



# Strategic Carbon Accounting & Decarbonization Approaches for Serbia

Module 2

# Content outline

01 **Module 1 - Importance of carbon accounting to achieve climate change mitigation**

02 **Module 2 - Emission sectors according to the International Panel on Climate Change**

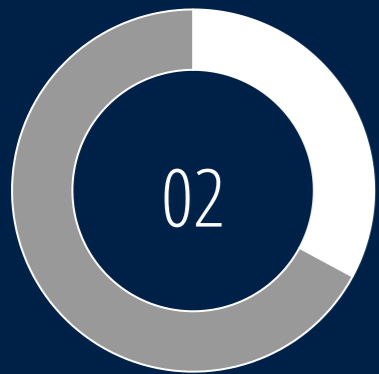
03 **Module 3 - Key steps in carbon emissions accounting and reporting**

04 **Module 4 - Carbon accounting and reporting in practice**

05 **Module 5 - Tools for carbon accounting**

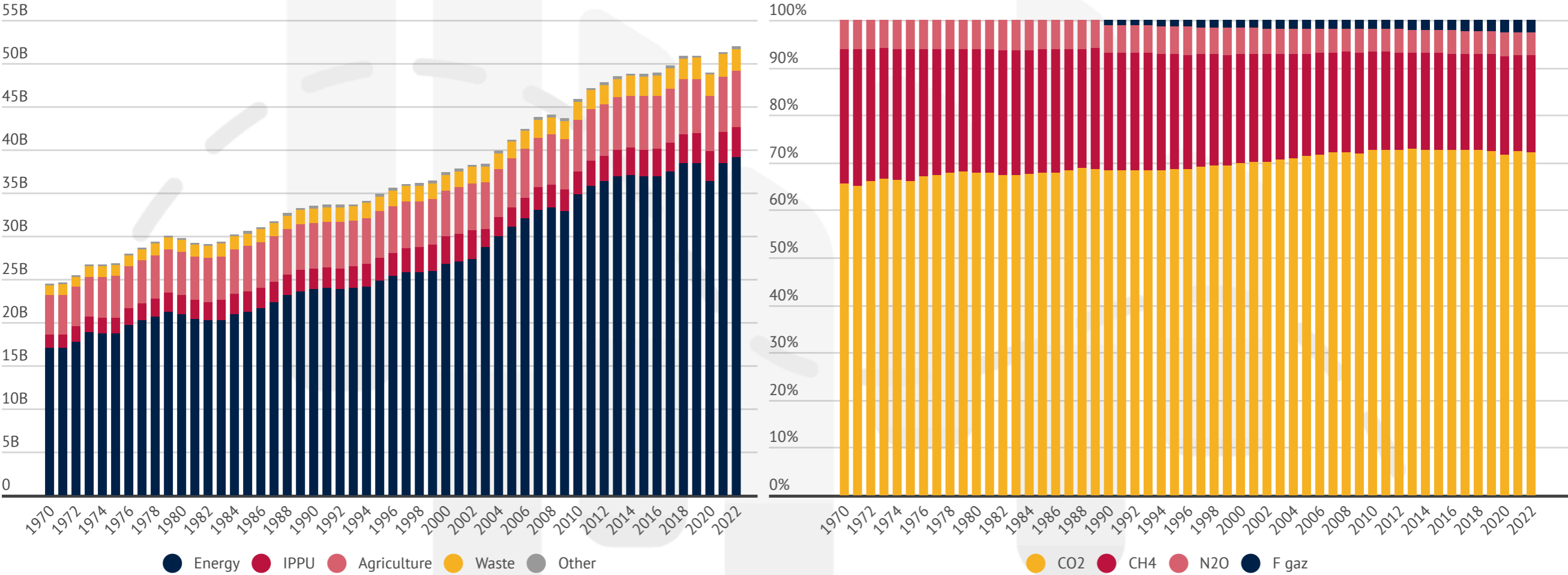
06 **Module 6 - Application of carbon accounting in business environment**





