the period between 2000 to 2008

## CHAPTER 11 Projections

Republic of Macedonia this year have not reported national projections, thus have not covered information in Tables Annex IV, Table 2A and 2B.

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23. **Recommended Structure for Informative Inventory Report (IIR)**, Annex VI to ECE/EB.AIR/97 Version: 30 Sept 2009
24. *EMEP/CORINAIR Emission Inventory Guidebook, “Good practice guidance for CLRTAP emission inventories”*

## ANNEXES

**Annex 1: NFR – SNAP correspondence**

EMEP/NFR	Title	SNAP
<b>1A1</b>	<b>1A1 Energy industries</b>	
1A1a	1A1a Public electricity and heat production	010101 Combustion plants $\geq 300$ MW (boilers) 010202 Combustion plants $\geq 50 < 300$ 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	NO
1A2a	1A2a Stationary combustion in manufacturing industries and construction: Iron and steel	030103 Combustion plants $< 50$ MW (boilers) 030302 Reheating furnaces steel and iron
1A2b	1A2b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals	030103 Combustion plants $< 50$ MW (boilers) 030324 Nickel production (thermal process)
1A2c	1A2c Stationary combustion in manufacturing industries and construction: Chemicals	030103 Combustion plants $< 50$ MW (boilers)
1A2d	1A2d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print	030103 Combustion plants $< 50$ MW (boilers)
1A2e	1A2e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco	030103 Combustion plants $< 50$ MW (boilers)
1A2fi	1A2f I Stationary combustion in manufacturing industries and construction: Other	030103 Combustion plants $< 50$ MW (boilers) 030313 Asphalt concrete plants 030319 Bricks and tiles 030326 Other
1 A 2 f ii	1 A 2 f ii Mobile Combustion in manufacturing industries and construction	080800 Other mobile sources and machinery – Industry
1A3a i (i)	1A3a i International aviation (LTO)	080502 International airport traffic (LTO cycles - $< 1000$ m)
1A3a i (ii)	1A3a i (ii) International aviation (Cruise)	080504 International cruise traffic ( $> 1000$ m)
1A3a ii(i)	1A3a ii (i) Civil aviation (domestic, LTO)	NE
1A3a ii (ii)	1A3a ii Civil aviation (Domestic, Cruise)	NE
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 $< 50$ cm <sup>3</sup> 070500 Motorcycles $> 50$ cm <sup>3</sup>

EMEP/NFR	Title	SNAP
1A3bv	1A3bv R.T., Gasoline evaporation	070600
1A3b vi	1A3b vi R.T., Automobile tyre and brake wear	070700
1A3b vii	1A3b vii R.T., Automobile road abrasion	070800
1A3c	1A3c Railways	080200 Railways
1A3d I (i)	1A3d i (i) International maritime navigation	NO
1 A 3 d i (ii)	1 A 3 d i (ii) International inland waterways	NO
1A3d ii	1A3d ii National navigation (Shipping)	NE
1A3e	1A3e Pipeline compressors	NE
1A4a i	1A4a I Commercial / institutional: Stationary	020103 Combustion plants < 50 MW (boilers)
1 A 4 a ii	1 A 4 a ii Commercial / institutional: Mobile	NE
1A4b i	1A4b i Residential: Stationary plants	02 02 05 Other equipments (stoves, fireplaces, cooking,...)
1A4b ii	1A4b ii Residential: Household and gardening (mobile)	080900 Household and gardening
1A4c i	1A4c i Agriculture/Forestry/Fishing: Stationary	020302 Agriculture— Combustion plants < 50 MW
1A4c ii	1A4c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery	080600 Agriculture 080700 Forestry
1A4c iii	1A4c iii National fishing	NE
1B1a	1B1a Coal mining and handing	050101 Open cast mining
1B1b	1B1b Solid fuel transformation	NO
1B1c	1B1c Other fugitive emissions from solid fuels	NO
1B2a i	1B2ai Exploration production, transport	NO
1B2a iv	1B2a iv Refining/Storage	040101 Petroleum Products Processing 040103 Sulphur Recovery Plants 040104 Storage and Handling of Products in Refinery
1B2a v	1B2a v Distribution of oil products	050501 Refinery dispatch station 050502 Transport and depots 050503 Service stations (including refuelling of cars)
1B2b	1B2b Natural gas	NO
1B2c	1B2c Venting and flaring	090203 Flaring in oil refinery
<b>2A</b>	<b>2A MINERAL INDUSTRY</b>	
2A1	2A1 Cement Production	040612 Cement (decarbonising)
2A2	2A2 Lime Production	040614 Lime (decarbonising)
2A 3	2 A3 Limestone and Dolomite Use	NE

EMEP/NFR	Title	SNAP
2 A 4	2A4 Soda Ash Production and use	NE
2A 5	2A5 Asphalt Roofing	040610 Roof covering with asphalt materials
2A 6	2A6 Road Paving with Asphalt	040611 Road paving with asphalt
2 A 7 a	2 A 7 a Quarrying and mining of minerals other than coal	040616 Extraction of mineral ores 040623 Quarrying
2 A 7 b	2 A 7 b Construction and demolition	040624 Public works and building sites
2 A 7 c	2A 7 c Storage, handling and transport of mineral products	040900 Storage, handling and transport of mineral products
2A 7d	2A7 Other including non fuel mining and construction	NE
<b>2C</b>	<b>2C Metal Production</b>	
2 C 1	2 C 1 Iron and steel production	040207 Electric furnace steel plant 040208 Rolling mills 040302 Ferro alloys
2 C 2	2 C 2 Ferroalloys production	040302 Ferro alloys
2 C 3	2 C 3 Aluminum production	030310 Secondary aluminium production
2 C 5 a	2 C 5 a Copper production	NO
2 C 5 b	2 C 5 b Lead production	040309 b Secondary production
2 C 5 c	2 C 5 c Nickel production	NO
2 C 5 d	2 C 5 d Zinc production	NO
2 C 5 e	2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)	NE
2 C 5 f	2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)	NE
<b>2D</b>	<b>Other production industry</b>	
2D1	2D1 Pulp and Paper	NE
2D2	2D2 Food and Drink	040605 Bread 040606 Wine 040607 Beer 040608 Spirits
2 D 3	2 D 3 Wood processing	040620 Wood processing
<b>3A</b>	<b>3A Paint Application</b>	
3 A 1	3 A 1 Decorative coating application	060102 Paint application : car repairing

EMEP/NFR	Title	SNAP
		060103 Paint application : construction and buildings 060104 Paint application : domestic use (except 060107) 060107 Paint application : wood 060109 Other non industrial paint application
3 A 2	3 A 2 Industrial coating application	060108 Other industrial paint application
3 A 3	3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)	060100 Paint application
3C	3C CHEMICAL PRODUCTS	060301 Polyester processing 060302 Polyvinylchloride processing 060306 Pharmaceutical products manufacturing 060311 Adhesive, magnetic tapes, films and photographs
<b>3D</b>	<b>3D Other product use</b>	
3 D 1	3 D 1 Printing	NE
3 D 2	3 D 2 Domestic solvent use including fungicides	060408 Domestic solvent use (other than paint application)
3 D 3	3 D 3 Other product use	060405 Application of glues and adhesives
<b>4B</b>	<b>4B MANURE MANAGEMENT</b>	
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
4B6	4B6 Horses	100506 Horses
4B7	4B7 Mules and Asses	NE
4B8	4B8 Swine	100503 Fattening pigs 100504 Sows
4B9a	4 B 9 a Laying hens	100507 Laying hens
4 B 9 b	4 B 9 b Broilers	NE
4 B 9 c	4 B 9 c Turkeys	NE
4 B 9 d	4 B 9 d Other poultry	NE
4B13	4B13 Other	NE
<b>6A</b>	<b>6A Solid Waste Disposal on Land</b>	090401 Managed Waste Disposal on Land



EMEP/NFR	Title	SNAP
		090402 Unmanaged Waste Disposal Sites
6 C a	6 C a Clinical waste incineration (d)	090207 Incineration of hospital wastes
6 C b	6 C b Industrial waste incineration (d)	NO
6 C c	6 C c Municipal waste incineration (d)	NO
6 C d	6 C d Cremation	NO
6 C e	6 C e Small scale waste burning	NE
6 D	6 D Other waste(e)	NO
11	11 Natural sources	
11B	11B Forest fires	110301 Forest and other vegetation fires-Man inducted

**Annex 2: NFR Reporting tables NFR09 - 2010**

Table IV 1 (Revised UNECE/EMEP Reporting Guidelines ECE/EB.AIR/97)

<i>NFR sectors to be reported to LRTAP</i>					NOx (as NO <sub>2</sub> )	NM VOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>Gg NO<sub>2</sub></b>	<b>Gg</b>	<b>Gg SO<sub>2</sub></b>	<b>Gg</b>	<b>Gg</b>	<b>Gg</b>
A_PublicPower	1 A 1 a	(a)	1 A 1 a Public electricity and heat production		12,385	0,093	78,462	NE	4,242	0,506
B_IndustrialComb	1 A 1 b	(a)	1 A 1 b Petroleum refining		0,224	0,007	0,457	NE	0,020	0,083
B_IndustrialComb	1 A 1 c	(a)	1 A 1 c Manufacture of solid fuels and other energy industries		NO	NO	NO	NO	NO	NO
B_IndustrialComb	1 A 2 a	(a)	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel		0,808	0,247	2,489	NE	0,383	2,381
B_IndustrialComb	1 A 2 b	(a)	1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals		0,00247	0,00010	0,00024	NE	0,00006	0,00089
B_IndustrialComb	1 A 2 c	(a)	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals		0,354	0,013	0,020	NE	0,006	0,127
B_IndustrialComb	1 A 2 d	(a)	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0,011	0,001	0,015	NE	0,00319	0,00712
B_IndustrialComb	1 A 2 e	(a)	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0,100	0,011	0,135	NE	0,027	0,058
B_IndustrialComb	1 A 2 f i		1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)		1,069	0,069	0,258	NE	0,00003	0,689
I_OffRoadMob	1 A 2 f ii		1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)		0,878	0,038	0,00038	0,00036	0,028	0,190
J_AviLTO	1 A 3 a ii (i)		1 A 3 a ii (i) Civil aviation (Domestic, LTO)		NE	NE	NE	NE	NE	NA
J_AviLTO	1 A 3 a i (i)		1 A 3 a i (i) International aviation (LTO)		0,046	0,003	0,004	NE	NE	0,065
G_RoadRail	1 A 3 b i		1 A 3 b i Road transport: Passenger cars		3,158	2,319	0,010	0,032	0,089	20,074
G_RoadRail	1 A 3 b ii		1 A 3 b ii Road transport: Light duty vehicles		1,399	0,177	0,002	0,001	0,256	1,196
G_RoadRail	1 A 3 b iii		1 A 3 b iii Road transport: Heavy duty vehicles		6,923	0,299	0,003	0,003	0,225	1,497
G_RoadRail	1 A 3 b iv		1 A 3 b iv Road transport: Mopeds & motorcycles		0,020	0,240	0,00017	0,00013	0,006	1,030
G_RoadRail	1 A 3 b v		1 A 3 b v Road transport: Gasoline evaporation		NA	1,586	NA	NA	NA	NA
G_RoadRail	1 A 3 b vi		1 A 3 b vi Road transport: Automobile tyre and brake wear		NA	NA	NA	NA	0,0417	NA
G_RoadRail	1 A 3 b vii		1 A 3 b vii Road transport: Automobile road abrasion		NA	NA	NA	NA	0,0349	NA
G_RoadRail	1 A 3 c	(a)	1 A 3 c Railways		0,188	0,017	0,00036	0,00003	0,005	0,038
H_Shipping	1 A 3 d i (ii)		1 A 3 d i (ii) International inland waterways		NO	NO	NO	NO	NO	NO
H_Shipping	1 A 3 d ii	(a)	1 A 3 d ii National navigation (Shipping)		NE	NE	NE	NE	NE	NE
B_IndustrialComb	1 A 3 e		1 A 3 e Pipeline compressors		NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 4 a i		1 A 4 a i Commercial / institutional: Stationary		0,481	0,124	0,580	NE	0,195	1,097
I_OffRoadMob	1 A 4 a ii		1 A 4 a ii Commercial / institutional: Mobile		NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 4 b i		1 A 4 b i Residential: Stationary plants		0,776	6,883	0,615	0,028	5,415	39,427

