



# Greenhouse Gas Emissions in Macedonia

## Macedonia Numbers at a Glance (2013)

**12.07 MtCO<sub>2</sub>e\***

Total GHG emissions  
(0.02% of world total)

World: 48,257 MtCO<sub>2</sub>e

**2,072,543**

Population

World: 7,176,092,192

**5.8**

tCO<sub>2</sub>e per capita

World: 6.72 tCO<sub>2</sub>e

**US\$ 9,864 Million**

GDP\*\*

World: US\$71,059 Billion

**1,225**

tCO<sub>2</sub>e/million US\$ GDP

World: 679 tCO<sub>2</sub>e/million US\$ GDP

**+1.83 MtCO<sub>2</sub>e (+18%)**

Change in GHG emissions  
(1990 - 2013)

World: +1,434 MtCO<sub>2</sub>e  
(+43%)

Sources: WRI CAIT 2.0, 2017.

Emissions including Land-Use Change and Forestry

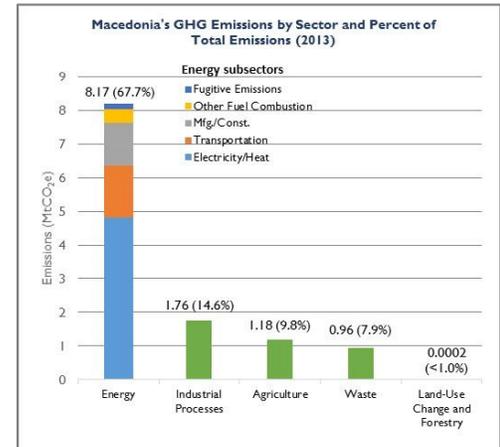
\*Million metric tons of carbon dioxide equivalent. Global Warming Potentials are from the Intergovernmental Panel on Climate Change Second Assessment Report

\*\*Gross Domestic Product (GDP) in constant 2010 US\$

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## Greenhouse Gas (GHG) Emissions by Sector

According to the World Resources Institute Climate Analysis Indicators Tool (WRI CAIT), Macedonia's GHG emissions in 2013 were dominated by the energy sector (67.7%), with electricity and heat generation and transportation contributing 78% of energy emissions. Industrial processes (IP) was the second most significant source (14.6%), followed by agriculture (9.8%) and waste (7.9%).<sup>1</sup> Land use change and forestry (LUCF) contributed minimally (<1.0%) to total emissions.<sup>2</sup> Macedonia's First [Biennial Update Report \(BUR\)](#) to the UNFCCC, submitted in 2015, includes a GHG inventory for the period 1990-2012 and shows energy as the largest source of emissions during this period, with an average share of 77% of the total national GHG emissions. The waste sector was the second highest source of emissions with an average share of 9% during the same period, followed by the Agriculture, Forestry and Land Use (AFLOU) (8%), and IP (6%).<sup>3</sup>



Source: WRI CAIT 2.0, 2017.

## Change in GHG Emissions in Macedonia (1990-2013)

According to WRI CAIT,<sup>4</sup> Macedonia's GHG emissions increased by 1.83 MtCO<sub>2</sub>e from 1990 to 2013. The average annual change in total emissions during this period was 0.8%, with sector-specific average annual changes as follows: energy (-0.1%), IP (5.4%), and waste (0.9%). The average annual change in agriculture from 1992 to 2013 was -1.2% and 1.3% for LUCF. The BUR notes that total GHG emissions experienced a slight increase of 0.4% between 1990 and 2012. The change in emissions in the energy and IP sectors is discussed below.