## Emission sectors according to the IPCC

# Global anthropogenic GHG emissions

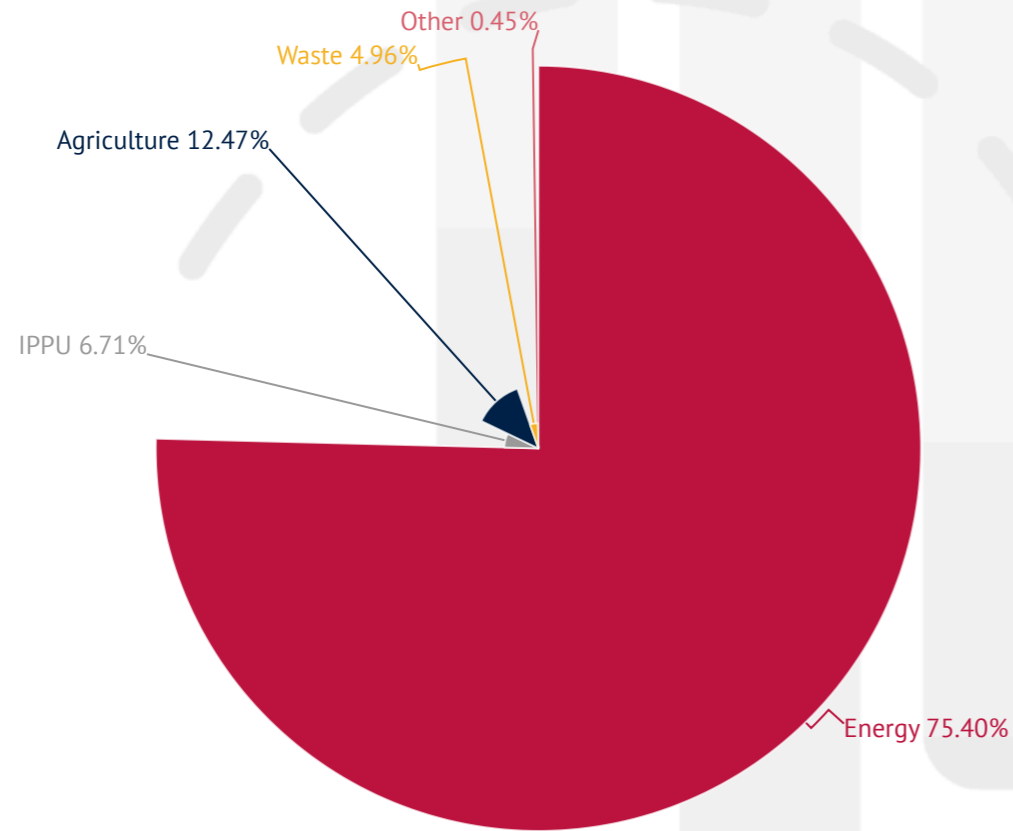


Source: EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version 8.0, (2023) European Commission.

Note: Fossil emissions only. Emissions from land use and land use change are not included.

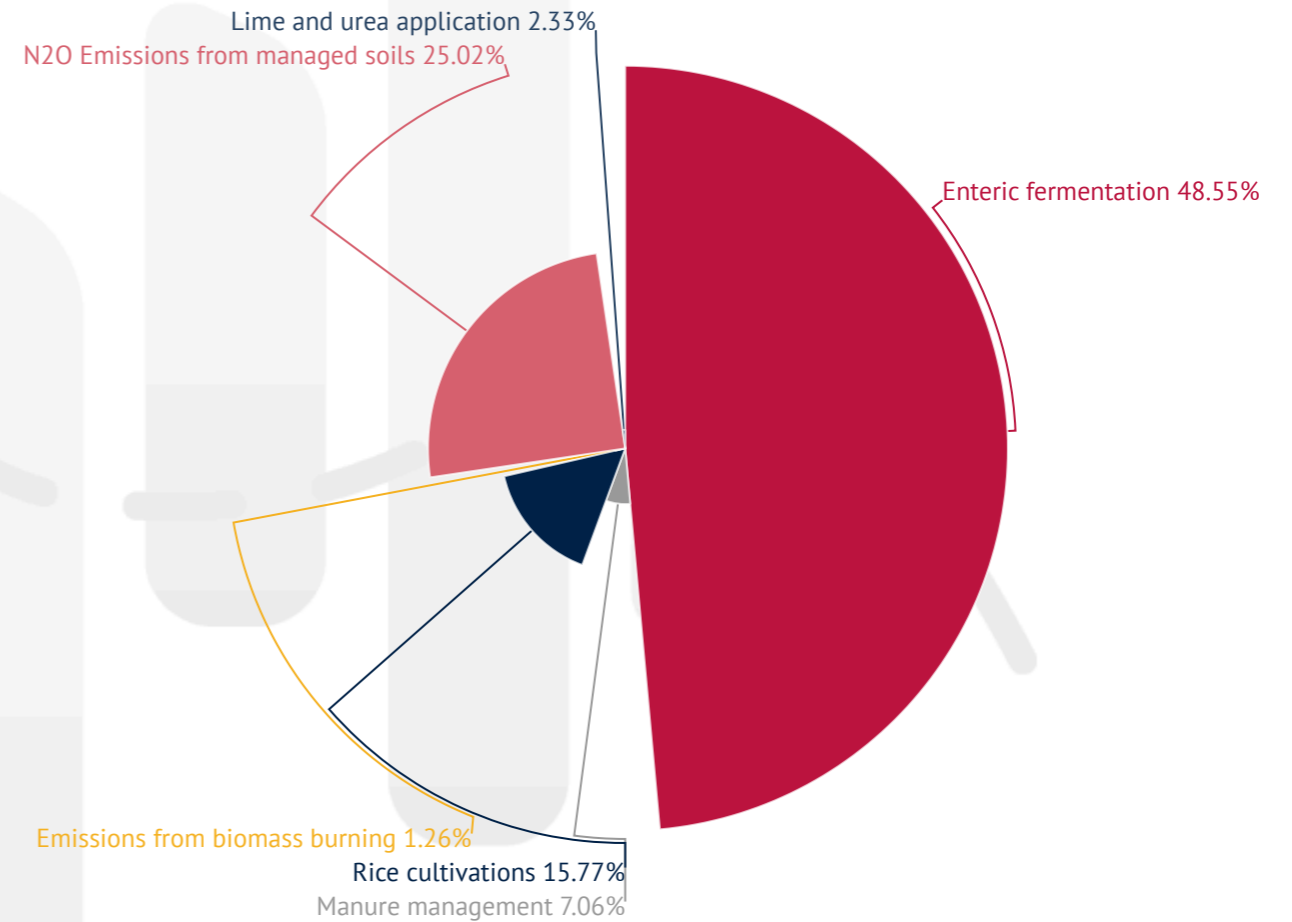
# Global anthropogenic GHG emissions in 2022

