# MACEDONIAN DATABASE OF GREENHOUSE GAS EMISSIONS

# GHG INVENTORY

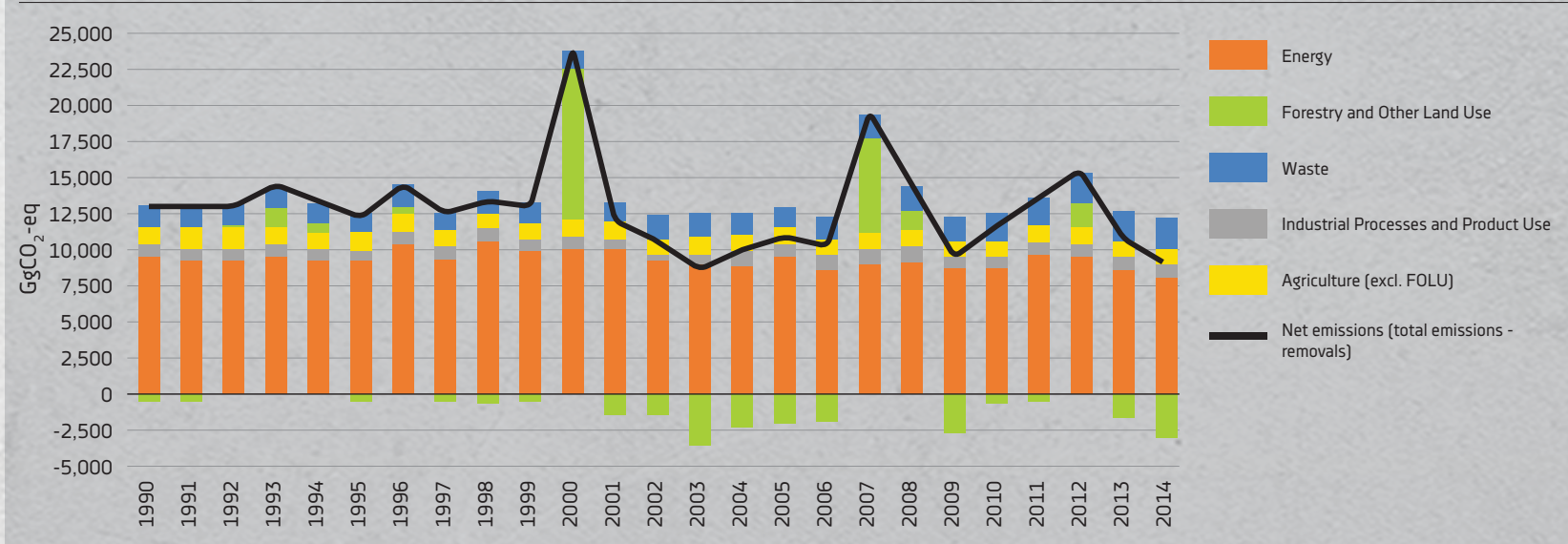
## PERIOD 1990–2014

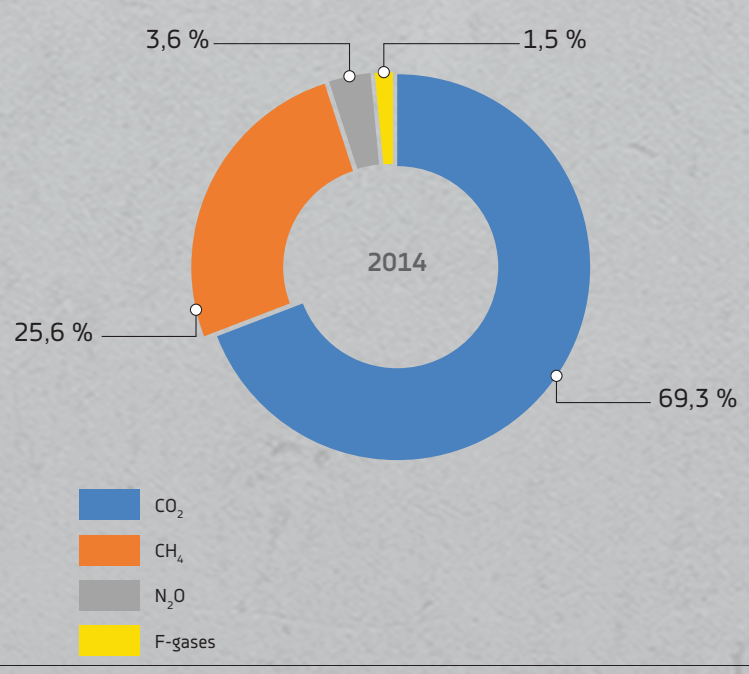
## IT'S GOOD TO KNOW

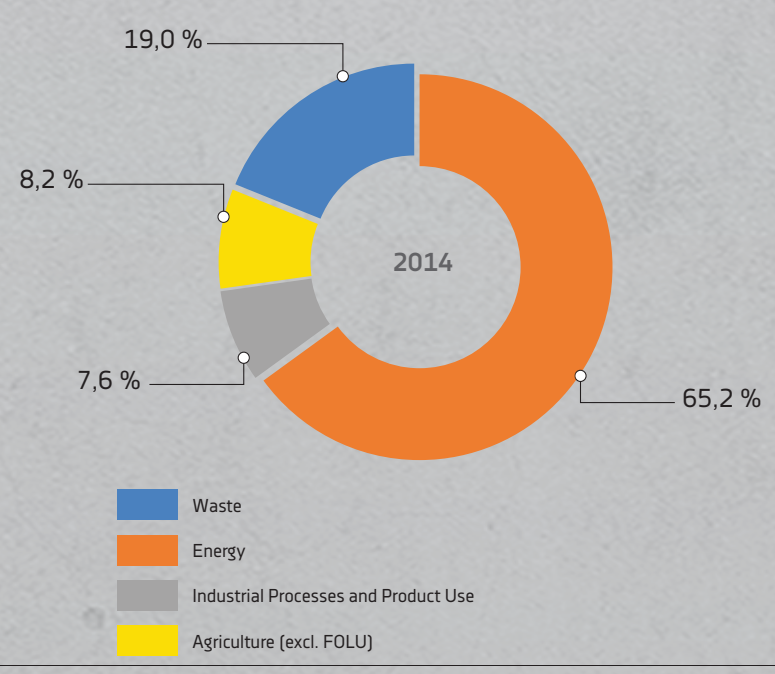
| BASICS | IMPROVEMENTS | THE PROCESS IN A NUTSHELL | FOLLOW UP |
|---|---|---|---|
| ▪ Comprises emissions from 5 greenhouse gases: $CO_2$, $CH_4$, $N_2O$, PFCs and HFCs<br>▪ Also includes 4 precursors/indirect emissions: CO, NOx, NMVOC and $SO_2$<br>▪ Covers 4 sectors, with approximately 60 categories/ subcategories<br>▪ The methodology is same for all countries in the world 2006 IPCC Guidelines for National Greenhouse Gas Inventories<br>▪ Emissions of GHG are calculated, not measured | ▪ Improved disaggregation of dataset: similar fuels, which were grouped together in the older energy balances, are now given separately<br>▪ 6 country-specific emission factors are now calculated<br>▪ Emissions from refrigeration and air-conditioning have been added<br>▪ Data on changes in land use have been calculated on the basis of the available graphical data sets (CORINE land cover). | ▪ Prepared by a highly qualified team of 17 national experts (41% woman)<br>▪ Using a wide participatory approach, involving:<br>· 30 institutions (12 governmental Institutions, 5 international organizations, 6 NGOs, 5 academic institutions and 2 private companies)<br>· 80 persons (57% woman)<br>▪ Sustainability ensured: 2 new persons trained in the development