<i>NFR sectors to be reported to LRTAP</i>					NOx (as NO <sub>2</sub> )	NM VOC	SOx (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>Gg NO<sub>2</sub></b>	<b>Gg</b>	<b>Gg SO<sub>2</sub></b>	<b>Gg</b>	<b>Gg</b>	<b>Gg</b>
I_OffRoadMob	1 A 4 b ii		1 A 4 b ii Residential: Household and gardening (mobile)		0,004	0,112	6,87E-05	3,01E-06	0,002	0,597
C_SmallComb	1 A 4 c i		1 A 4 c i Agriculture/Forestry/Fishing: Stationary		0,051	0,050	0,100	0,00016	0,035	0,256
I_OffRoadMob	1 A 4 c ii		1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		0,019	0,047	3,67E-05	5,56E-06	0,001	0,249
H_Shipping	1 A 4 c iii		1 A 4 c iii Agriculture/Forestry/Fishing: National fishing		NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 5 a	(a)	1 A 5 a Other stationary (including military)		NE	NE	NE	NE	NE	NE
I_OffRoadMob	1 A 5 b	(a)	1 A 5 b Other, Mobile (including military, land based and recreational boats)		NE	NE	NE	NE	NE	NE
E_Fugitive	1 B 1 a	(a)	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling		NA	5,379	NE	NA	NE	NA
E_Fugitive	1 B 1 b	(a)	1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation		NO	NO	NO	NO	NO	NO
E_Fugitive	1 B 1 c	(a)	1 B 1 c Other fugitive emissions from solid fuels		NO	NO	NO	NO	NO	NO
E_Fugitive	1 B 2 a i		1 B 2 a i Exploration, production, transport		NA	NO	NO	NA	NA	NA
E_Fugitive	1 B 2 a iv		1 B 2 a iv Refining / storage		NA	0,171	NE	NA	NA	NA
E_Fugitive	1 B 2 a v		1 B 2 a v Distribution of oil products		NA	0,062	NE	NA	NA	NA
E_Fugitive	1 B 2 b	(a)	1 B 2 b Natural gas		NA	NO	NO	NA	NA	NA
E_Fugitive	1 B 2 c	(a)	1 B 2 c Venting and flaring		0,016	0,001	0,002	NE	NE	0,004
E_Fugitive	1 B 3		1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2		NE	NE	NE	NE	NE	NE
D_IndProcess	2 A 1	(a)	2 A 1 Cement production		NE	NE	NE	NA	0,169	NE
D_IndProcess	2 A 2	(a)	2 A 2 Lime production		NE	NE	NE	NA	0,00096	NE
D_IndProcess	2 A 3	(a)	2 A 3 Limestone and dolomite use		NA	NA	NA	NA	NE	NA
D_IndProcess	2 A 4	(a)	2 A 4 Soda ash production and use		NA	NA	NA	NA	NE	NA
D_IndProcess	2 A 5	(a)	2 A 5 Asphalt roofing		NA	0,00016	NA	NA	0,01867	0,00031
D_IndProcess	2 A 6	(a)	2 A 6 Road paving with asphalt		NE	0,005	NE	NA	4,062	NE
D_IndProcess	2 A 7 a		2 A 7 a Quarrying and mining of minerals other than coal		NA	NA	NA	NA	0,000390	NA
D_IndProcess	2 A 7 b		2 A 7 b Construction and demolition		NA	NA	NA	NA	0,148322	NA
D_IndProcess	2 A 7 c		2 A 7 c Storage, handling and transport of mineral products		NA	NA	NA	NA	0,022201	NA
D_IndProcess	2 A 7 d		2 A 7 d Other Mineral products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
D_IndProcess	2 B 1	(a)	2 B 1 Ammonia production		NO	NO	NO	NO	NO	NO

<i>NFR sectors to be reported to LRTAP</i>					NO <sub>x</sub> (as NO <sub>2</sub> )	NMVOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>Gg NO<sub>2</sub></b>	<b>Gg</b>	<b>Gg SO<sub>2</sub></b>	<b>Gg</b>	<b>Gg</b>	<b>Gg</b>
D_IndProcess	2 B 2	(a)	2 B 2 Nitric acid production		NO	NA	NA	NO	NO	NA
D_IndProcess	2 B 3	(a)	2 B 3 Adipic acid production		NO	NA	NA	NA	NO	NO
D_IndProcess	2 B 4	(a)	2 B 4 Carbide production		NO	NO	NO	NA	NO	NO
D_IndProcess	2 B 5 a		2 B 5 a Other chemical industry (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
D_IndProcess	2 B 5 b		2 B 5 b Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 1	(a)	2 C 1 Iron and steel production		NE	0,164	NE	NE	0,327	NE
D_IndProcess	2 C 2	(a)	2 C 2 Ferroalloys production		NE	NE	NE	NE	0,081	NE
D_IndProcess	2 C 3	(a)	2 C 3 Aluminum production		NE	NE	NE	NE	0,004	NE
D_IndProcess	2 C 5 a		2 C 5 a Copper production		NO	NO	NO	NO	NO	NO
D_IndProcess	2 C 5 b		2 C 5 b Lead production		NE	NE	NE	NE	0,002	NE
D_IndProcess	2 C 5 c		2 C 5 c Nickel production		NO	NO	NO	NO	NO	NO
D_IndProcess	2 C 5 d		2 C 5 d Zinc production		NO	NO	NO	NO	NO	NO
D_IndProcess	2 C 5 e		2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 5 f		2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
D_IndProcess	2 D 1	(a)	2 D 1 Pulp and paper		NE	NE	NE	NE	NE	NE
D_IndProcess	2 D 2	(a)	2 D 2 Food and drink		NA	0,631	NA	NA	NE	NA
D_IndProcess	2 D 3		2 D 3 Wood processing		NE	NE	NE	NE	0,143	NE
D_IndProcess	2 E		2 E Production of POPs		NO	NO	NO	NO	NO	NO
D_IndProcess	2 F		2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		NA	NA	NA	NA	NA	NA
D_IndProcess	2 G		2 G Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE
F_Solvents	3 A 1		3 A 1 Decorative coating application		NA	2,60E-07	NA	NA	NA	NA
F_Solvents	3 A 2		3 A 2 Industrial coating application		NA	5,54E-07	NA	NA	NA	NA

<i>NFR sectors to be reported to LRTAP</i>					NO <sub>x</sub> (as NO <sub>2</sub> )	NMVOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>Gg NO<sub>2</sub></b>	<b>Gg</b>	<b>Gg SO<sub>2</sub></b>	<b>Gg</b>	<b>Gg</b>	<b>Gg</b>
F_Solvents	3 A 3		3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)		NA	6,93E-08	NA	NA	NA	NA
F_Solvents	3 B 1		3 B 1 Degreasing		NA	NE	NA	NA	NE	NA
F_Solvents	3 B 2		3 B 2 Dry cleaning		NA	NE	NA	NA	NE	NA
F_Solvents	3 C	(a)	3 C Chemical products		NE	5,24E-07	NE	NE	NE	NE
F_Solvents	3 D 1		3 D 1 Printing		NA	NE	NA	NA	NE	NA
F_Solvents	3 D 2		3 D 2 Domestic solvent use including fungicides		NA	2,055	NA	NA	NE	NA
F_Solvents	3 D 3		3 D 3 Other product use		0,00003	0,00003	NE	NE	0,00029	0,00087
O_AgriLivestock	4 B 1 a	(a)	4 B 1 a Cattle dairy		0,021	1,836	NA	4,590	NE	NA
O_AgriLivestock	4 B 1 b	(a)	4 B 1 b Cattle non-dairy		0,012	0,924	NA	1,411	NE	NA
O_AgriLivestock	4 B 2	(a)	4 B 2 Buffalo		0,00004	NE	NA	0,009	NE	NA
O_AgriLivestock	4 B 3	(a)	4 B 3 Sheep		0,004	0,156	NA	1,090	NE	NA
O_AgriLivestock	4 B 4	(a)	4 B 4 Goats		NE	NE	NA	NE	NE	NA
O_AgriLivestock	4 B 6	(a)	4 B 6 Horses		0,003	NE	NA	0,395	NE	NA
O_AgriLivestock	4 B 7	(a)	4 B 7 Mules and asses		NE	NE	NA	NE	NE	NA
O_AgriLivestock	4 B 8	(a)	4 B 8 Swine		0,009	0,743	NA	1,258	NE	NA
O_AgriLivestock	4 B 9 a		4 B 9 a Laying hens		0,006	0,598	NA	0,958	NE	NA
O_AgriLivestock	4 B 9 b		4 B 9 b Broilers		NE	NE	NA	NE	NE	NA
O_AgriLivestock	4 B 9 c		4 B 9 c Turkeys		NE	NE	NA	NE	NE	NA
O_AgriLivestock	4 B 9 d		4 B 9 d Other poultry		NE	NE	NA	NE	NE	NA
O_AgriLivestock	4 B 13	(a)	4 B 13 Other		NE	NE	NA	NE	NE	NA
P_AgriOther	4 D 1 a	(b)	4 D 1 a Synthetic N-fertilizers		NE	NE	NA	NE	NE	NA
P_AgriOther	4 D 2 a		4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products		NA	NA	NA	NA	NE	NA
P_AgriOther	4 D 2 b		4 D 2 b Off-farm storage, handling and transport of bulk agricultural products		NA	NA	NA	NA	NE	NA
P_AgriOther	4 D 2 c		4 D 2 c N-excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)		NE	NA	NA	NE	NE	NA
Q_AgriWastes	4 F	(a)	4 F Field burning of agricultural wastes		NE	NE	NE	NE	NE	NE
P_AgriOther	4 G	(a)	4 G Agriculture other(c)		NE	NE	NE	NE	NE	NE
L_OtherWasteDisp	6 A	(a)	6 A Solid waste disposal on land		NA	0,10797	NA	NE	NE	NA

<i>NFR sectors to be reported to LRTAP</i>					NO <sub>x</sub> (as NO <sub>2</sub> )	NM VOC	SO <sub>x</sub> (as SO <sub>2</sub> )	NH <sub>3</sub>	TSP	CO
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>Gg NO<sub>2</sub></b>	<b>Gg</b>	<b>Gg SO<sub>2</sub></b>	<b>Gg</b>	<b>Gg</b>	<b>Gg</b>
M_WasteWater	6 B	(a)	6 B Waste-water handling		NA	NO	NA	NO	NO	NA
N_WasteIncin	6 C a		6 C a Clinical wasteincineration (d)		0,00064	0,00032	0,00064	NE	0,00023	0,00128
N_WasteIncin	6 C b		6 C b Industrial waste incineration (d)		NO	NO	NO	NO	NO	NO
N_WasteIncin	6 C c		6 C c Municipal waste incineration (d)		NO	NO	NO	NO	NO	NO
N_WasteIncin	6 C d		6 C d Cremation		NO	NO	NO	NO	NO	NO
N_WasteIncin	6 C e		6 C e Small scale waste burning		NE	NE	NE	NE	NE	NE
L_OtherWasteDisp	6 D	(a)	6 D Other waste(e)		NO	NO	NO	NO	NO	NO
R_Other	7 A	(a)	7 A Other (included in national total for entire territory)		NE	NE	NE	NE	NE	NE
	<b>NATIONAL TOTAL</b>	(f) (h)	National total for the entire territory		28,967	25,168	83,153	9,775	15,992	69,576
	<b>National total (FU)</b>	(h)	National total accounting transport emissions based on fuel used		NE	NE	NE	NE	NE	NE
	<b>GRID TOTAL</b>	(g)	National total for the EMEP grid domain		NE	NE	NE	NE	NE	NE
	<b>UNFCCC national total</b>		National total as reported under UNFCCC		NE	NE	NE	NE	NE	NE
<b>Memo Items. NOT TO BE INCLUDED IN NATIONAL TOTALS UNLESS OTHERWISE STATED</b>										
K_CivilAviCruise	1 A 3 a ii (ii)		1 A 3 a ii (ii) Civil aviation (Domestic, Cruise)		NE	NE	NE	NE	NE	NE
T_IntAviCruise	1 A 3 a i (ii)		1 A 3 a i (ii) International aviation (Cruise)		0,115	0,005	0,009	NE	NE	0,010
z_Memo	1 A 3 d i (i)	(a)	1 A 3 d i (i) International maritime navigation		NO	NO	NO	NO	NO	NO
z_Memo	1 A 3	(i)	Transport (fuel used)		NE	NE	NE	NE	NE	NE
z_Memo	7 B		7 B Other not included in nationaltotal of the entire territory (Please specify in notes and your IIR)		NE	NE	NE	NE	NE	NE
S_Natural	11A		(11 08 Volcanoes)		NO	NO	NO	NO	NO	NO
S_Natural	11 B		Forest fires		0,472500	1,417500	0,094500	0,094500	1,10E-09	14,175
S_Natural	11 C		Other natural emissions (Please specify in notes and your IIR)		NE	NE	NE	NE	NE	NE

Table IV 1 (Revised UNECE/EMEP Reporting Guidelines ECE/EB.AIR/97)

		<i>NFR sectors to be reported to LRTAP</i>			Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<b>NFR Code</b>	<b>annotation</b>	<b>Longname</b>	<b>Notes:</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>
A_PublicPower	1 A 1 a	(a)	1 A 1 a Public electricity and heat production		0,928	0,110	0,180	0,876	0,568	0,024	0,982	2,819	0,384
B_IndustrialComb	1 A 1 b	(a)	1 A 1 b Petroleum refining		0,008	0,002	0,000	0,004	0,019	0,015	0,976	NE	0,046
B_IndustrialComb	1 A 1 c	(a)	1 A 1 c Manufacture of solid fuels and other energy industries		NO	NO	NO	NO	NO	NO	NO	NO	NO
B_IndustrialComb	1 A 2 a	(a)	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel		0,356	0,006	0,018	0,013	0,074	0,064	0,892	0,004	0,500
B_IndustrialComb	1 A 2 b	(a)	1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals		0,00003	0,00002	0,00001	0,00000	0,00004	0,00002	0,00046	NE	0,01347
B_IndustrialComb	1 A 2 c	(a)	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals		0,0029	0,0025	0,0010	0,0006	0,0050	0,0028	0,0369	0,00005	0,0693
B_IndustrialComb	1 A 2 d	(a)	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		0,00174	0,00004	0,00001	0,00011	0,00137	0,00077	0,02753	0,00000	0,00105
B_IndustrialComb	1 A 2 e	(a)	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		0,01586	0,00035	0,00018	0,00096	0,01184	0,00675	0,23611	0,00002	0,01112
B_IndustrialComb	1 A 2 f i		1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)		0,08487	0,00589	0,07596	0,01936	0,04215	0,05242	0,31452	0,01744	0,30233
I_OffRoadMob	1 A 2 f ii		1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)		0,000771	0,00024	NE	NE	0,00119	0,04035	0,00166	0,00024	0,02374
J_AviLTO	1 A 3 a ii (i)		1 A 3 a ii (i) Civil aviation (Domestic, LTO)		NA	NA	NA	NA	NA	NA	NA	NA	NA
J_AviLTO	1 A 3 a i (i)		1 A 3 a i (i) International aviation (LTO)		NE	NE	NE	NE	NE	NE	NE	NE	NE
G_RoadRail	1 A 3 b i		1 A 3 b i Road transport: Passenger cars		0,00367	0,00171	NE	NE	0,00853	0,29001	0,01194	0,00171	0,17060
G_RoadRail	1 A 3 b ii		1 A 3 b ii Road transport: Light duty vehicles		0,002988	0,00093	NE	NE	0,00463	0,15730	0,00648	0,00093	0,09253
G_RoadRail	1 A 3 b iii		1 A 3 b iii Road transport: Heavy duty vehicles		0,00608	0,00187	NE	NE	0,00936	0,31807	0,01310	0,00187	0,18710
G_RoadRail	1 A 3 b iv		1 A 3 b iv Road transport: Mopeds & motorcycles		0,00004	0,00002	NE	NE	0,00011	0,00357	0,00015	0,00002	0,00210
G_RoadRail	1 A 3 b v		1 A 3 b v Road transport: Gasoline evaporation		NA	NA	NA	NA	NA	NA	NA	NA	NA