GHG emissions by sector, 52 GtCO<sub>2</sub>-eq



Emissions fossiles et bio, 60 GtCO<sub>2</sub>-e

Agriculture\*, 6.5 GtCO<sub>2</sub>-eq

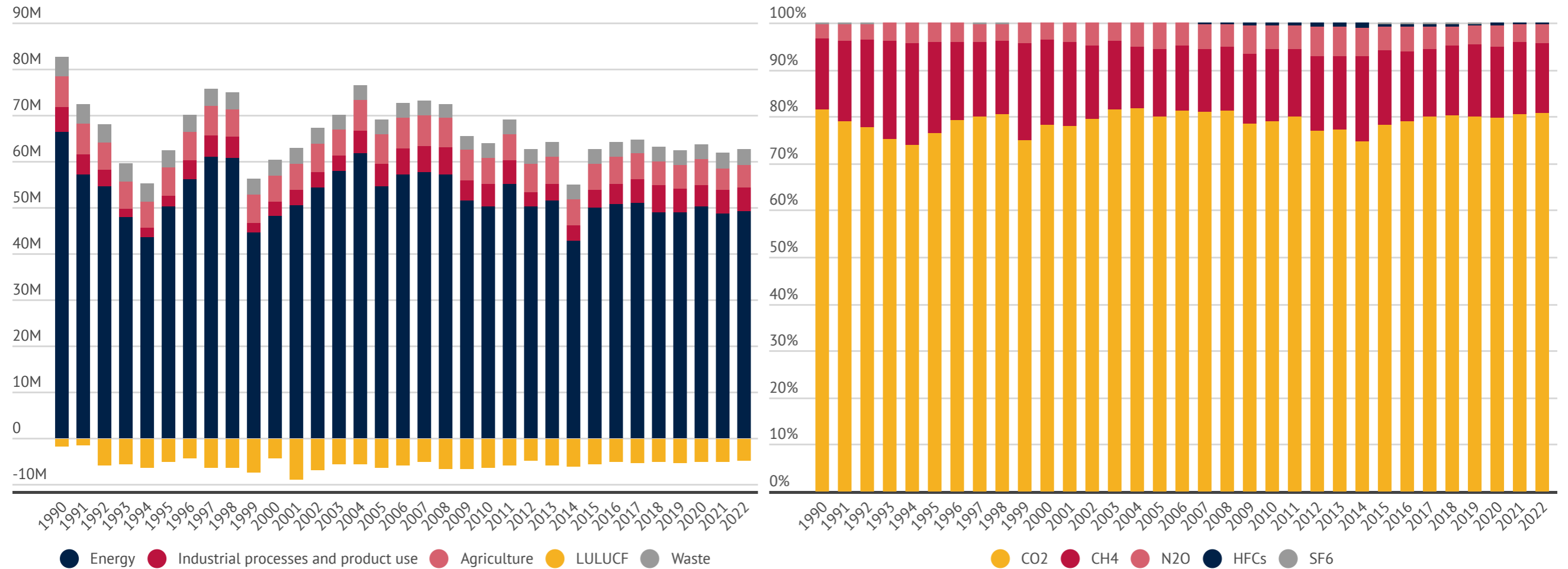


\*Emissions fossil & bio

Source: EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO<sub>2</sub>, EDGAR CH<sub>4</sub>, EDGAR N<sub>2</sub>O, EDGAR F-GASES version 8.0, (2023) European Commission.

Note: Fossil emissions only. Emissions from land use and land use change are not included.