of GHG inventories<br>▪ 4-stage quality verification process implemented<br>· 2 at national level (inventory team and national UNFCCC certified reviewer)<br>· 2 at international level (Global Support Programme and UNFCCC) | ▪ Develop remote sensing and Earth observation capacities in the country in order to derive more detailed data on changes in land use<br>▪ Include waste fraction data from the regional plans (once they are completed) |

SIGNIFICANT PROGRESS ACHIEVED

## GHG EMISSION TRENDS




GHG emissions and removals by sector (in Gg $CO_2$-eq) and by gas

## TOP 5

### CATEGORIES WITH FAST-CHANGING EMISSION TRENDS:

1. Solid Waste disposal ▲
2. Road Transportation ▲
3. Energy Industries ▼
4. Other Sectors – Liquid Fuels ▼
5. Energy Industries - Liquid Fuels ▼

### CATEGORIES WITH THE HIGHEST EMISSIONS IN 2014:

1. Energy Industries – Solid Fuels
2. Solid Waste Disposal
3. Road Transportation
4. Manufacturing Industries and Construction – Liquid Fuels
5. Enteric fermentation

| Gas | $CO_2$ equivalent |
|---|---|
| $CO_2$ | 1 |
| $CH_4$ | 21 |
| $N_2O$ | 310 |
| HFC-125 | 2,800 |
| HFC-143a | 3,800 |
| HFC-134a | 1,300 |
| HFC-32 | 650 |
| HFC-227ea | 2,900 |
| $CF_4$ | 6,500 |
| $C_2F_6$ | 9,200 |

Global warming potential values (100-year time horizon)

### DATA AVAILABILITY VS ACCURACY/ UNCERTAINTY OF GHG INVENTORIES

The AFOLU sector has the **HIGHEST UNCERTAINTY**, exceeding

**40%**

followed closely by the WASTE SECTOR and the LIVESTOCK subcategory.