NFR Aggregation for Gridding and LPS (GNFR)	NFR sectors to be reported to LRTAP				Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	NFR Code	Annotation	Longname	Notes:	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
G_RoadRail	1 A 3 b vi		1 A 3 b vi Road transport: Automobile tyre and brake wear		NE	NE	NE	NE	NE	NE	NE	NE	NE
G_RoadRail	1 A 3 b vii		1 A 3 b vii Road transport: Automobile road abrasion		NE	NE	NE	NE	NE	NE	NE	NE	NE
G_RoadRail	1 A 3 c	(a)	1 A 3 c Railways		NE	0,00004	NE	NE	0,00018	0,00609	0,00025	0,00004	0,00358
H_Shipping	1 A 3 d i (ii)		1 A 3 d i (ii) International inland waterways		NO	NO	NO	NO	NO	NO	NO	NO	NO
H_Shipping	1 A 3 d ii	(a)	1 A 3 d ii National navigation (Shipping)		NE	NE	NE	NE	NE	NE	NE	NE	NE
B_IndustrialComb	1 A 3 e		1 A 3 e Pipeline compressors		NE	NE	NE	NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 4 a i		1 A 4 a i Commercial / institutional: Stationary		0,07949	0,00235	0,00122	0,00468	0,05150	0,02999	0,95671	0,00037	0,10718
I_OffRoadMob	1 A 4 a ii		1 A 4 a ii Commercial / institutional: Mobile		NE	NE	NE	NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 4 b i		1 A 4 b i Residential: Stationary plants		0,34832	0,01496	0,00421	0,01017	0,06731	0,08783	0,72959	0,00375	1,00113
I_OffRoadMob	1 A 4 b ii		1 A 4 b ii Residential: Household and gardening (mobile)		0,10668	0,00001	NE	NE	0,00004	0,00146	0,00006	0,00001	0,00086
C_SmallComb	1 A 4 c i		1 A 4 c i Agriculture/Forestry/Fishing: Stationary		0,01263	0,00112	0,00004	0,00068	0,01107	0,00594	0,16973	0,00002	0,01148
I_OffRoadMob	1 A 4 c ii		1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		0,05813	0,00001	NE	NE	0,00004	0,00151	0,00006	0,00001	0,00089
H_Shipping	1A 4 c iii		1A 4 c iii Agriculture/Forestry/Fishing: National fishing		NE	NE	NE	NE	NE	NE	NE	NE	NE
C_SmallComb	1 A 5 a	(a)	1 A 5 a Other stationary (including military)		NE	NE	NE	NE	NE	NE	NE	NE	NE
I_OffRoadMob	1 A 5 b	(a)	1 A 5 b Other, Mobile (including military, land based and recreational boats)		NE	NE	NE	NE	NE	NE	NE	NE	NE
E_Fugitive	1 B 1 a	(a)	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling		NE	NE	NE	NE	NE	NE	NE	NE	NE
E_Fugitive	1 B 1 b	(a)	1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation		NO	NO	NO	NO	NO	NO	NO	NO	NO
E_Fugitive	1 B 1 c	(a)	1 B 1 c Other fugitive emissions from solid fuels		NO	NO	NO	NO	NO	NO	NO	NO	NO
E_Fugitive	1 B 2 a i		1 B 2 a i Exploration, production, transport		NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Fugitive	1 B 2 a iv		1 B 2 a iv Refining / storage		NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Fugitive	1 B 2 a v		1 B 2 a v Distribution of oil products		NA	NA	NA	NA	NA	NA	NA	NA	NA
E_Fugitive	1 B 2 b	(a)	1 B 2 b Natural gas		NA	NA	NA	NA	NA	NA	NA	NA	NA

NFR Aggregation for Gridding and LPS (GNFR)	NFR sectors to be reported to LRTAP				Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	NFR Code	Annotation	Longname	Notes:	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
E_Fugitive	1 B 2 c	(a)	1 B 2 c Venting and flaring		NE	NE	NE	NE	NE	NE	NE	NE	NE
E_Fugitive	1 B 3		1 B 3 Other fugitive emissions from geothermal energy production, peat and other energy extraction not included in 1 B 2		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 A 1	(a)	2 A 1 Cement production		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 A 2	(a)	2 A 2 Lime production		NE	NE	NE	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 3	(a)	2 A 3 Limestone and dolomite use		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 4	(a)	2 A 4 Soda ash production and use		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 5	(a)	2 A 5 Asphalt roofing		NE	NE	NE	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 6	(a)	2 A 6 Road paving with asphalt		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 7 a		2 A 7 a Quarrying and mining of minerals other than coal		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 7 b		2 A 7 b Construction and demolition		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 7 c		2 A 7 c Storage, handling and transport of mineral products		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 A 7 d		2 A 7 d Other Mineral products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 B 1	(a)	2 B 1 Ammonia production		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 B 2	(a)	2 B 2 Nitric acid production		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 B 3	(a)	2 B 3 Adipic acid production		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 B 4	(a)	2 B 4 Carbide production		NO	NO	NO	NO	NO	NO	NO	NO	NO
D_IndProcess	2 B 5 a		2 B 5 a Other chemical industry (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 B 5 b		2 B 5 b Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 1	(a)	2 C 1 Iron and steel production		5,020	0,022	0,109	0,437	4,911	0,076	0,153	0,022	4,365
D_IndProcess	2 C 2	(a)	2 C 2 Ferroalloys production		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 3	(a)	2 C 3 Aluminum production		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 5 a		2 C 5 a Copper production		NO	NO	NO	NO	NO	NO	NO	NO	NO
D_IndProcess	2 C 5 b		2 C 5 b Lead production		0,439	0,004	0,000	0,012	NE	NE	NE	NE	NE
D_IndProcess	2 C 5 c		2 C 5 c Nickel production		NO	NO	NO	NO	NO	NO	NO	NO	NO
D_IndProcess	2 C 5 d		2 C 5 d Zinc production		NO	NO	NO	NO	NO	NO	NO	NO	NO

NFR Aggregation for Gridding and LPS (GNFR)	NFR sectors to be reported to LRTAP				Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	NFR Code	annotation	Longname	Notes:	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
D_IndProcess	2 C 5 e		2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 C 5 f		2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 D 1	(a)	2 D 1 Pulp and paper		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 D 2	(a)	2 D 2 Food and drink		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 D 3		2 D 3 Wood processing		NA	NA	NA	NE	NA	NE	NA	NA	NA
D_IndProcess	2 E		2 E Production of POPs		NA	NA	NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 F		2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		NE	NE	NE	NE	NE	NE	NE	NE	NE
D_IndProcess	2 G		2 G Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)		NE	NE	NE	NE	NE	NE	NE	NE	NE
F_Solvents	3 A 1		3 A 1 Decorative coating application		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 A 2		3 A 2 Industrial coating application		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 A 3		3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 B 1		3 B 1 Degreasing		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 B 2		3 B 2 Dry cleaning		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 C	(a)	3 C Chemical products		NE	NE	NE	NE	NE	NE	NE	NE	NE
F_Solvents	3 D 1		3 D 1 Printing		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 D 2		3 D 2 Domestic solvent use including fungicides		NA	NA	NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 D 3		3 D 3 Other product use		3,57E-07	7,14E-07	7,14E-07	1,14E-06	2,50E-06	1,07E-06	NE	NE	NE
O_AgrilLivestock	4 B 1 a	(a)	4 B 1 a Cattle dairy		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgrilLivestock	4 B 1 b	(a)	4 B 1 b Cattle non-dairy		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgrilLivestock	4 B 2	(a)	4 B 2 Buffalo		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgrilLivestock	4 B 3	(a)	4 B 3 Sheep		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgrilLivestock	4 B 4	(a)	4 B 4 Goats		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgrilLivestock	4 B 6	(a)	4 B 6 Horses		NA	NA	NA	NA	NA	NA	NA	NA	NA

		<i>NFR sectors to be reported to LRTAP</i>			Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<b>NFR Code</b>	<b>Annotation</b>	<b>Longname</b>	<b>Notes:</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>	<b>Mg</b>
O_AgriLivestock	4 B 7	(a)	4 B 7 Mules and asses		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 8	(a)	4 B 8 Swine		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 9 a		4 B 9 a Laying hens		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 9 b		4 B 9 b Broilers		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 9 c		4 B 9 c Turkeys		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 9 d		4 B 9 d Other poultry		NA	NA	NA	NA	NA	NA	NA	NA	NA
O_AgriLivestock	4 B 13	(a)	4 B 13 Other		NA	NA	NA	NA	NA	NA	NA	NA	NA
P_AgriOther	4 D 1 a	(b)	4 D 1 a Synthetic N-fertilizers		NA	NA	NA	NA	NA	NA	NA	NA	NA
P_AgriOther	4 D 2 a		4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products		NA	NA	NA	NA	NA	NA	NA	NA	NA
P_AgriOther	4 D 2 b		4 D 2 b Off-farm storage, handling and transport of bulk agricultural products		NA	NA	NA	NA	NA	NA	NA	NA	NA
P_AgriOther	4 D 2 c		4 D 2 c N-excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NA	NA	NA	NA
Q_AgriWastes	4 F	(a)	4 F Field burning of agricultural wastes		NE	NE	NE	NE	NE	NE	NE	NE	NE
P_AgriOther	4 G	(a)	4 G Agriculture other(c)		NE	NE	NE	NE	NE	NE	NE	NE	NE
L_OtherWasteDis p	6 A	(a)	6 A Solid waste disposal on land		NA	NA	NE	NA	NA	NA	NA	NA	NA
M_WasteWater	6 B	(a)	6 B Waste-water handling		NO	NO	NO	NO	NO	NO	NO	NO	NO
N_WasteIncIn	6 C a		6 C a Clinical waste incineration (d)		0,00596	0,00046	0,00367	0,00060	0,00215	0,00119	0,00018	NE	NE
N_WasteIncIn	6 C b		6 C b Industrial waste incineration (d)		NO	NO	NO	NO	NO	NO	NO	NO	NO
N_WasteIncIn	6 C c		6 C c Municipal waste incineration (d)		NO	NO	NO	NO	NO	NO	NO	NO	NO
N_WasteIncIn	6 C d		6 C d Cremation		NO	NO	NO	NO	NO	NO	NO	NO	NO
N_WasteIncIn	6 C e		6 C e Small scale waste burning		NE	NE	NE	NE	NE	NE	NE	NE	NE
L_OtherWasteDis p	6 D	(a)	6 D Other waste(e)		NO	NO	NO	NO	NO	NO	NO	NO	NO
R_Other	7 A	(a)	7 A Other (included in national total for entire territory)		NE	NE	NE	NE	NE	NE	NE	NE	NE
	<b>NATIONAL TOTAL</b>	(f) (h)	National total for the entire territory		7,482	0,176	0,394	1,379	5,788	1,185	5,509	2,871	7,294

NFR Aggregation for Gridding and LPS (GNFR)	NFR sectors to be reported to LRTAP				Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn
	NFR Code	Annotation	Longname	Notes:	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
	<b>National total (FU)</b>	(h)	National total accounting transport emissions based on fuel used		NE	NE	NE	NE	NE	NE	NE	NE	NE
	<b>GRID TOTAL</b>	(g)	National total for the EMEP grid domain		NE	NE	NE	NE	NE	NE	NE	NE	NE
	<b>UNFCCC national total</b>		National total as reported under UNFCCC		NE	NE	NE	NE	NE	NE	NE	NE	NE
<b>Memo Items. NOT TO BE INCLUDED IN NATIONAL TOTALS UNLESS OTHERWISE STATED</b>													
K_CivilAviCruise	1 A 3 a ii (ii)		1 A 3 a ii (ii) Civil aviation (Domestic, Cruise)		NE	NE	NE	NE	NE	NE	NE	NE	NE
T_IntAviCruise	1 A 3 a i (ii)		1 A 3 a i (ii) International aviation (Cruise)		NE	NE	NE	NE	NE	NE	NE	NE	NE
z_Memo	1 A 3 d i (i)	(a)	1 A 3 d i (i) International maritime navigation		NO	NO	NO	NO	NO	NO	NO	NO	NO
z_Memo	1 A 3	(i)	Transport (fuel used)		NE	NE	NE	NE	NE	NE	NE	NE	NE
z_Memo	7 B		7 B Other not included in national total of the entire territory (Please specify in notes and your IIR)		NE	NE	NE	NE	NE	NE	NE	NE	NE
S_Natural	11 A		(11 08 Volcanoes)		NO	NO	NO	NO	NO	NO	NO	NO	NO
S_Natural	11 B		Forest fires		NE	NE	NE	NE	NE	NE	NE	NE	NE
S_Natural	11 C		Other natural emissions (Please specify in notes and your IIR)		NE	NE	NE	NE	NE	NE	NE	NE	NE

Table IV 1 (Revised UNECE/EMEP Reporting Guidelines ECE/EB.AIR/97)