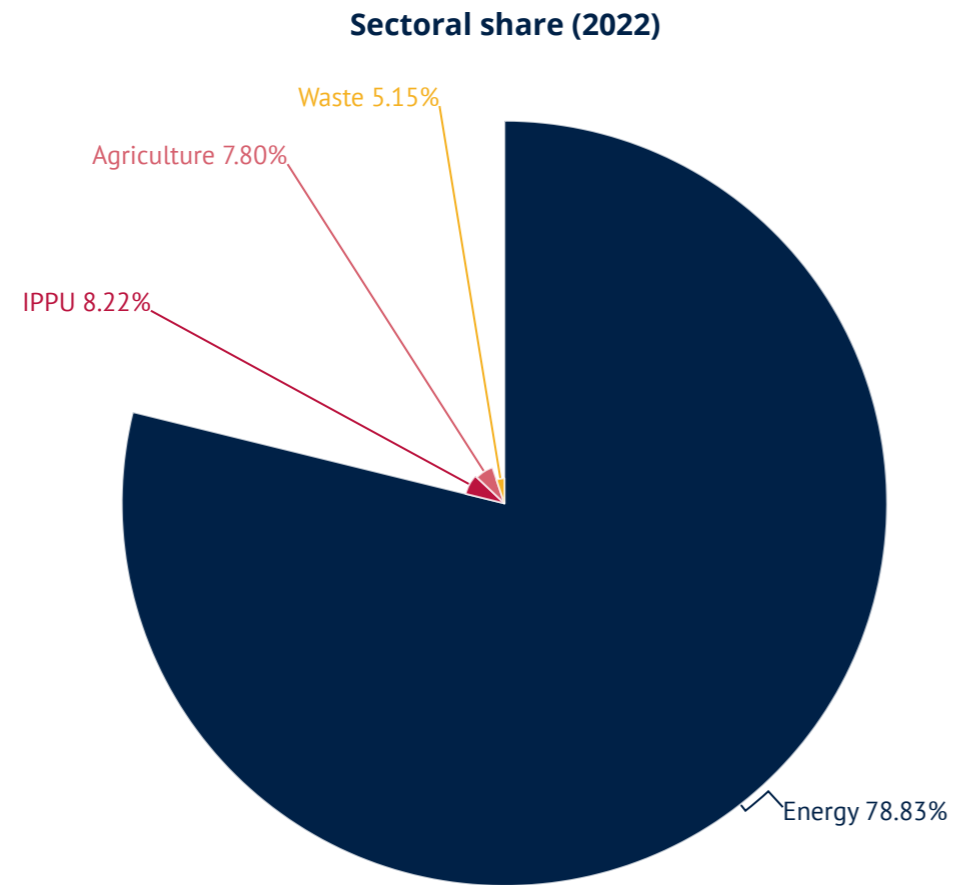
# GHG emissions in Serbia



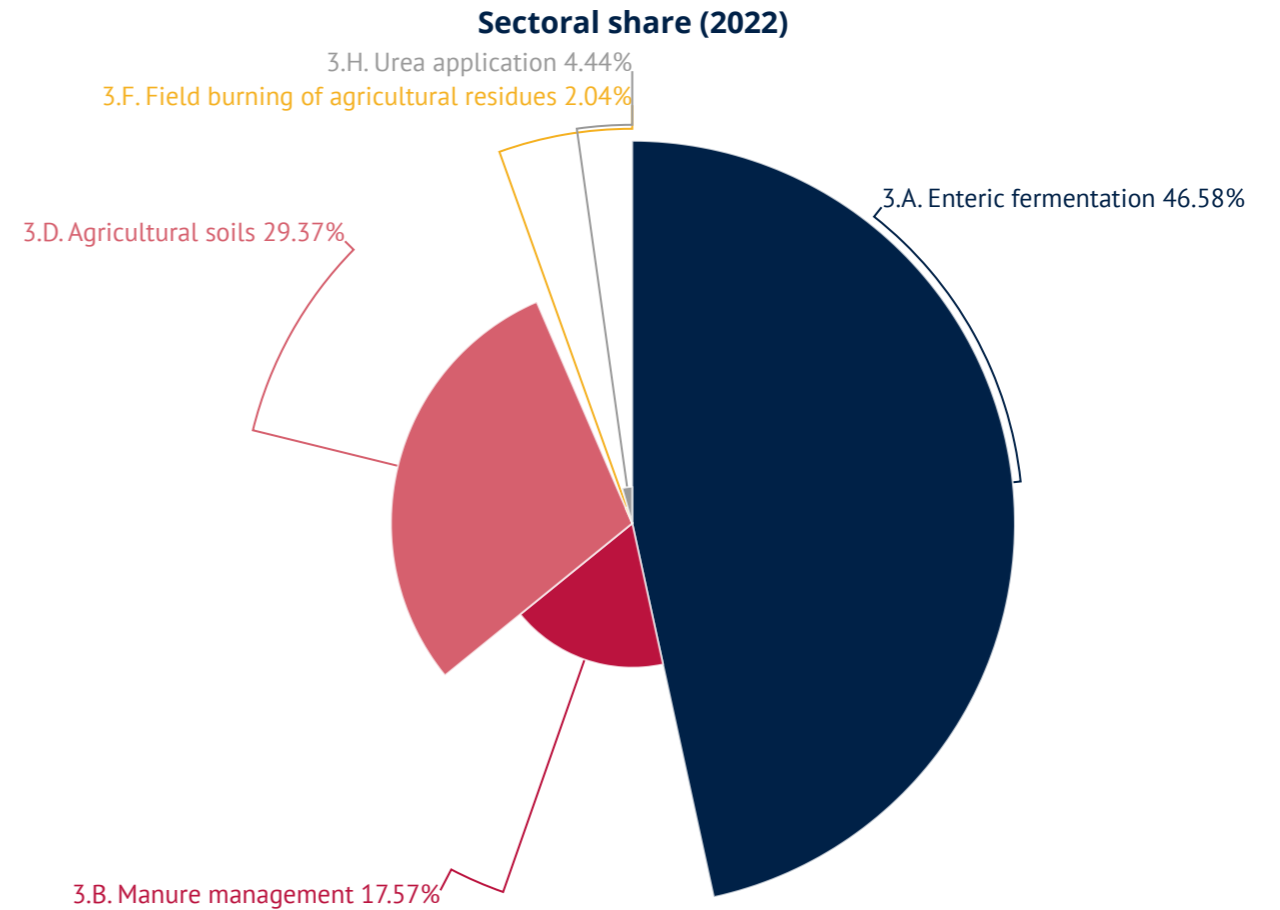
Source: NIR, 2024

# GHG emissions in Serbia

National GHG emissions, 62.5 million tCO<sub>2</sub>-eq\*