**The lowest levels of uncertainty are in the ENERGY SECTOR, followed by the IPPU SECTOR.**

# WHERE DO GHG EMISSIONS COME FROM?

## ENERGY

**95%** of the **EMISSIONS** in the ENERGY sector are emissions from Energy Industries, from Transport and Manufacturing Industries and Construction

**60%** of Energy sector emissions in 2014 are...

Almost all of the Energy sector GHG emissions in 2014 are $CO_2$ **96.8%**

...**EMISSIONS** released as a result of FUEL COMBUSTION activities, as well as FUGITIVE EMISSIONS from the extraction of solid fuels and the transmission and distribution of liquid and gaseous fuels.

## INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)

The METAL INDUSTRY is the **MAIN CONTRIBUTOR**, with emissions from the production of ferroalloys predominating. The MINERAL INDUSTRY follows, with most emissions generated by CEMENT PRODUCTION.

The remainder of the emissions result from Ozone-Depleting Substances, i.e. the use of substitutes in the country.

$CO_2$ and HFCs emissions were the highest contributor of overall greenhouse emissions from IPPU in 2014.

$CO_2$ **80%**

HFCs **19,91%**

## PRECURSORS AND INDIRECT EMISSIONS

In 2014, the energy sector is the **MOST SIGNIFICANT CONTRIBUTOR** of PRECURSORS and INDIRECT GHG EMISSIONS, amounting to **89,2%**

$SO_2$ **48%** CO **31%** NOx **11%** NMVOC **10%**

Share of emissions in 2014

## AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)

**50%** OF TOTAL GHG EMISSIONS IN THE AFOLU SECTOR (IN $CO_2$-eq.) ARE ACOUNTED TO LIVESTOCK PRODUCTION.

Within the Land category, emissions are mainly the result of activities and changes in Forest Land (wood for fuel, afforestation and forest fires, etc.) and conversion from one land use type of agricultural land to another.

The Forestry sector is the major contributor of GHG sinks, with the exception of several years (2000, 2007, 2008 and 2012) when the severity of forest fires was significantly above the annual average.

## WASTE

**50%** **INCREASED** are the WASTE greenhouse gas emissions in 2014 in comparison to 2003.

**19%** of total GHG emissions in 2014.

The percentage of the Solid Waste Disposal emissions in total waste emissions accounted for **94,4%**

Other emissions come from:

- Biological Treatment of Solid Waste
- Incineration
- Open Burning of Waste
- Wastewater Treatment and Discharge (domestic and industrial).

# UNUSUAL GHG EMITTERS

Running shoes with air cushions enable high performance because the air used is actually **greenhouse gas $SF_6$**.

**0,07** metric tons per year

Will boost your carbon footprint by running on a treadmill for **30 minutes three times a week**.

Drying one load of laundry a week emits 0.1 metric tons of $CO_2$ into the atmosphere.

The greenhouse gas $SF_6$ in TENNIS BALLS improve their performance and make them bounce higher.

$SF_6$ emissions occur through leakage and maintenance losses in equipment for the transmission and distribution of electricity.

*7= *3,5=

Emission of greenhouse gases liquer production.

**Emissions of $CO_2$ eq** in production of a ton of...

poultry 0,5-1,5t beef 4t

partly from the methane from enteric fermentation, but mostly from the cereals used as cattle food.

Refrigerators and air-conditioners are the primary sources of HFC emissions, of which mobile air-conditioners used in cars and other vehicles generate the largest amount.

**Even after a landfill has been closed, bacteria continue to decompose the buried waste, which will result in methane emissions for years.**

A ton of apples transported from a local producer to open market in a light truck (25 km) generates roughly **3 kg $CO_2$ eq**.

A ton of apples transported from South Africa to Europe by plane (c.10,000 km) generates **3,2 tons of $CO_2$ eq**.

The use of manure as a fertilizer leads to emissions from agricultural soils.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