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
A_PublicPower	1 A 1 a	(a)	1 A 1 a Public electricity and heat production		1.341,0	51.191,7	1.970,5	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 1 b	(a)	1 A 1 b Petroleum refining		779,9	NO	1.293,8	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 1 c	(a)	1 A 1 c Manufacture of solid fuels and other energy industries		NO	NO	NO	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 a	(a)	1 A 2 a Stationary combustion in manufacturing industries and construction: Iron and steel		3.314,0	2.245,6	1.076,4	82,0	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 b	(a)	1 A 2 b Stationary Combustion in manufacturing industries and construction: Non-ferrous metals		1,6	NO	32,9	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 c	(a)	1 A 2 c Stationary combustion in manufacturing industries and construction: Chemicals		123,3	NO	4.880,2	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 d	(a)	1 A 2 d Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print		105,9	NO	1,8	NO	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 e	(a)	1 A 2 e Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco		907,3	8,5	94,7	7,3	NO	NA	TJ NCV
B_IndustrialComb	1 A 2 f i		1 A 2 f i Stationary combustion in manufacturing industries and construction: Other (Please specify in your IIR)		1.079,4	NO	91,6	0,9	NO	NA	TJ NCV
I_OffRoadMob	1 A 2 f ii		1 A 2 f ii Mobile Combustion in manufacturing industries and construction: (Please specify in your IIR)		1.020,7	NO	NO	NO	NO	NA	TJ NCV
J_AviLTO	1 A 3 a ii (i)		1 A 3 a ii (i) Civil aviation (Domestic, LTO)		NE	NA	NA	NA	NA	NA	TJ NCV
J_AviLTO	1 A 3 a i (i)		1 A 3 a i (i) International aviation (LTO)		199,1	NA	NA	NA	NA	NA	TJ NCV
G_RoadRail	1 A 3 b i		1 A 3 b i Road transport: Passenger cars		7.456,4	NA	2.634,4	NO	NA	NA	TJ NCV
G_RoadRail	1 A 3 b ii		1 A 3 b ii Road transport: Light duty vehicles		3.979,9	NA	NE	NA	NA	NA	TJ NCV
G_RoadRail	1 A 3 b iii		1 A 3 b iii Road transport: Heavy duty vehicles		8.061,6	NA	NE	NA	NA	NA	TJ NCV
G_RoadRail	1 A 3 b iv		1 A 3 b iv Road transport: Mopeds & motorcycles		92,5	NA	NO	NA	NA	NA	TJ NCV
G_RoadRail	1 A 3 b v		1 A 3 b v Road transport: Gasoline evaporation		69.771,0	NA	NA	NA	NA	NA	TJ NCV
G_RoadRail	1 A 3 b vi		1 A 3 b vi Road transport: Automobile tyre and brake wear		NA	NA	NA	NA	NA	1.717,0	10 <sup>6</sup> km
G_RoadRail	1 A 3 b vii		1 A 3 b vii Road transport: Automobile road abrasion		NA	NA	NA	NA	NA	1.717,0	10 <sup>6</sup> km
G_RoadRail	1 A 3 c	(a)	1 A 3 c Railways		153,9	NO	NA	NA	NA	NA	TJ NCV
H_Shipping	1 A 3 d i (ii)		1 A 3 d i (ii) International inland waterways		NO	NO	NA	NA	NA	NA	TJ NCV
H_Shipping	1 A 3 d ii	(a)	1 A 3 d ii National navigation (Shipping)		NE	NE	NA	NA	NA	NA	TJ NCV
B_IndustrialComb	1 A 3 e		1 A 3 e Pipeline compressors		NE	NA	NE	NA	NA	NA	TJ NCV
C_SmallComb	1 A 4 a i		1 A 4 a i Commercial / institutional: Stationary		3.671,8	48,8	301,7	560,9	NA	NA	TJ NCV
I_OffRoadMob	1 A 4 a ii		1 A 4 a ii Commercial / institutional: Mobile		NE	NE	NE	NE	NE	NA	TJ NCV

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
C_SmallComb	1 A 4 b i		1 A 4 b i Residential: Stationary plants		2.899,8	68,2	418,7	7.352,1	NE	NA	TJ NCV
I_OffRoadMob	1 A 4 b ii		1 A 4 b ii Residential: Household and gardening (mobile)		37,8	NO	NE	NO	NO	NA	TJ NCV
C_SmallComb	1 A 4 c i		1 A 4 c i Agriculture/Forestry/Fishing: Stationary		706,4	NE	NE	42,1	NE	NA	TJ NCV
I_OffRoadMob	1 A 4 c ii		1 A 4 c ii Agriculture/Forestry/Fishing: Off-road vehicles and other machinery		38,7	NA	NA	NO	NA	NA	TJ NCV
H_Shipping	1 A 4 c iii		1 A 4 c iii Agriculture/Forestry/Fishing: National fishing		NE	NA	NA	NA	NA	NA	TJ NCV
C_SmallComb	1 A 5 a	(a)	1 A 5 a Other stationary (including military)		NE	NE	NE	NE	NE	NA	TJ NCV
I_OffRoadMob	1 A 5 b	(a)	1 A 5 b Other, Mobile (including military, land based and recreational boats)		NE	NA	NA	NO	NA	NA	TJ NCV
E_Fugitive	1 B 1 a	(a)	1 B 1 a Fugitive emission from solid fuels: Coal mining and handling		NA	NA	NA	NA	NA	6,7	coal produced [Mt]
E_Fugitive	1 B 1 b	(a)	1 B 1 b Fugitive emission from solid fuels: Solid fuel transformation		NA	NA	NA	NA	NA	NO	coal used for transformation [Mt]
E_Fugitive	1 B 1 c	(a)	1 B 1 c Other fugitive emissions from solid fuels		NA	NA	NA	NA	NA	NO	Please specify
E_Fugitive	1 B 2 a i		1 B 2 a i Exploration, production, transport		NA	NA	NA	NA	NA	NO	Crude Oil produced [Mt]
E_Fugitive	1 B 2 a iv		1 B 2 a iv Refining / storage		NA	NA	NA	NA	NA	853,0	Crude Oil Refined [Mt]
E_Fugitive	1 B 2 a v		1 B 2 a v Distribution of oil products		NA	NA	NA	NA	NA	0,3	Oil Consumed [Mt]
E_Fugitive	1 B 2 b	(a)	1 B 2 b Natural gas		NA	NA	NA	NA	NA	NO	Gas throughput [Mn3]
E_Fugitive	1 B 2 c	(a)	1 B 2 c Venting and flaring		NA	NA	NA	NA	NA	164,5	Gas vented Flared [TJ]
E_Fugitive	1 B 3		1 B 3 Other fugitive emissions from geothermal energy production , peat and other energy extraction not included in 1 B 2		NA	NA	NA	NA	NA	NE	Geothermal energy extracted [TJ]

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
D_IndProcess	2 A 1	(a)	2 A 1 Cement production		NA	NA	NA	NA	NA	766,0	Clinker Production [kt]
D_IndProcess	2 A 2	(a)	2 A 2 Lime production		NA	NA	NA	NA	NA	1,6	Lime Produced [kt]
D_IndProcess	2 A 3	(a)	2 A 3 Limestone and dolomite use		NA	NA	NA	NA	NA	NE	Limestone and Dolomite used [kt]
D_IndProcess	2 A 4	(a)	2 A 4 Soda ash production and use		NA	NA	NA	NA	NE	NE	Soda Ash Production kt
D_IndProcess	2 A 5	(a)	2 A 5 Asphalt roofing		NA	NA	NA	NA	NA	31,1	Roofing Material Production [Mio m2]
D_IndProcess	2 A 6	(a)	2 A 6 Road paving with asphalt		NA	NA	NA	NA	NA	290,1	Asphalt Production [kt]
D_IndProcess	2 A 7 a		2 A 7 a Quarrying and mining of minerals other than coal		NA	NA	NA	NA	NA	5,6	Material quarried [Mt]
D_IndProcess	2 A 7 b		2 A 7 b Construction and demolition		NA	NA	NA	NA	NA	915.569,0	floor space constructed/ demolished [M3]
D_IndProcess	2 A 7 c		2A 7 c Storage, handling and transport of mineral products		NA	NA	NA	NA	NA	2,2	Amount [Mt]
D_IndProcess	2 A 7 d		2 A 7 d Other Mineral products (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	[t]
D_IndProcess	2 B 1	(a)	2 B 1 Ammonia production		NA	NA	NA	NA	NA	NO	Ammonia Production [kt]
D_IndProcess	2 B 2	(a)	2 B 2 Nitric acid production		NA	NA	NA	NA	NA	NO	Nitric Acid Production [kt]
D_IndProcess	2 B 3	(a)	2 B 3 Adipic acid production		NA	NA	NA	NA	NA	NO	Adipic Acid Production [kt]



	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
D_IndProcess	2 B 4	(a)	2 B 4 Carbide production		NA	NA	NA	NA	NA	NO	Carbide Production [kt]
D_IndProcess	2 B 5 a		2 B 5 a Other chemical industry (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	[t]PVC
D_IndProcess	2 B 5 b		2 B 5 b Storage, handling and transport of chemical products (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	Please specify
D_IndProcess	2 C 1	(a)	2 C 1 Iron and steel production		NA	NA	NA	NA	NA	1.091,3	Steel Produced [kt]
D_IndProcess	2 C 2	(a)	2 C 2 Ferroalloys production		NA	NA	NA	NA	NA	81,2	Ferroalloys Production [kt]
D_IndProcess	2 C 3	(a)	2 C 3 Aluminum production		NA	NA	NA	NA	NA	1,9	Aluminium production [kt]
D_IndProcess	2 C 5 a		2 C 5 a Copper production		NA	NA	NA	NA	NA	NO	Copper production [kt]
D_IndProcess	2 C 5 b		2 C 5 b Lead production		NA	NA	NA	NA	NA	3,5	Lead production [kt]
D_IndProcess	2 C 5 c		2 C 5 c Nickel production		NA	NA	NA	NA	NA	NO	Nickel production [kt]
D_IndProcess	2 C 5 d		2 C 5 d Zinc production		NA	NA	NA	NA	NA	NO	Zinc production [kt]
D_IndProcess	2 C 5 e		2 C 5 e Other metal production (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	Please specify
D_IndProcess	2 C 5 f		2 C 5 f Storage, handling and transport of metal products (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	Amount (kt)
D_IndProcess	2 D 1	(a)	2 D 1 Pulp and paper		NA	NA	NA	NA	NA	NE	Pulp production [kt]

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
D_IndProcess	2 D 2	(a)	2 D 2 Food and drink		NA	NA	NA	NA	NA	315,4	Bread, Wine, Beer, Spirits Production [kt]
D_IndProcess	2 D 3		2 D 3 Wood processing		NA	NA	NA	NA	NA	142,8	Please specify
D_IndProcess	2 E		2 E Production of POPs		NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 F		2 F Consumption of POPs and heavy metals (e.g. electrical and scientific equipment)		NA	NA	NA	NA	NA	NA	NA
D_IndProcess	2 G		2 G Other production, consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 A 1		3 A 1 Decorative coating application		NA	NA	NA	NA	NA	1,7	Paint applied [kt]
F_Solvents	3 A 2		3 A 2 Industrial coating application		NA	NA	NA	NA	NA	1,4	Paint applied [kt]
F_Solvents	3 A 3		3 A 3 Other coating application (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	0,3	Solvents used [kt]
F_Solvents	3 B 1		3 B 1 Degreasing		NA	NA	NA	NA	NA	NE	Solvents used [kt]
F_Solvents	3 B 2		3 B 2 Dry cleaning		NA	NA	NA	NA	NA	NE	Solvents used [kt]
F_Solvents	3 C	(a)	3 C Chemical products		NA	NA	NA	NA	NA	52,4	NA
F_Solvents	3 D 1		3 D 1 Printing		NA	NA	NA	NA	NA	NA	NA
F_Solvents	3 D 2		3 D 2 Domestic solvent use including fungicides		NA	NA	NA	NA	NA	2.055	Solvents used [1000 head]
F_Solvents	3 D 3		3 D 3 Other product use		NE	NE	NE	NE	NE	7.143,7	[t]
O_AgriLivestock	4 B 1 a	(a)	4 B 1 a Cattle dairy		NA	NA	NA	NA	NA	135,0	Population Size (1000 head)
O_AgriLivestock	4 B 1 b	(a)	4 B 1 b Cattle non-dairy		NA	NA	NA	NA	NA	124,9	Population Size (1000 head)

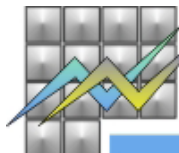
	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<b>Notes:</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
O_AgriLivestock	4 B 2	(a)	4 B 2 Buffalo		NA	NA	NA	NA	NA	1,04	Population Size (1000 head)
O_AgriLivestock	4 B 3	(a)	4 B 3 Sheep		NA	NA	NA	NA	NA	778,4	Population Size (1000 head)
O_AgriLivestock	4 B 4	(a)	4 B 4 Goats		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
O_AgriLivestock	4 B 6	(a)	4 B 6 Horses		NA	NA	NA	NA	NA	26,7	Population Size (1000 head)
O_AgriLivestock	4 B 7	(a)	4 B 7 Mules and asses		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
O_AgriLivestock	4 B 8	(a)	4 B 8 Swine		NA	NA	NA	NA	NA	190,6	Population Size (1000 head)
O_AgriLivestock	4 B 9 a		4 B 9 a Laying hens		NA	NA	NA	NA	NA	1.994,9	Population Size (1000 head)
O_AgriLivestock	4 B 9 b		4 B 9 b Broilers		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
O_AgriLivestock	4 B 9 c		4 B 9 c Turkeys		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
O_AgriLivestock	4 B 9 d		4 B 9 d Other poultry		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
O_AgriLivestock	4 B 13	(a)	4 B 13 Other		NA	NA	NA	NA	NA	NE	Population Size (1000 head)
P_AgriOther	4 D 1 a	(b)	4 D 1 a Synthetic N-fertilizers		NA	NA	NA	NA	NA	NE	Use of synthetic fertilizers (kg N/yr)
P_AgriOther	4 D 2 a		4 D 2 a Farm-level agricultural operations including storage, handling and transport of agricultural products		NA	NA	NA	NA	NA	NE	Please specify