Agricultural GHG emissions, 4.9 million tCO<sub>2</sub>-eq\*

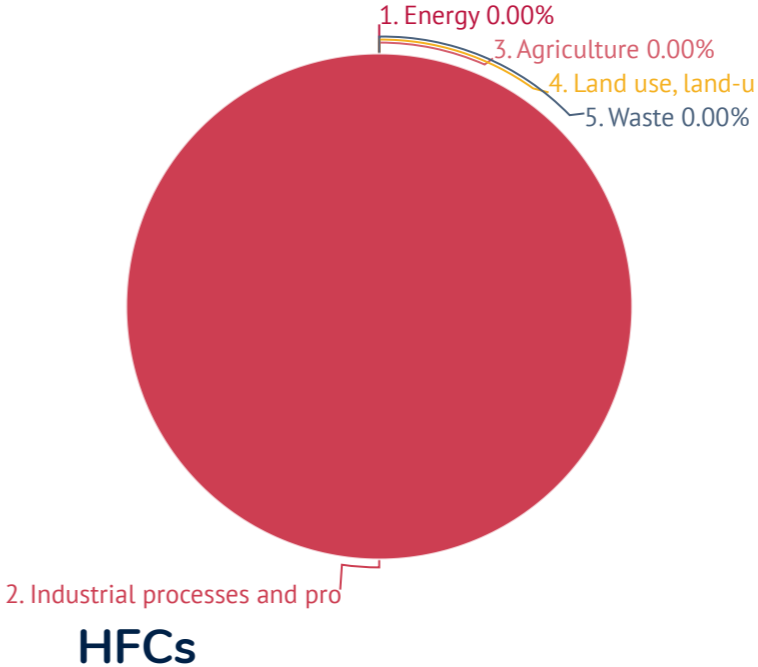
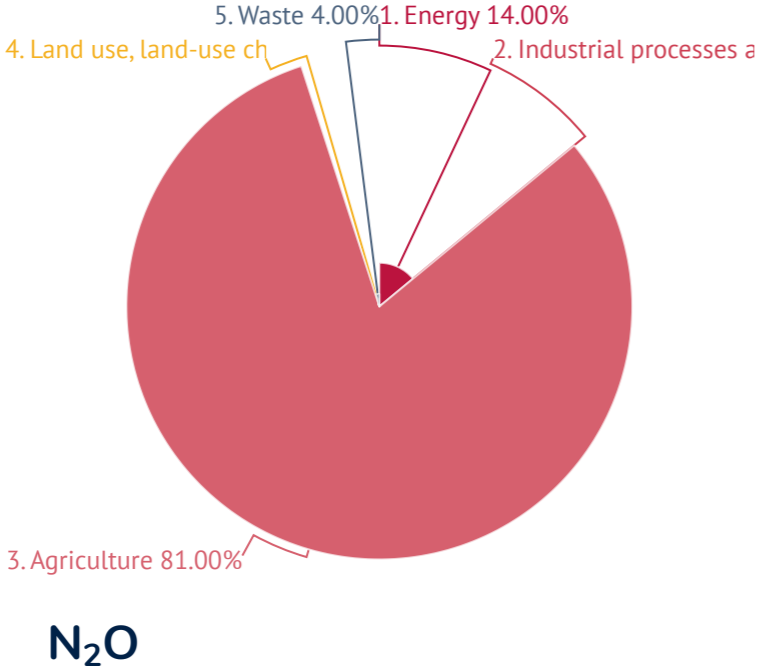
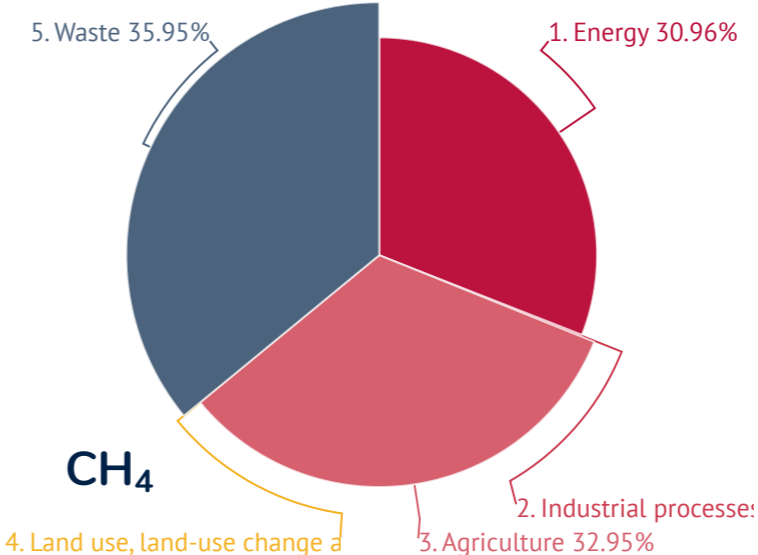
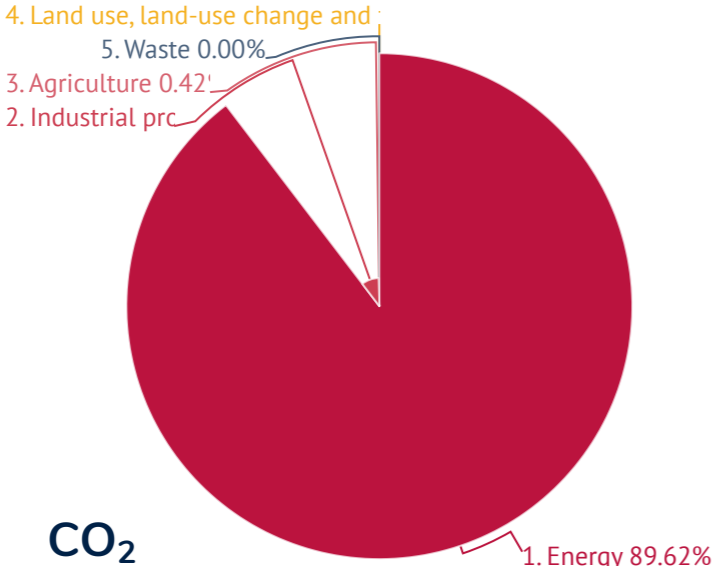