**Energy:** According to WRI CAIT, Macedonia's energy sector emissions dropped by 0.71 MtCO<sub>2</sub>e from 1990 to 2013, with electricity and heat production driving this decrease, followed by manufacturing and construction. BUR data indicate that energy emissions decreased 3% between 1990 and 2012. International Energy Agency (IEA) data show that industrial fuel consumption dropped by 26% in the period 1990-2013,<sup>5</sup> due to decreased industrial activity in the country, partly explained by the closure of aluminum, lead and zinc production plants in 2003.<sup>6</sup> Although total electricity generation increased 6% between 1990 and 2013, IEA data

<sup>1</sup>World Resources Institute Climate Analysis Indicators Tool (WRI CAIT 2.0, 2017). Global Warming Potentials (GWPs) are from the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (SAR). WRI CAIT follows the [Revised 1996 IPCC Guidelines](#) to present emissions from six sectors: energy, IP, agriculture, LUCF, waste, and international bunkers (not reported here). It draws on the Food and Agriculture Organization (FAO) for LUCF and agriculture emissions, the International Energy Agency (IEA), primarily, for energy emissions, and the US Environment Protection Agency for IP and waste sectors emissions. The factsheet uses WRI CAIT data due to its comprehensiveness, accessibility, and use of reputable sources (see [User Guide: Greenhouse Gas Emissions Fact Sheets](#)).

<sup>2</sup>WRI CAIT 2.0, 2017.

<sup>3</sup>Republic of Macedonia. Macedonia's First [Biennial Update Report \(BUR\)](#) to the UNFCCC, 2015. The First BUR uses GWPs from the IPCC SAR. It follows the [2006 IPCC Guidelines](#) to present emissions from four sectors: energy, IP, AFOLU, and waste; and uses the 2006 Inventory Software to calculate/estimate sector and total GHG emissions. The Second BUR covering the 2013-2014 period is currently under preparation.

<sup>4</sup>WRI CAIT does not show agriculture, LUCF, and total GHG emissions for 1990 and 1991. Energy, waste, and IP emissions are approximated for 1990-1991 according to the methodology WRI uses to calculate emissions for newly formed countries. (WRI. [CAIT Country Greenhouse Gas Emissions: Sources & Methods](#), 2015). Total GHGs in 1990-1991 are calculated based on emissions from energy, IP, and waste only. 1992 is the first year for which emissions from all sectors are included in the national total.

<sup>5</sup>International Energy Agency (IEA). Statistics: Former Yugoslav Republic of Macedonia, Balances [1990](#) and [2013](#).

<sup>6</sup>Republic of Macedonia, BUR, 2015.

show a significant decrease in the share of coal, and an increase in the share of hydro, natural gas and solar photovoltaic (PV) in the electricity mix during this period.<sup>7</sup> As of 2013, 66% of electricity was generated by coal, followed by hydro (26%), natural gas (5.9%), fuel oil (1.9%), and solar PV (0.1%).<sup>8</sup> REK Bitola and REK Oslomej, Macedonia's two thermal power plants, have a total installed capacity of 825 MW and are fueled by domestic lignite coal.<sup>9</sup> The BUR notes that Macedonia has continuously increased electricity production to meet rising demand driven by economic growth, and is working to accelerate development of renewable energy sources. The government recognizes that the use of lignite as fuel has negative environmental impacts, and is not a sustainable energy solution.<sup>10</sup> In 2010, Macedonia adopted its [Strategy for Energy Development until 2030](#) with several priority objectives including modernizing and improving efficiency in energy infrastructure, increasing the use of renewables in electricity production, increasing the use of natural gas, and integrating the national energy sector into the regional and European electricity and natural gas market through the construction of new connections and development of adequate legislation. Macedonia also prepared and adopted its [Renewable Energy Strategy](#) in 2010, which sets a 21% renewable energy target as a percentage of gross final energy consumption by 2020, in line with the European Union Renewable Energy Directive.