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
<b>NFR Aggregation for Gridding and LPS (GNFR)</b>	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<i>Notes:</i>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>	<b>TJ NCV</b>		
P_AgriOther	4 D 2 b		4 D 2 b Off-farm storage, handling and transport of bulk agricultural products		NA	NA	NA	NA	NA	NE	Please specify
P_AgriOther	4 D 2 c		4 D 2 c N-excretion on pasture range and paddock unspecified (Please specify the sources included/excluded in the notes column to the right)		NA	NA	NA	NA	NA	NE	kg N/yr
Q_AgriWastes	4 F	(a)	4 F Field burning of agricultural wastes		NA	NA	NA	NA	NA	NE	Area burned k ha/yr
P_AgriOther	4 G	(a)	4 G Agriculture other(c)		NA	NA	NA	NA	NA	NA	NA
L_OtherWasteDisp	6 A	(a)	6 A Solid waste disposal on land		NA	NA	NA	NA	NA	358,46	Annual deposition of MSW at the SWDS [Gg]
M_WasteWater	6 B	(a)	6 B Waste-water handling		NA	NA	NA	NA	NA	NO	Total organic product [Gg DC/yr]
N_WasteIncinc	6 C a		6 C a Clinical wasteincineration (d)		NA	NA	NA	NA	NA	0,5	Waste incinerated [Gg]
N_WasteIncinc	6 C b		6 C b Industrial waste incineration (d)		NA	NA	NA	NA	NA	NO	Waste incinerated [Gg]
N_WasteIncinc	6 C c		6 C c Municipal waste incineration (d)		NA	NA	NA	NA	NA	NO	MSW incinerated [Gg]
N_WasteIncinc	6 C d		6 C d Cremation		NA	NA	NA	NA	NA	NO	Incineration of corpses [Number]
N_WasteIncinc	6 C e		6 C e Small scale waste burning		NA	NA	NA	NA	NA	NE	Amount of waste burned [kt]
L_OtherWasteDisp	6 D	(a)	6 D Other waste(e)		NA	NA	NA	NA	NA	NO	Please specify
R_Other	7 A	(a)	7 A Other (included in national total for entire territory)		NA	NA	NA	NA	NA	NA	NA
	<b>NATIONAL TOTAL</b>	(f) (h)	National total for the entire territory		NA	NA	NA	NA	NA	NA	NA

	<i>NFR sectors to be reported to LRTAP</i>				Activity Data (From 1990)						
					Liquid Fuels	Solid Fuels	Gaseous Fuels	Bio-mass	Other Fuels	Other activity (specified)	Other Activity Units
NFR Aggregation for Gridding and LPS (GNFR)	<i>NFR Code</i>	<i>annotation</i>	<i>Longname</i>	<i>Notes:</i>	TJ NCV	TJ NCV	TJ NCV	TJ NCV	TJ NCV		
	<b>National total (FU)</b>	(h)	National total accounting transport emissions based on fuel used		NA	NA	NA	NA	NA	NA	NA
	<b>GRID TOTAL</b>	(g)	National total for the EMEP grid domain		NA	NA	NA	NA	NA	NA	NA
	<b>UNFCCC national total</b>		National total as reported under UNFCCC		NE	NE	NE	NE	NE	NE	
<b>Memo Items. NOT TO BE INCLUDED IN NATIONAL TOTALS UNLESS OTHERWISE STATED</b>											
K_CivilAviCruise	1 A 3 a ii (ii)		1 A 3 a ii (ii) Civil aviation (Domestic, Cruise)		NE	NA	NA	NA	NA	NA	TJ NCV
T_IntAviCruise	1 A 3 a i (ii)		1 A 3 a i (ii) International aviation (Cruise)		396,0	NA	NA	NA	NA	NA	TJ NCV
z_Memo	1 A 3 d i (i)	(a)	1 A 3 d i (i) International maritime navigation		NO	NA	NA	NA	NA	NA	TJ NCV
z_Memo	1 A 3	(i)	Transport (fuel used)		NE	NE	NE	NE	NE	NE	
z_Memo	7 B		7 B Other not included in national total of the entire territory (Please specify in notes and your IIR)		NA	NA	NA	NA	NA	NA	NA
S_Natural	11A		(11 08 Volcanoes)		NA	NA	NA	NA	NA	NO	Please specify
S_Natural	11 B		Forest fires		NA	NA	NA	NA	NA	4.725,0	Area of forest burned [ha]
S_Natural	11 C		Other natural emissions (Please specify in notes and your IIR)		NE	NE	NE	NE	NE	NE	

LPS	GNFR	E-PRTR/ PRTR Facility ID	Height class (1-5)	Longitude	Latitude	NOx (as NO <sub>2</sub> )	NM VOC	SOx (as SO <sub>2</sub> )	CO	Pb	Cd	Hg
				deg	deg	Gg	Gg	Gg	Gg	Mg	Mg	Mg
001-REK Bitola	A_PublicPower		5	21,3039	41,0314	10,25779	0,07484	66,91776	0,36232	0,792447	0,092452	0,154087
002-REK Oslomej	A_PublicPower		4	21,0000	41,5500	1,66987	0,01218	10,16974	0,05898	0,129003	0,015050	0,025084
003-Rafinerija OKTA	B_IndustrialComb		4	21,6548	41,9896	0,24066	0,00760	0,45950	0,08733	0,007526	0,002390	0,000263
004-Cementarnica USJE	B_IndustrialComb		2	21,4655	41,9677	1,06857	0,06894	0,25784	0,68940	0,000068	0,000006	0,000076
006-Makstil	D_IndProcess		1	21,4647	42,0172	0,08907	0,01525	0,01788	0,51446	0,759044	0,058742	0,014740
007-Feni Industri	B_IndustrialComb		2	21,9501	41,4409	0,24613	0,02217	0,36633	0,08888	0,035893	0,000816	0,000268
008-Mittal Steel	D_IndProcess		1	21,4647	42,0172	0,02153	0,00077	0,00015	0,00769	0,000062	0,000154	0,000062
009-ESM Energetika	A_PublicPower		2	21,4650	42,0381	0,05614	0,00095	0,00019	0,02460	0,000126	0,000315	0,000063
011-Toplana ZAPAD	A_PublicPower		1	21,3969	42,0006	0,20776	0,00222	0,46867	0,00676	0,004735	0,001256	0,000387
012-Toplana ISTOK	A_PublicPower		2	21,4597	41,9935	0,51600	0,00364	0,86851	0,06644	0,009065	0,003064	0,000863
013-Teteks	B_IndustrialComb		2	20,9700	41,9830	0,02050	0,00021	0,12155	0,00098	0,001641	0,000181	0,000298

**Annex 3: Energy balances of Macedonia, 2010**



## ЕНЕРГИЈА - ENERGY

### СООПШТЕНИЕ - NEWS RELEASE

#### Енергетски биланси, 2010

#### - претходни податоци -

Според податоците на Државниот завод за статистика, во 2010 година, вкупното примарно производство на енергија во Република Македонија изнесуваше 1 615 629 тое или 56.2% од вкупно потребната енергија.

Вкупната потребна енергија за 2010 година изнесуваше 2 875 440 тое.

Најголеми финални потрошувачи на енергија во 2010 година беа: индустријата со 28.8%, домаќинствата со 29.5 % и сообраќајот со 25.3% (од расположливата финална потрошувачка).

во 000 тое

in '000 toe

Снабдување и потрошувачка	2010 <sup>1)</sup>	2009 <sup>2)</sup>	Supply and consumption
Бруто-примарно производство	1615.629	1606.956	Total primary production
Увоз	1614.683	1638.154	Imports
Салдо на залихи	-7.796	-70.575	Stock change
Извоз	347.076	365.010	Exports
<b>Вкупно потребна енергија</b>	<b>2875.440</b>	<b>2809.525</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	2230.554	2501.875	Transformation input
Производство на трансформирана енергија	1380.609	1590.535	Transformation output
Размена	0	0.000	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	79.260	80.404	Consumption of the energy branch
Загуби во пренос и дистрибуција	121.465	112.684	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>1824.770</b>	<b>1705.097</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	35.405	34.236	Final non-energy consumption
Финална енергетска потрошувачка	1789.365	1670.861	Final energy consumption
Индустрија	525.088	421.593	Industry
Сообраќај	460.880	439.685	Transport
Домаќинства	538.117	541.581	Households
Земјоделство	27.152	18.516	Agriculture
Други сектори	238.129	249.486	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>

<sup>1)</sup> Претходни податоци / Preliminary data

<sup>2)</sup> Дефинитивни податоци / Definitive data

### Energy balances, 2010

#### - preliminary data -

According to the State Statistical Office data, in 2010, the Total primary production of energy in the Republic of Macedonia was 1 615 629 toe or 56.2% of Gross inland consumption.

The gross inland consumption of energy for 2010 was 2 875 440 toe.

The biggest Final energy consumers in 2010 were: Industry with 28.8%, Households with 29.5% and Transport with 25.3% (of the Available for final consumption).

За подетални информации јавете се кај:

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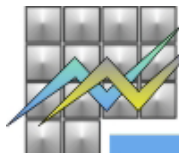
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Енергетски биланси, 2010 во природни единици мерки <sup>1)</sup>  
Energy balances, 2010 in natural units <sup>1)</sup>

Снабдување и потрошувачка	Камен јаглен	Кокс	Лигнит	Сурова нафта	Влезни сировини	Supply and consumption
	Hard coal	Coke	Lignite	Crude oil	Feedstocks	
	000 тони / '000 tonnes			000 тони / '000 tonnes		
Бруто-примарно производство	-	-	6724.351	-	-	Total primary production
Увоз	3.507	26.884	239.917	842.307	-	Imports
Салдо на залихи	-	0.093	15.199	10.691	-	Stock change
Извоз	0.263	0.707	40.321	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>3.244</b>	<b>26.270</b>	<b>6939.146</b>	<b>852.998</b>	<b>0.000</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	-	6738.687	852.998	21.713	Transformation input
Термоцентрали	-	-	6691.722	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	31.293	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	852.998	21.713	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	15.672	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	-	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-	-	-	-	21.713	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>3.244</b>	<b>26.270</b>	<b>200.459</b>	-	-	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	3.244	26.270	200.459	-	-	Final energy consumption
Индустрија	3.244	26.270	185.147	-	-	Industry
Индустрија за железо и челик	3.244	25.959	184.622	-	-	Iron & steel industry
Обоена металургија	-	-	-	-	-	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	-	Chemical industry
Индустрија за градежен материјал стакло и керамика	-	-	-	-	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	-	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	-	0.309	-	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	-	-	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	-	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	-	0.002	0.525	-	-	Engineering & other metal industry
Останати индустрии	-	-	-	-	-	Other industries
Сообраќај	-	-	-	-	-	Transport
Железнички сообраќај	-	-	-	-	-	Railways
Патен сообраќај	-	-	-	-	-	Road transport
Воздушен сообраќај	-	-	-	-	-	Air transport
Останата потрошувачка	-	-	15.312	-	-	Households, commerce, pub. auth., etc.
Домаќинства	-	-	8.919	-	-	Households
Земјоделство	-	-	0.015	-	-	Agriculture
Други сектори	-	-	6.378	-	-	Other
<b>Статистичка разлика</b>	-	-	-	-	-	<b>Statistical difference</b>

<sup>1)</sup> Претходни податоци / Provisional data

Продолжува на страница 3 / Continuing on page 3



Енергетски биланси, 2010 во природни единици мерки <sup>1)</sup>  
Energy balances, 2010 in natural units <sup>1)</sup>

Снабдување и потрошувачка	Вкупно нафтени продукти	Рафинериски гас	ТНГ	Моторен бензин	Керозини, млазни горива	Supply and consumption
	Total petroleum products	Refinery gas	LPG	Motor spirit	Kerosenes, jet fuels	
000 тони / '000 tonnes						
Бруто-примарно производство	-	-	-	-	-	Total primary production
Увоз	403.773	-	40.949	33.812	0.311	Imports
Салдо на залихи	9.253	-	-0.017	-9.235	2.001	Stock change
Извоз	333.069	-	2.667	62.257	14.879	Exports
<b>Вкупно потребна енергија</b>	<b>79.956</b>	<b>0.000</b>	<b>38.265</b>	<b>-37.680</b>	<b>-12.567</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	86.333	0.037	1.650	-	-	Transformation input
Термоцентрали	15.652	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	22.994	0.037	-	-	-	Refineries
Јавни котлари и комбинирани електрани	16.711	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	30.976	-	1.650	-	-	Autoproducer heat plants
Производство на трансформирана енергија	828.334	0.037	24.416	161.258	19.455	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	828.334	0.037	24.416	161.258	19.455	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-21.218	-	-	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.333	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>799.407</b>	<b>-</b>	<b>61.031</b>	<b>123.578</b>	<b>6.888</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	36.142	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	763.265	-	61.031	123.578	6.888	Final energy consumption
Индустија	189.671	-	4.202	-	-	Industry
Индустија за железо и челик	72.856	-	0.134	-	-	Iron & steel industry
Обоена металургија	0.751	-	0.714	-	-	Non-ferrous metal industry
Хемиска индустрија	0.196	-	0.001	-	-	Chemical industry
Индустија за градежен материјал стакло и керамика	82.969	-	1.988	-	-	Glass, pottery & building mat. industry
Индустија за експлоатација на руди	17.193	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	4.372	-	0.708	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.229	-	0.050	-	-	Textile, leather & clothing industry
Индустија за хартија и печатење	0.006	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	2.770	-	0.603	-	-	Engineering & other metal industry
Останати индустрии	8.329	-	0.004	-	-	Other industries
Сообраќај	438.610	-	41.807	123.227	6.888	Transport
Железнички сообраќај	3.580	-	-	-	-	Railways
Патен сообраќај	428.046	-	41.807	123.131	-	Road transport
Воздушен сообраќај	6.984	-	-	0.096	6.888	Air transport
Останата потрошувачка	134.985	-	15.021	0.351	-	Households, commerce, pub. auth., etc.
Домаќинства	42.665	-	9.082	-	-	Households
Земјоделство	16.976	-	0.015	0.351	-	Agriculture
Други сектори	75.344	-	5.924	-	-	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>