\* without FOLU emissions which represent a sink of 4.5 million tCO<sub>2</sub>-eq

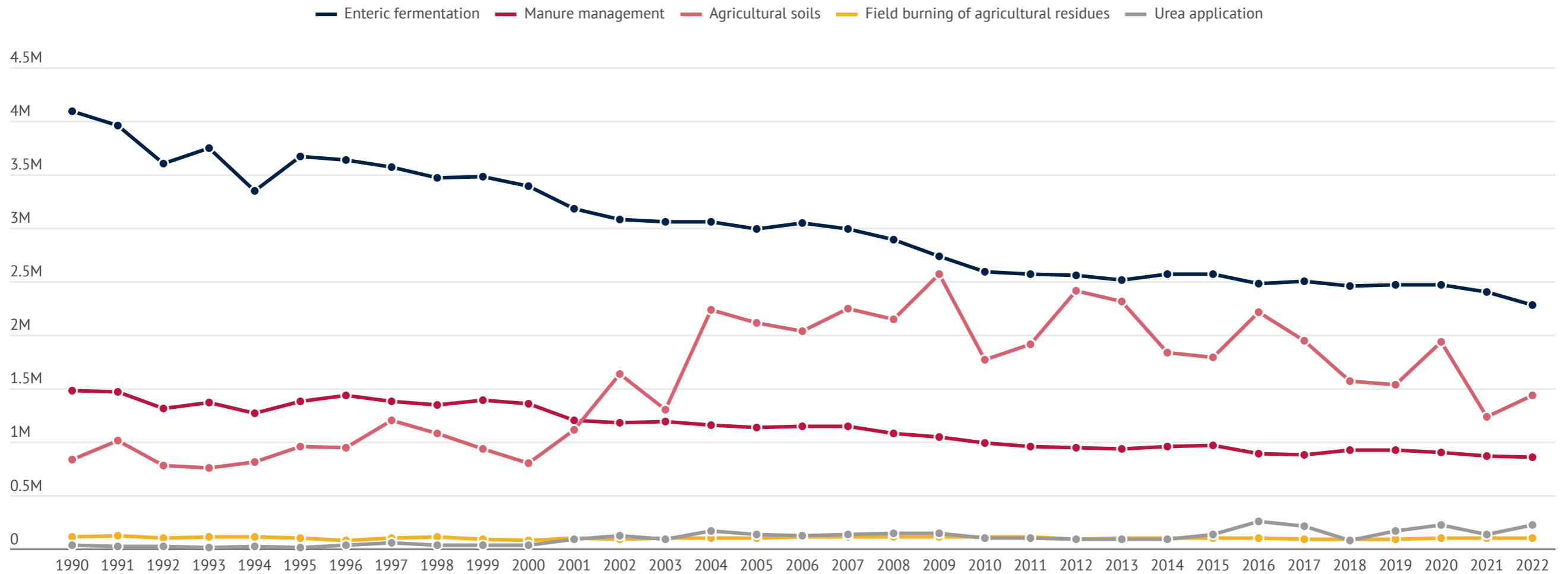
All emissions are expressed in tCO<sub>2</sub>-eq and are estimated using the GWP of the AR5.