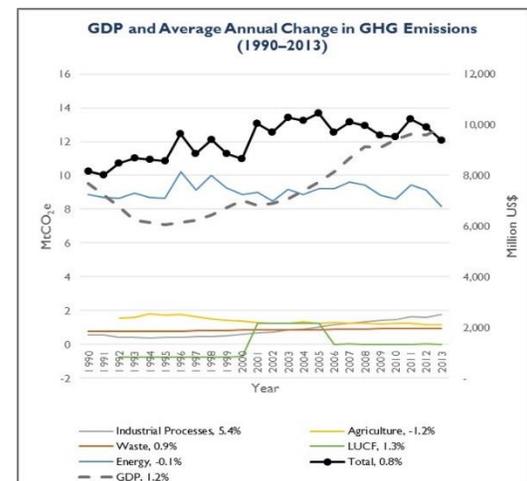
**Industrial Processes:** WRI CAIT data show that IP emissions increased 1.19 MtCO<sub>2</sub>e from 1990 to 2013.<sup>11</sup> In contrast, BUR data show a 10% decrease in IP emissions from 1990 to 2012. The BUR identifies the metal industry as the main contributor to GHG emissions, with ferroalloy production contributing the most, followed by the mineral industry where cement production is the primary source, and slight contributions from the chemical industry. Industrial production decreased from 1992 to 1998, due to the economic downturn following the country's separation from Yugoslavia and independence in 1991. This led to decreased emissions from lime and steel production, followed by a stable rise after 1999.<sup>12</sup> The BUR notes emissions from ferroalloy production have generally fluctuated.

### Carbon Intensity: GHG Emissions Relative to Gross Domestic Product (GDP)

According to WRI CAIT, Macedonia's GHG emissions grew 18% from 1990 to 2013, averaging 0.8% annually, while GDP grew 28%, averaging 1.2% annually. Although GDP grew faster than GHG emissions, in 2013, Macedonia's economy emitted almost twice more GHGs relative to GDP than the world average, indicating potential for improvement. In its [Intended Nationally Determined Contribution \(INDC\)](#), submitted to the UNFCCC in 2015, Macedonia states its plans to reduce its carbon dioxide emissions relative to GDP to transition gradually to a low-carbon economy.

### Climate Change Mitigation Targets and Plans

Macedonia's INDC communicates its target to reduce carbon dioxide emissions from fossil fuel combustion by 30% by 2030, compared to the business as usual scenario, through mitigation measures in energy supply, buildings, and transport. Energy supply mitigation measures include reduction of distribution losses, establishment of renewable energy power plants (hydro, solar, wind, biogas, and biomass cogeneration), shifting to central heating in Bitola, installation of solar thermal collectors, and increasing the share of biofuels to 5% of the energy mix. In buildings, mitigation measures include the labeling of appliances, public awareness campaigns on energy efficiency, and refurbishment and construction of buildings according to the Rulebook on Energy Performance of Buildings and Directive 2010/31/EU. In transport, Macedonia plans to increase the use of rail, renew its vehicle fleet, increase the use of bicycles and encourage walking, and introduce a parking policy. The INDC notes that the ambition of the target could be increased to 36% with additional mitigation and policy measures in the same sectors. Besides national investments, the implementation of national mitigation policies and measures shall also depend on the involvement of the private sector, access to new sources of finance, and enhanced international support through new climate finance mechanisms such as the Green Climate Fund.<sup>13</sup> Macedonia signed but has not ratified the Paris Agreement.<sup>14</sup>



Source: WRI CAIT 2.0, 2017.

<sup>7</sup> IEA. Statistics: Former Yugoslav Republic of Macedonia, Electricity and Heat [1990](#) and [2013](#). In 1990, 90% of electricity was generated by coal, followed by hydro (9%), and fuel oil (1%).

<sup>8</sup> Ibid.

<sup>9</sup> ELEM Macedonia Power Plants. [TPP Bitola](#) and [TPP Oslomej](#), viewed on April 10, 2017.

<sup>10</sup> Republic of Macedonia, BUR, 2015.

<sup>11</sup> WRI notes that the 1996 IPCC Guidelines include several IP subsectors that, due to lack of data, are not included in CAIT. These include emissions from, *inter alia*, the chemical industry, and iron and steel production which may instead be included in the Energy sector under Manufacturing and Construction ([WRI, 2015](#)).

<sup>12</sup> Republic of Macedonia, BUR, 2015.

<sup>13</sup> Republic of Macedonia. Macedonia's [Intended Nationally Determined Contribution \(INDC\)](#) to the UNFCCC, 2015.

<sup>14</sup> UNFCCC, [Paris Agreement – Status of Ratification](#), viewed on April 7, 2017.