Продолжува на страница 4 / Continuing on page 4



Енергетски биланси, 2010 во природни единици мерки <sup>1)</sup>  
Energy balances, 2010 in natural units <sup>1)</sup>

Снабдување и потрошувачка	Дизел и гориво за ложење	Мазут	Други нафтени продукти	Природен гас	Supply and consumption
	Gas / diesel oil	Residual fuel oil	Other petroleum products	Natural gas	
	000 тони / '000 tonnes			'000 m <sup>3</sup>	
Бруто-примарно производство	-	-	-	-	Total primary production
Увоз	196.160	-	132.541	118396.526	Imports
Салдо на залихи	0.777	15.655	0.073	-94.451	Stock change
Извоз	164.930	56.087	32.249	-	Exports
<b>Вкупно потребна енергија</b>	<b>32.006</b>	<b>-40.433</b>	<b>100.365</b>	<b>118302.075</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	6.667	77.979	-	80551.762	Transformation input
Термоцентрали	-	15.652	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	478.415	Autoprod. thermal power stations
Рафинерии	-	22.957	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	16.711	-	65974.415	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	6.667	22.659	-	14098.932	Autoproducer heat plants
Производство на трансформирана енергија	363.530	259.638	-	-	Transformation output
Термоцентрали	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	Autoprod. thermal power stations
Рафинерии	363.530	259.638	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	Autoproducer heat plants
Размена	0.495	-21.713	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.333	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	908.450	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>388.031</b>	<b>119.514</b>	<b>100.365</b>	<b>36841.863</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	36.142	-	Final non-energy consumption
Финална енергетска потрошувачка	388.031	119.514	64.223	36841.863	Final energy consumption
Индустрија	36.099	85.147	64.223	35736.903	Industry
Индустрија за железо и челик	4.227	68.495	-	32131.391	Iron & steel industry
Обоена металургија	0.037	-	-	-	Non-ferrous metal industry
Хемиска индустрија	0.195	-	-	145.678	Chemical industry
Индустрија за градежен материјал стакло и керамика	2.074	14.684	64.223	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	17.193	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	3.664	-	-	1852.136	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.179	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	0.006	-	-	196.463	Paper and printing
Инженерство и друга метална индустрија	1.805	0.362	-	1411.235	Engineering & other metal industry
Останати индустрии	6.719	1.606	-	-	Other industries
Сообраќај	266.687	-	-	252.204	Transport
Железнички сообраќај	3.580	-	-	-	Railways
Патен сообраќај	263.107	-	-	252.204	Road transport
Воздушен сообраќај	-	-	-	-	Air transport
Останата потрошувачка	85.245	34.367	-	852.756	Households, commerce, pub. auth., etc.
Домаќинства	33.583	-	-	-	Households
Земјоделство	0.540	16.070	-	-	Agriculture
Други сектори	51.122	18.297	-	852.756	Other
<b>Статистичка разлика</b>	-	-	-	-	<b>Statistical difference</b>

<sup>1)</sup>Претходни податоци / Provisional data

Продолжува на страница 5 / Continuing on page 5

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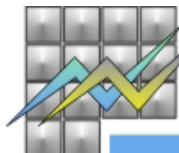
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Енергетски биланси, 2010 во природни единици мерки <sup>1)</sup>  
Energy balances, 2010 in natural units <sup>1)</sup>

Снабдување и потрошувачка	Геотер- мална топлина	Био- маса	Хидро електрична енергија	Био- дизел	Топлин- ска енергија	Вкупно електрична енергија	Supply and consumption
	Geothe- rmal heat	Bio- mass	Hydro- electricity	Biodiesel	Derived heat	Electrical energy	
	'000 m <sup>3</sup>		GWh	'000 toni/ tonnes	TJ	GWh	
Бруто-примарно производство	3384.243	748.023	2429.283	1.999	-	-	Total primary production
Увоз	-	30.780	-	-	-	1420.221	Imports
Салдо на залихи	-	-28.417	-	0.995	-	-	Stock change
Извоз	-	0.243	-	2.499	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>3384.243</b>	<b>750.143</b>	<b>2429.283</b>	<b>0.495</b>	<b>0.000</b>	<b>1420.221</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	7.696	-	-	-	-	Transformation input
Термоцентрали	-	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	7.696	-	-	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	5214.128	4828.466	Transformation output
Термоцентрали	-	-	-	-	-	4801.587	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	138.648	2.346	Autoprod. thermal power stations
Рафинерии	-	-	-	-	824.770	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	2623.428	24.532	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	1627.282	-	Autoproducer heat plants
Размена	-	-	-2429.283	-0.495	-	2429.283	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	-	-	-	1040.343	616.996	Consumption of the energy branch
Загуби во пренос и дистрибуција	353.643	-	-	-	387.648	1279.257	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>3030.601</b>	<b>742.447</b>	<b>-</b>	<b>-</b>	<b>3786.138</b>	<b>6781.716</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	755.174	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	2275.427	742.447	-	-	3786.138	6781.716	Final energy consumption
Индустрија	-	11.947	-	-	1742.520	2009.715	Industry
Индустрија за железо и челик	-	7.534	-	-	326.879	1297.723	Iron & steel industry
Обоена металургија	-	-	-	-	0.255	7.644	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	114.689	64.157	Chemical industry
Индустрија за градежен материјал стакло и керамика	-	0.084	-	-	165.549	135.896	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	-	1.249	-	-	8.194	164.396	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	-	0.668	-	-	757.038	142.008	Food, drink & tobacco industry
Текстилна индустрија и кожарство	-	0.251	-	-	205.507	53.493	Textile, leather & clothing industry
Индустрија за хартија и печатење	-	0.166	-	-	105.604	16.210	Paper and printing
Инженерство и друга метална индустрија	-	0.056	-	-	41.719	88.222	Engineering & other metal industry
Останати индустрии	-	1.939	-	-	17.086	39.966	Other industries
Сообраќај	-	-	-	-	-	25.589	Transport
Железнички сообраќај	-	-	-	-	-	20.123	Railways
Патен сообраќај	-	-	-	-	-	-	Road transport
Воздушен сообраќај	-	-	-	-	-	5.466	Air transport
Останата потрошувачка	2275.427	730.500	-	-	2043.618	4746.412	Households, commerce, pub. auth., etc.
Домаќинства	-	675.128	-	-	1423.521	3233.037	Households
Земјоделство	1898.514	3.865	-	-	-	15.128	Agriculture
Други сектори	376.913	51.506	-	-	620.097	1498.246	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>



Енергетски биланси, 2010 во илјада тони еквивалент на нафта<sup>1)</sup>  
Energy balances, 2010 in thousand tonnes of oil equivalent<sup>1)</sup>

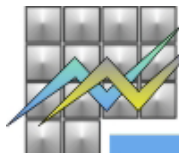
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Снабдување и потрошувачка	Камен јаглен	Кокс	Лигнит	Сурова нафта	Влезни суровини	Supply and consumption
	Hard coal	Coke	Lignite	Crude oil	Feedstocks	
Бруто-примарно производство	-	-	1194.131	-	-	Total primary production
Увоз	2.182	16.494	115.129	862.903	-	Imports
Салдо на залихи	-	0.063	-20.311	10.952	-	Stock change
Извоз	0.164	0.434	11.506	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>2.018</b>	<b>16.123</b>	<b>1277.443</b>	<b>873.855</b>	<b>0.000</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	-	1185.099	873.855	21.000	Transformation input
Термоцентрали	-	-	1176.296	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	6.179	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	873.855	21.000	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	2.623	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	-	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-	-	-	-	21.000	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>2.018</b>	<b>16.123</b>	<b>92.344</b>	-	-	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	2.018	16.123	92.344	-	-	Final energy consumption
Индустрија	2.018	16.123	88.379	-	-	Industry
Индустрија за железо и челик	2.018	15.932	88.246	-	-	Iron & steel industry
Обоена металургија	-	-	-	-	-	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	-	Chemical industry
Индустрија за градежен материјал, стакло и керамика	-	-	-	-	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	-	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	-	0.190	-	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	-	-	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	-	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	-	0.001	0.133	-	-	Engineering & other metal industry
Останати индустрии	-	-	-	-	-	Other industries
Сообраќај	-	-	-	-	-	Transport
Железнички сообраќај	-	-	-	-	-	Railways
Патен сообраќај	-	-	-	-	-	Road transport
Воздушен сообраќај	-	-	-	-	-	Air transport
Останата потрошувачка	-	-	3.965	-	-	Households, commerce, pub. auth., etc.
Домаќинства	-	-	2.263	-	-	Households
Земјоделство	-	-	0.004	-	-	Agriculture
Други сектори	-	-	1.698	-	-	Other
<b>Статистичка разлика</b>	-	-	-	-	-	<b>Statistical difference</b>

<sup>1)</sup>Претходни податоци / Provisional data

Продолжува на страница 7 / Continuing on page 7



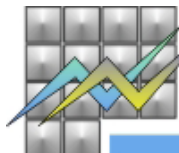
Енергетски биланси, 2010 во илјада тони еквивалент на нафта <sup>1)</sup>  
Energy balances, 2010 in thousand tonnes of oil equivalent <sup>1)</sup>

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Снабдување и потрошувачка	Вкупно нафтени продукти Total petroleum products	Рафинериски гас Refinery gas	ТНГ LPG	Моторен бензин Motor spirit	Керозини, млазни горива Kerosenes, jet fuels	Supply and consumption
Бруто-примарно производство	-	-	-	-	-	Total primary production
Увоз	392.301	-	46.272	36.179	0.331	Imports
Салдо на залихи	9.214	-	-0.021	-9.726	2.074	Stock change
Извоз	332.700	-	2.982	65.496	15.426	Exports
<b>Вкупно потребна енергија</b>	<b>68.816</b>	<b>0.000</b>	<b>43.270</b>	<b>-39.043</b>	<b>-13.021</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	84.204	0.055	1.845	-	-	Transformation input
Термоцентрали	15.046	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	22.258	0.055	-	-	-	Refineries
Јавни котлари и комбинирани електрани	16.161	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	30.740	-	1.845	-	-	Autoproducer heat plants
Производство на трансформирана енергија	841.002	0.055	26.820	169.052	20.163	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	841.002	0.055	26.820	169.052	20.163	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-20.562	-	-	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.374	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>803.677</b>	<b>-</b>	<b>68.245</b>	<b>130.009</b>	<b>7.142</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	34.697	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	768.981	-	68.245	130.009	7.142	Final energy consumption
Индустија	172.220	-	4.699	-	-	Industry
Индустија за железо и челик	71.110	-	0.150	-	-	Iron & steel industry
Обоена металургија	0.836	-	0.798	-	-	Non-ferrous metal industry
Хемиска индустрија	0.202	-	0.001	-	-	Chemical industry
Индустија за градежен материјал, стакло и керамика	66.162	-	2.223	-	-	Glass, pottery & building mat. industry
Индустија за експлоатација на руди	17.724	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	4.561	-	0.792	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.240	-	0.056	-	-	Textile, leather & clothing industry
Индустија за хартија и печатење	0.006	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	2.886	-	0.674	-	-	Engineering & other metal industry
Останати индустрии	8.491	-	0.005	-	-	Other industries
Сообраќај	458.476	-	46.749	129.640	7.142	Transport
Железнички сообраќај	3.691	-	-	-	-	Railways
Патен сообраќај	447.541	-	46.749	129.537	-	Road transport
Воздушен сообраќај	7.244	-	-	0.103	7.142	Air transport
Останата потрошувачка	138.284	-	16.797	0.369	-	Households, commerce, pub. auth., etc.
Домаќинства	44.704	-	10.156	-	-	Households
Земјоделство	16.570	-	0.017	0.369	-	Agriculture
Други сектори	77.011	-	6.625	-	-	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>

Продолжува на страница 8 / Continuing on page 8



Енергетски биланси, 2010 во илјада тони еквивалент на нафта<sup>1)</sup>  
Energy balances, 2010 in thousand tonnes of oil equivalent<sup>1)</sup>