Source: NIR, 2024

# Sectoral share in 2022



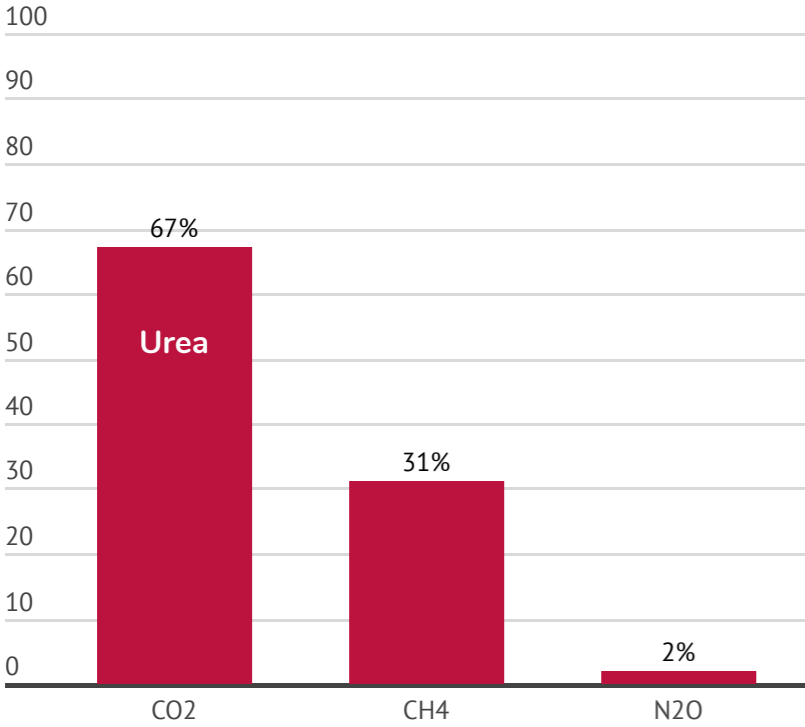
# Time series of emissions from Agriculture in Serbia



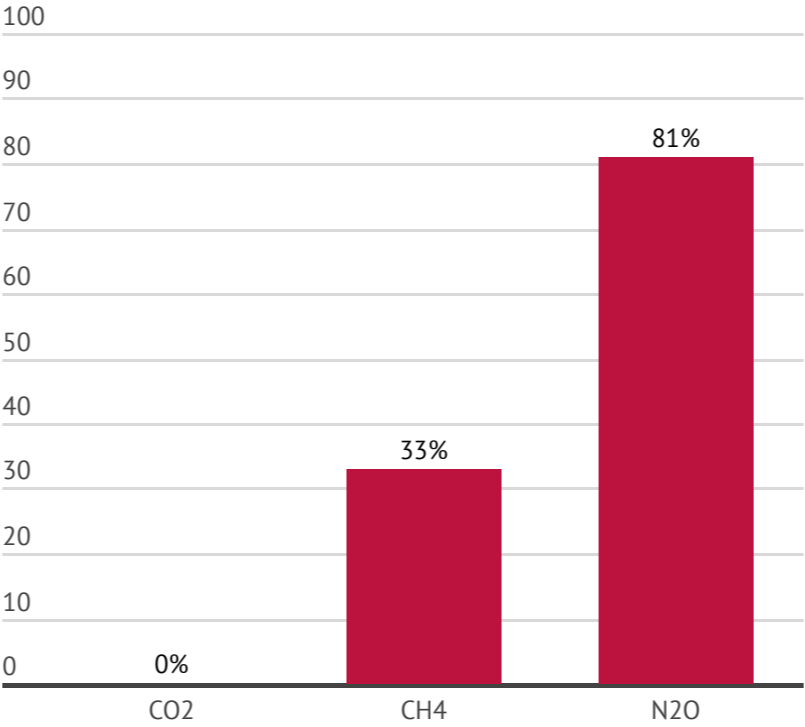
All emissions are expressed in tCO<sub>2</sub>-eq and are estimated using the GWP of the AR5.

# Sources of GHGs from agriculture

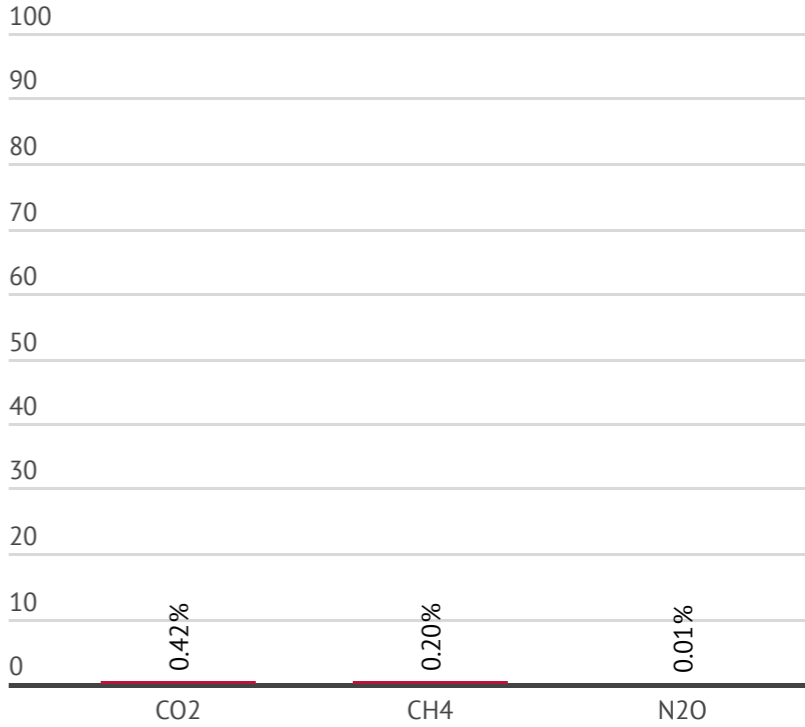
GHG sharing agriculture



Compare agriculture GHG to their national counterpart





Compare agriculture to national GHG emissions



**Agriculture represents the highest mitigation potential for N<sub>2</sub>O in particular and in a lesser extent CH<sub>4</sub>**