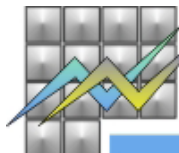
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Снабдување и потрошувачка	Дизел и гориво за ложење Gas / diesel oil	Мазут Residual fuel oil	Други нафтени продукти Other petroleum products	Природен гас Natural gas	Supply and consumption
Бруто-примарно производство	-	-	-	-	Total primary production
Увоз	203.025	-	106.494	95.393	Imports
Салдо на залихи	0.792	16.111	-0.016	-0.076	Stock change
Извоз	169.994	54.545	24.256	-	Exports
<b>Вкупно потребна енергија</b>	<b>33.823</b>	<b>-38.433</b>	<b>82.221</b>	<b>95.317</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	6.859	75.446	-	64.901	Transformation input
Термоцентрали	-	15.046	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	0.385	Autoprod. thermal power stations
Рафинерии	-	22.203	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	16.161	-	53.156	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	6.859	22.036	-	11.360	Autoproducer heat plants
Производство на трансформирана енергија	373.805	251.106	-	-	Transformation output
Термоцентрали	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	Autoprod. thermal power stations
Рафинерии	373.805	251.106	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	Autoproducer heat plants
Размена	0.437	-21.000	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.374	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	0.732	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>399.833</b>	<b>116.228</b>	<b>82.221</b>	<b>29.684</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	34.697	-	Final non-energy consumption
Финална енергетска потрошувачка	399.833	116.228	47.525	29.684	Final energy consumption
Индустрија	37.190	82.806	47.525	28.794	Industry
Индустрија за железо и челик	4.349	66.612	-	25.889	Iron & steel industry
Обоена металургија	0.038	-	-	-	Non-ferrous metal industry
Хемиска индустрија	0.201	-	-	0.117	Chemical industry
Индустрија за градежен материјал стакло и керамика	2.135	14.280	47.525	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	17.724	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	3.770	-	-	1.492	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.184	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	0.006	-	-	0.158	Paper and printing
Инженерство и друга метална индустрија	1.860	0.352	-	1.137	Engineering & other metal industry
Останати индустрии	6.924	1.562	-	-	Other industries
Сообраќај	274.946	-	-	0.203	Transport
Железнички сообраќај	3.691	-	-	-	Railways
Патен сообраќај	271.255	-	-	0.203	Road transport
Воздушен сообраќај	-	-	-	-	Air transport
Останата потрошувачка	87.696	33.422	-	0.687	Households, commerce, pub. auth., etc.
Домаќинства	34.549	-	-	-	Households
Земјоделство	0.556	15.628	-	-	Agriculture
Други сектори	52.599	17.794	-	0.687	Other
<b>Статистичка разлика</b>	-	-	-	-	<b>Statistical difference</b>

<sup>1)</sup>Претходни податоци / Provisional data

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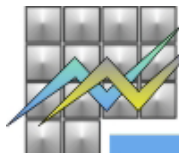
Енергетски биланси, 2010 во илјада тони еквивалент на нафта<sup>1)</sup>  
Energy balances, 2010 in thousand tonnes of oil equivalent<sup>1)</sup>

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Снабдување и потрошувачка	Геотер-мална топлина Geothermal heat	Био-маса Bio-mass	Хидро електрична енергија Hydro-electricity	Био-дизел Bio-diesel	Топлин-ска енергија Derived heat	Вкупно електрична енергија Electrical energy	Supply and consumption
Бруто-примарно производство	11.913	198.978	208.841	1.766	-	-	Total primary production
Увоз	-	8.188	-	-	-	122.094	Imports
Салдо на залихи	-	-8.518	-	0.879	-	-	Stock change
Извоз	-	0.065	-	2.208	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>11.913</b>	<b>198.582</b>	<b>208.841</b>	<b>0.437</b>	<b>0.000</b>	<b>122.094</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	1.494	-	-	-	-	Transformation input
Термоцентрали	-	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	1.494	-	-	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	124.513	415.094	Transformation output
Термоцентрали	-	-	-	-	-	412.783	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	3.311	0.202	Autoprod. thermal power stations
Рафинерии	-	-	-	-	19.696	-	Refineries
Јавни котлари и Комбинирани електрани	-	-	-	-	62.647	2.109	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	38.859	-	Autoproducer heat plants
Размена	-	-	-208.841	-0.437	-	208.841	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	-	-	-	24.843	53.042	Consumption of the energy branch
Загуби во пренос и дистрибуција	1.501	-	-	-	9.257	109.975	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>10.413</b>	<b>197.088</b>	-	-	<b>90.413</b>	<b>583.011</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	0.710	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	9.703	197.088	-	-	90.413	583.011	Final energy consumption
Индустрија	-	3.171	-	-	41.611	172.771	Industry
Индустрија за железо и челик	-	2.000	-	-	7.806	111.563	Iron & steel industry
Обоена металургија	-	-	-	-	0.006	0.657	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	2.739	5.515	Chemical industry
Индустрија за градежен материјал	-	0.022	-	-	3.953	11.683	Glass, pottery & building mat. industry
стакло и керамика	-	0.332	-	-	0.196	14.133	Ore-extraction industry
Индустрија за експлоатација на руди	-	0.177	-	-	18.078	12.208	Food, drink & tobacco industry
Прехранбена индустрија, пијалаци и тутун	-	0.067	-	-	4.908	4.599	Textile, leather & clothing industry
Текстилна индустрија и кожарство	-	0.044	-	-	2.522	1.394	Paper and printing
Индустрија за хартија и печатење	-	0.015	-	-	0.996	7.584	Engineering & other metal industry
Инженерство и друга метална индустрија	-	0.515	-	-	0.408	3.436	Other industries
Останати индустрии	-	-	-	-	-	2.200	Transport
Сообраќај	-	-	-	-	-	1.730	Railways
Железнички сообраќај	-	-	-	-	-	-	Road transport
Патен сообраќај	-	-	-	-	-	0.470	Air transport
Воздушен сообраќај	-	-	-	-	-	408.040	Households, commerce, pub. auth., etc.
Останата потрошувачка	9.703	193.916	-	-	48.802	277.938	Households
Домаќинства	-	179.218	-	-	33.994	1.301	Agriculture
Земјоделство	8.251	1.026	-	-	-	128.801	Other
Други сектори	1.452	13.673	-	-	14.808	-	
<b>Статистичка разлика</b>	-	-	-	-	-	-	<b>Statistical difference</b>





Енергетски биланси, 2009 во илјада тони еквивалент на нафта <sup>1)</sup>  
Energy balances, 2009 in thousand tonnes of oil equivalent <sup>1)</sup>

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Снабдување и потрошувачка	Камен јаглен Hard coal	Кокс Coke	Лигнит Lignite	Сурова нафта Crude oil	Влезни суровини Feedstocks	Supply and consumption
Бруто-примарно производство	-	-	1293.211	-	-	Total primary production
Увоз	3.279	1.220	45.322	1022.903	-	Imports
Салдо на залихи	-	0.279	0.769	-26.591	-	Stock change
Извоз	-	0.023	5.790	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>3.279</b>	<b>1.475</b>	<b>1333.511</b>	<b>996.312</b>	<b>0.000</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	-	1271.263	996.312	35.273	Transformation input
Термоцентрали	-	-	1262.137	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	4.184	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	996.312	35.273	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	4.942	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	-	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-	-	-	-	35.273	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>3.279</b>	<b>1.475</b>	<b>62.249</b>	-	-	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	3.279	1.475	62.249	-	-	Final energy consumption
Индустрија	3.279	1.475	58.502	-	-	Industry
Индустрија за железо и челик	3.279	1.322	58.359	-	-	Iron & steel industry
Обоена металургија	-	-	-	-	-	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	-	Chemical industry
Индустрија за градежен материјал, стакло и керамика	-	-	-	-	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	-	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	-	0.151	-	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	-	-	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	-	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	-	0.003	0.143	-	-	Engineering & other metal industry
Останати индустрии	-	-	-	-	-	Other industries
Сообраќај	-	-	-	-	-	Transport
Железнички сообраќај	-	-	-	-	-	Railways
Патен сообраќај	-	-	-	-	-	Road transport
Воздушен сообраќај	-	-	-	-	-	Air transport
Останата потрошувачка	-	-	3.747	-	-	Households, commerce, pub. auth., etc.
Домаќинства	-	-	2.040	-	-	Households
Земјоделство	-	-	0.004	-	-	Agriculture
Други сектори	-	-	1.703	-	-	Other
<b>Статистичка разлика</b>	-	-	-	-	-	<b>Statistical difference</b>

<sup>1)</sup> Дефинитивни податоци / Definitive data



Енергетски биланси, 2009 во илјада тони еквивалент на нафта <sup>1)</sup>  
Energy balances, 2009 in thousand tonnes of oil equivalent <sup>1)</sup>

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Снабдување и потрошувачка	Вкупно нафтени продукти Total petroleum products	Рафинериски гас Refinery gas	ТНГ LPG	Моторен бензин Motor spirit	Керозини, млазни горива Kerosenes, jet fuels	Supply and consumption
Бруто-примарно производство	-	-	-	-	-	Total primary production
Увоз	369.801	-	48.787	31.581	0.012	Imports
Салдо на залихи	-36.883	-	-0.643	-15.881	-1.202	Stock change
Извоз	359.145	-	6.667	70.797	16.603	Exports
<b>Вкупно потребна енергија</b>	<b>-26.226</b>	<b>0.000</b>	<b>41.476</b>	<b>-55.097</b>	<b>-17.794</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	162.963	2.267	1.806	-	-	Transformation input
Термоцентрали	60.484	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	0.342	-	-	-	-	Autoprod. thermal power stations
Рафинерии	17.650	2.267	-	-	-	Refineries
Јавни котлари и комбинирани електрани	47.032	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	37.455	-	1.806	-	-	Autoproducer heat plants
Производство на трансформирана енергија	984.317	2.267	30.897	185.270	20.688	Transformation output
Термоцентрали	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	984.317	2.267	30.897	185.270	20.688	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	-	Autoproducer heat plants
Размена	-33.385	-	-	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.354	-	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	-	-	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>760.389</b>	<b>-</b>	<b>70.567</b>	<b>130.172</b>	<b>2.895</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	34.132	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	726.257	-	70.567	130.172	2.895	Final energy consumption
Индустрија	149.277	-	4.617	-	-	Industry
Индустрија за железо и челик	60.433	-	0.126	-	-	Iron & steel industry
Обоена металургија	0.628	-	0.529	-	-	Non-ferrous metal industry
Хемиска индустрија	0.104	-	-	-	-	Chemical industry
Индустрија за градежен материјал, стакло и керамика	59.907	-	2.572	-	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	15.036	-	-	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	3.502	-	0.582	-	-	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.105	-	0.011	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	0.009	-	-	-	-	Paper and printing
Инженерство и друга метална индустрија	2.069	-	0.789	-	-	Engineering & other metal industry
Останати индустрии	7.483	-	0.008	-	-	Other industries
Сообраќај	437.144	-	49.633	129.819	2.895	Transport
Железнички сообраќај	3.745	-	-	-	-	Railways
Патен сообраќај	430.360	-	49.633	129.676	-	Road transport
Воздушен сообраќај	3.038	-	-	0.143	2.895	Air transport
Останата потрошувачка	139.836	-	16.317	0.353	-	Households, commerce, pub. auth., etc.
Домаќинства	45.658	-	9.256	-	-	Households
Земјоделство	9.008	-	0.019	0.353	-	Agriculture
Други сектори	85.171	-	7.042	-	-	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>



Енергетски биланси, 2009 во илјада тони еквивалент на нафта <sup>1)</sup>  
Energy balances, 2009 in thousand tonnes of oil equivalent <sup>1)</sup>

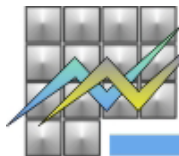
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Снабдување и потрошувачка	Дизел и гориво за ложење Gas / diesel oil	Мазут Residual fuel oil	Други нафтени продукти Other petroleum products	Природен гас Natural gas	Supply and consumption
Бруто-примарно производство	-	-	-	-	Total primary production
Увоз	191.750	18.468	79.204	63.809	Imports
Салдо на залихи	-6.005	-21.612	8.461	0.084	Stock change
Извоз	168.449	80.067	16.561	-	Exports
<b>Вкупно потребна енергија</b>	<b>17.296</b>	<b>-83.212</b>	<b>71.104</b>	<b>63.893</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	8.649	150.241	-	34.435	Transformation input
Термоцентрали	0.037	60.447	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	0.342	-	0.324	Autoprod. thermal power stations
Рафинерии	-	15.384	-	-	Refineries
Јавни котлари и комбинирани електрани	-	47.032	-	25.144	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	8.612	27.038	-	8.967	Autoproducer heat plants
Производство на трансформирана енергија	386.576	358.619	-	-	Transformation output
Термоцентрали	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	Autoprod. thermal power stations
Рафинерии	386.576	358.619	-	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	Autoproducer heat plants
Размена	1.888	-35.273	-	-	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	1.354	-	-	-	Consumption of the energy branch
Загуби во пренос и дистрибуција	-	-	-	0.617	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>395.758</b>	<b>89.893</b>	<b>71.104</b>	<b>28.841</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	-	-	34.132	-	Final non-energy consumption
Финална енергетска потрошувачка	395.758	89.893	36.972	28.841	Final energy consumption
Индустрија	26.148	81.540	36.972	27.805	Industry
Индустрија за железо и челик	1.778	58.530	-	26.062	Iron & steel industry
Обоена металургија	0.100	-	-	-	Non-ferrous metal industry
Хемиска индустрија	0.104	-	-	0.142	Chemical industry
Индустрија за градежен материјал, стакло и керамика	1.342	19.023	36.972	-	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	12.834	2.201	-	-	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	2.920	-	-	1.364	Food, drink & tobacco industry
Текстилна индустрија и кожарство	0.093	-	-	-	Textile, leather & clothing industry
Индустрија за хартија и печатење	0.009	-	-	-	Paper and printing
Инженерство и друга метална индустрија	0.797	0.483	-	0.237	Engineering & other metal industry
Останати индустрии	6.171	1.304	-	-	Other industries
Сообраќај	254.796	-	-	0.244	Transport
Железнички сообраќај	3.745	-	-	-	Railways
Патен сообраќај	251.052	-	-	0.244	Road transport
Воздушен сообраќај	-	-	-	-	Air transport
Останата потрошувачка	114.813	8.353	-	0.792	Households, commerce, pub. auth., etc.
Домаќинства	36.402	-	-	-	Households
Земјоделство	0.626	8.009	-	-	Agriculture
Други сектори	77.785	0.344	-	0.792	Other
<b>Статистичка разлика</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>Statistical difference</b>

<sup>1)</sup>Дефинитивни податоци / Definitive data



Енергетски биланси, 2009 во илјада тони еквивалент на нафта<sup>1)</sup>  
Energy balances, 2009 in thousand tonnes of oil equivalent<sup>1)</sup>

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Снабдување и потрошувачка	Геотер- мална топлина Geothermal heat	Био- маса Biomass	Хидро електрична енергија Hydro- electricity	Био- дизел Biodiesel	Топлин- ска енергија Derived heat	Вкупно електрична енергија Electrical energy	Supply and consumption
Бруто-примарно производство	9.749	194.279	109.209	0.508	-	-	Total primary production
Увоз	-	8.203	-	-	-	123.617	Imports
Салдо на залихи	-	-9.612	-	1.380	-	-	Stock change
Извоз	-	0.052	-	-	-	-	Exports
<b>Вкупно потребна енергија</b>	<b>9.749</b>	<b>192.818</b>	<b>109.209</b>	<b>1.888</b>	<b>0.000</b>	<b>123.617</b>	<b>Gross inland consumption</b>
Енергија за енергетски трансформации	-	1.630	-	-	-	-	Transformation input
Термоцентрали	-	-	-	-	-	-	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	-	-	Autoprod. thermal power stations
Рафинерии	-	-	-	-	-	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	-	-	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	1.630	-	-	-	-	Autoproducer heat plants
Производство на трансформирана енергија	-	-	-	-	128.447	477.771	Transformation output
Термоцентрали	-	-	-	-	-	477.459	Public thermal power stations
Индустриски топлани (енергани)	-	-	-	-	3.200	0.062	Autoprod. thermal power stations
Рафинерии	-	-	-	-	15.219	-	Refineries
Јавни котлари и комбинирани електрани	-	-	-	-	67.376	0.250	Main activity producer heat plants and CHP plants
Индустриски котлари и др.	-	-	-	-	42.653	-	Autoproducer heat plants
Размена	-	-	-109.209	-1.888	-	109.209	Exchanges and transfers, returns
Потрошувачка во енергетскиот сектор	-	0.021	-	-	19.983	59.046	Consumption of the energy branch
Загуби во пренос и дистрибуција	0.905	-	-	-	9.159	102.003	Distribution losses
<b>Расположливо за финална потрошувачка</b>	<b>8.843</b>	<b>191.166</b>	-	-	<b>99.305</b>	<b>549.548</b>	<b>Available for final consumption</b>
Финална неенергетска потрошувачка	0.104	-	-	-	-	-	Final non-energy consumption
Финална енергетска потрошувачка	8.740	191.166	-	-	99.305	549.548	Final energy consumption
Индустрија	-	0.784	-	-	46.175	134.296	Industry
Индустрија за железо и челик	-	0.037	-	-	8.280	71.753	Iron & steel industry
Обоена металургија	-	-	-	-	-	0.757	Non-ferrous metal industry
Хемиска индустрија	-	-	-	-	3.428	5.640	Chemical industry
Индустрија за градежен материјал, стакло и керамика	-	0.024	-	-	4.069	11.135	Glass, pottery & building mat. industry
Индустрија за експлоатација на руди	-	0.159	-	-	0.144	15.138	Ore-extraction industry
Прехранбена индустрија, пијалаци и тутун	-	0.059	-	-	19.649	13.120	Food, drink & tobacco industry
Текстилна индустрија и кожарство	-	0.089	-	-	6.544	5.260	Textile, leather & clothing industry
Индустрија за хартија и печатење	-	0.018	-	-	2.528	1.399	Paper and printing
Инженерство и друга метална индустрија	-	0.082	-	-	0.947	5.829	Engineering & other metal industry
Останати индустрии	-	0.317	-	-	0.587	4.265	Other industries
Сообраќај	-	-	-	-	-	2.297	Transport
Железнички сообраќај	-	-	-	-	-	1.807	Railways
Патен сообраќај	-	-	-	-	-	-	Road transport
Воздушен сообраќај	-	-	-	-	-	0.490	Air transport
Останата потрошувачка	8.740	190.382	-	-	53.130	412.955	Households, commerce, pub. auth., etc.
Домаќинства	-	174.361	-	-	35.854	283.667	Households
Земјоделство	7.164	0.961	-	-	-	1.380	Agriculture
Други сектори	1.576	15.060	-	-	17.276	127.908	Other
<b>Статистичка разлика</b>	-	-	-	-	-	-	<b>Statistical difference</b>



## Методолошки објаснувања

### Извор на податоци

Извори на податоци за годишното соопштение “Енергетски биланс, 2010” се: месечните извештаи за енергија, Ене.11, Ене.16, годишните извештаи за енергија, Ене.51, Ене.52, Ене.53, Ене.54, Ене.55, Ене.56, Ене.57, Ене.58, Ене.59, Ене.60, Ене.62, Ене.63, Ене.65, Тримесечниот извештај за шумарство, Годишниот извештај за шумарство, Годишниот извештај за земјоделство, Статистика на надворешна трговија, Процена на потрошувачката во домаќинствата по видови енергенти.

### Опфат на податоците

При прибирањето на податоците од извештајните единици се користи методот на целосен опфат (за деловните субјекти кои вршат производство, пренос и дистрибуција на енергенти) и по пат на примерок (за деловните субјекти кои се потрошувачи на енергенти).

Во податоците за производството на огревно дрво се опфатени државните и приватните шуми на Јавното претпријатие “Македонски шуми” и националните паркови.

### Дефиниции

За дефинирање на категориите во билансната шема се користени годишните прашалници за: јаглен, нафта, природен гас, електрична енергија и топлина, обновлива енергија за 2010 на Eurostat, ECE/UN и IEA/OECD.

**Камен јаглен** = антрацит + коксен јаглен + битуминозен јаглен

**Лигнит** = суббитуминозен јаглен + мрк јаглен + лигнит + тресет

**Моторен бензин** = безоловен моторен бензин + оловен моторен бензин + авионски бензин

**Керозини, млазни горива** = млазни горива + керозин + друг керозин

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## Methodological explanations

### Sources of data collection

Sources of data collection for the annual report on “Energy Balances, 2010” are: Monthly surveys on energy, Ene.11, Ene.16, Annual surveys on energy, Ene.51, Ene.52, Ene.53, Ene.54, Ene.55, Ene.56, Ene.57, Ene.58, Ene.59, Ene.60, Ene.62, Ene.63, Ene.65, Quarterly survey on forestry, Annual survey on forestry, Annual survey on agriculture, Statistical survey on external trade, Estimation of consumption in households by types of energy commodities.

### Data scope

In the process of collecting data from the reporting units the method of full coverage is used (for business entities that perform production, transmission and distribution of energy), as well as the sample method (for business entities that are consumers of energy).

Data on wood fuel production in the state and private forests are provided from the Public Enterprise for Forest Management “Makedonski sumi” and the National Parks.

### Definitions

For defining the categories in the balance scheme the Annual questionnaires for: Coal, Oil, Natural gas, Electricity and Heat, Renewables for 2010 of Eurostat, ECE/UN and IEA/OECD are used.

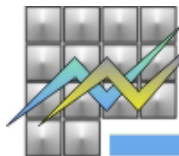
**Hard Coal** = Anthracite + Coking Coal + Other Bituminous Coal

**Lignite** = Sub-Bituminous Coal + Brown Coal + Lignite + Peat

**Motor Spirit** = Unleaded Motor Gasoline + Leaded Motor Gasoline + Aviation Gasoline

**Kerosenes, Jet Fuels** = Gasoline Type Jet Fuel + Kerosene Type Jet Fuel + Other Kerosene

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**Дизел и гориво за ложење** = дизел за транспорт + масло (нафта) за ложење (екстра лесно)

**Други нафтени продукти** = бел и индустриски шпиритус + средства за подмачкување (масла и мазива) + битумен + парафински восок + нафтен (петролејски) кокс + други нафтени продукти

**Биомаса** = огревно дрво + дрвени отпадоци и друг растителен отпад

**Увезот/Извезот** е количина која е внесена/изнесена во/од националната територија.

**Енергија за енергетски трансформации** претставува енергија потрошена за добивање на други облици на енергија (топлинска и електрична енергија).

**Термоцентрали** се постројки за производство на електрична енергија.

**Индустриски топлани (енергани)** се комбинирани постројки кои произведуваат топлинска и електрична енергија.

**Комбинирани електрани** се комбинирани постројки што произведуваат топлинска и електрична енергија наменета исклучиво за продажба.

**Јавни и индустриски котлари** се постројки за производство на топлинска енергија (која се троши во јавниот и останатите сектори).

**Размена** претставува трансфер на произведените нафтени продукти за понатамошно производство или трансфер на бруто-производството на хидроелектрична енергија.

**Загуби во преносот и дистрибуцијата** се сите загуби настанати при пренос и дистрибуција на енергија (природен гас, електрична енергија, геотермална топлина, топлинска енергија).

**Расположливо за финална потрошувачка** претставува енергија на располагање на крајните корисници.

Во секторот **Енергија** спаѓаат: 05, 08.92, 19, 35 (од НКД).

Во **индустриските** сектори спаѓаат:

Индустрија за железо и челик: 24.1, 24.2, 24.3, 24.51, 24.52 (од НКД);

Хемиска индустрија: 20, 21 (од НКД);

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**Gas/Diesel Oil** = Transport Diesel + Heating and Other Gasoil

**Other Petroleum Products** = White and Industrial Spirit + Lubricants + Bitumen + Paraffin Waxes + Petroleum Coke + Other Petroleum Products

**Biomass** = Wood Fuel + Wood Waste and Other Solid Waste.

**Import/Export** represents the quantity that entered/left the national territory.

**Transformation input** includes energy commodities consumed for transformation into another energy form (Heat and Electricity).

**Public thermal power stations** are plants for production of Electricity only.

**Autoproducer thermal power stations** are plants for combined production of Electricity and Heat.

**CHP plants** are combined heat and power plants, which produce both heat and electricity intended for sale.

**Main activity producer heat plants and Autoproducer heat plants** are plants for production of Heat (for consumption of public and other sectors).

**Exchanges and transfers, returns** represent transfer of produced Petroleum Products for further production or transfer of hydroelectricity gross production.

**Distribution losses** include all losses due to transmission and distribution of energy (natural gas, electrical energy, geothermal heat, derived heat).

**Available for final consumption** is energy available to final consumers.

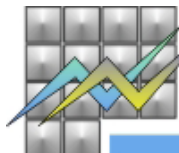
**Energy branch** includes: 05, 08.92, 19, 35 (from NACE).

**Industry** includes:

Iron & steel industry: 24.1, 24.2, 24.3, 24.51, 24.52 (from NACE);

Chemical industry: 20, 21 (from NACE);

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Обоена металургија: 24.4, 24.53, 24.54 (од НКД);  
Индустија за градежен материјал, стакло и керамика: 23 (од НКД);  
Индустија за експлоатација на руди: 07, 08, 09.9 (од НКД)  
Прехранбена индустрија, пијалаци и тутун: 10, 11, 12 (од НКД);  
Индустија за хартија и печатење: 17, 18 (од НКД);  
Текстилна индустрија и кожарство: 13, 14, 15 (од НКД);  
Инженерство и друга метална индустрија: 25, 26, 27, 28, 29, 30 (од НКД);  
Останати индустрии: 16, 41, 42, 43 (од НКД).

Во секторот **Сообраќај** спаѓаат: 49, 50, 51 (од НКД).

Во секторот **Земјоделство** спаѓаат: 01, 02 (од НКД).

**Статистичка разлика** = Расположливо за финална потрошувачка - Финална неенергетска потрошувачка - Финална енергетска потрошувачка

**Просечната калорична вредност** е добиена од од производителите на енергенти во Република Македонија. За енергентите коишто се увезуваат се користат просечните калорични вредности од земјите од коишто е вршен увозот.

Пресметката на енергетските биланси е извршена во природна единица мерка и во **тое** (тон еквивалент на нафта).

#### Метод на пресметка

Во пресметката на Енергетските биланси, 2010 е користена методологијата "Energy Statistics Methodology Eurostat F4, 1998г. Енергетските биланси се подготвуваат во согласност со европската Регулатива за енергетска статистика (Регулатива бр.1099/2008).

#### Класификации

Во распределбата на финалната потрошувачка на енергентите во Енергетскиот биланс за 2010 е користена Националната класификација на дејностите НКД Рев.2 ("Службен весник на Република Македонија" бр. 147/2008), додека во Енергетскиот биланс за 2009 е користена Националната класификација на дејностите НКД Рев.1 ("Службен весник на Република Македонија" бр. 09/2006).

Non-ferrous metal industry: 24.4, 24.53, 24.54 (from NACE);  
Glass, pottery & building mat. industry: 23 (from NACE);  
Ore-extraction industry: 07, 08, 09.9 (from NACE);  
Food, drink & tobacco industry: 10, 11, 12 (from NACE);  
Paper and printing: 17, 18 (from NACE);  
Textile, leather & clothing industry: 13, 14, 15 (from NACE);  
Engineering & other metal industry: 25, 26, 27, 28, 29, 30 (from NACE);  
Other industries: 16, 41, 42, 43, (from NACE).

**Transport** includes: 49, 50, 51 (from NACE).

**Agriculture** includes: 01, 02 (from NACE).

**Statistical difference** = Available for final consumption - Final non-energy consumption - Final energy consumption

**Average caloric value** is provided from the producers of energy commodities in the Republic of Macedonia.

For the imported energy commodities, average calorific values are used from the countries where the import was made. Calculation of the Energy Balances is made in natural units and in toe (tonne of oil equivalent).

#### Calculation method

For calculating the Energy balances, 2010, the methodology "Energy Statistics Methodology Eurostat F4, 1998" is used. Energy balances are prepared in accordance with Regulation (EC) No 1099/2008 on energy statistics

#### Classifications

In the distribution of the final Final energy consumption in the Energy balances, 2010, the National Classification of Activities NKD Rev.2 (Official Gazette of the Republic of Macedonia No. 147/2008) is used, while the Energy balances, 2009 are based on the National Classification of Activities NKD Rev.1 (Official Gazette of the Republic of Macedonia No. 09/2006).