# The TFI is responsible for the internationally-agreed methodologies used for the calculation of national anthropogenic GHG emissions and removals by signatories to the UNFCCC and its Paris Agreement

 Intergovernmental Panel on Climate Change   
**2006 IPCC Guidelines for  
National Greenhouse Gas Inventories**

Volume 1



## General Guidance and Reporting

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe



IPCC National Greenhouse Gas Inventories Programme

**IGES**

 Intergovernmental Panel on Climate Change   
**2006 IPCC Guidelines for  
National Greenhouse Gas Inventories**

Volume 2



## Energy

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe



IPCC National Greenhouse Gas Inventories Programme

**IGES**

 Intergovernmental Panel on Climate Change   
**2006 IPCC Guidelines for  
National Greenhouse Gas Inventories**

Volume 3



## Industrial Processes and Product Use

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe



IPCC National Greenhouse Gas Inventories Programme

**IGES**

 Intergovernmental Panel on Climate Change   
**2006 IPCC Guidelines for  
National Greenhouse Gas Inventories**

Volume 4



## Agriculture, Forestry and Other Land Use

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe



IPCC National Greenhouse Gas Inventories Programme

**IGES**

 Intergovernmental Panel on Climate Change   
**2006 IPCC Guidelines for  
National Greenhouse Gas Inventories**

Volume 5

## Waste

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe



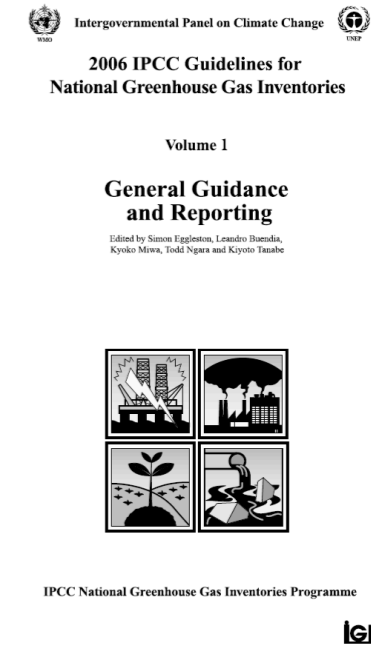
IPCC National Greenhouse Gas Inventories Programme

**IGES**

# IPCC 2006 - Volume 1 General guidance and reporting

## Outline

- Chapter 1 - Introduction to the 2006 Guidelines
- Chapter 2 - Approaches to data collection
- Chapter 3 - Uncertainties
- Chapter 4 - Methodological choice and identification of key categories
- Chapter 5 - Time series consistency
- Chapter 6 - Quality assurance / Quality control and verification
- Chapter 7 - Precursors and indirect emissions
- Chapter 8 - Reporting guidance and tables



Precursors are carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO<sub>2</sub>). Carbon monoxide (CO), Nitrogen oxides (NO<sub>x</sub>) and NMVOC in the presence of sunlight contribute to the formation of the greenhouse gas ozone (O<sub>3</sub>) in the troposphere and are therefore often called 'ozone precursors'. Furthermore, NO<sub>x</sub> emission plays an important role in the earth's nitrogen cycle. Sulphur Dioxide emissions lead to formation of sulphate particles, which also play a role in climate change. Ammonia (NH<sub>3</sub>) is an aerosol precursor, but is less important for aerosol formation than SO<sub>2</sub>.

# IPCC 2006 - Volume 2 Energy

Fossil fuel Combustion in energy industries, manufacturing, transport, and residential sectors

## Emissions from burning fossil fuels for electricity, heat, industry, transport, and households

### Stationary and mobile sources

Covers fixed sources like power plants and mobile ones like cars, trucks, ships, and planes.

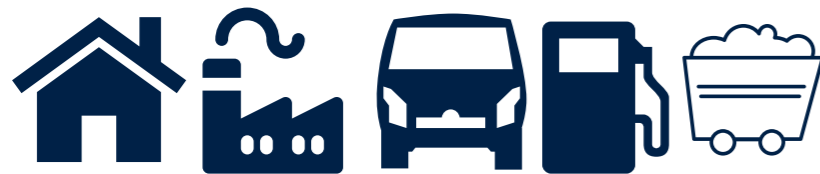
### Fugitive Emissions from coal mining, oil extraction, and natural gas systems

Unintentional releases of gases during coal mining, oil refining, and gas extraction or transport.

Provides methods and EF to estimate CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O from energy-related activities.

### Carbon capture and storage

Technologies that captures CO<sub>2</sub> emissions from fuel combustion or industrial processes and stores it underground to prevent release into the atmosphere.



2006 IPCC Guidelines for  
National Greenhouse Gas Inventories

Volume 2

Energy

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe

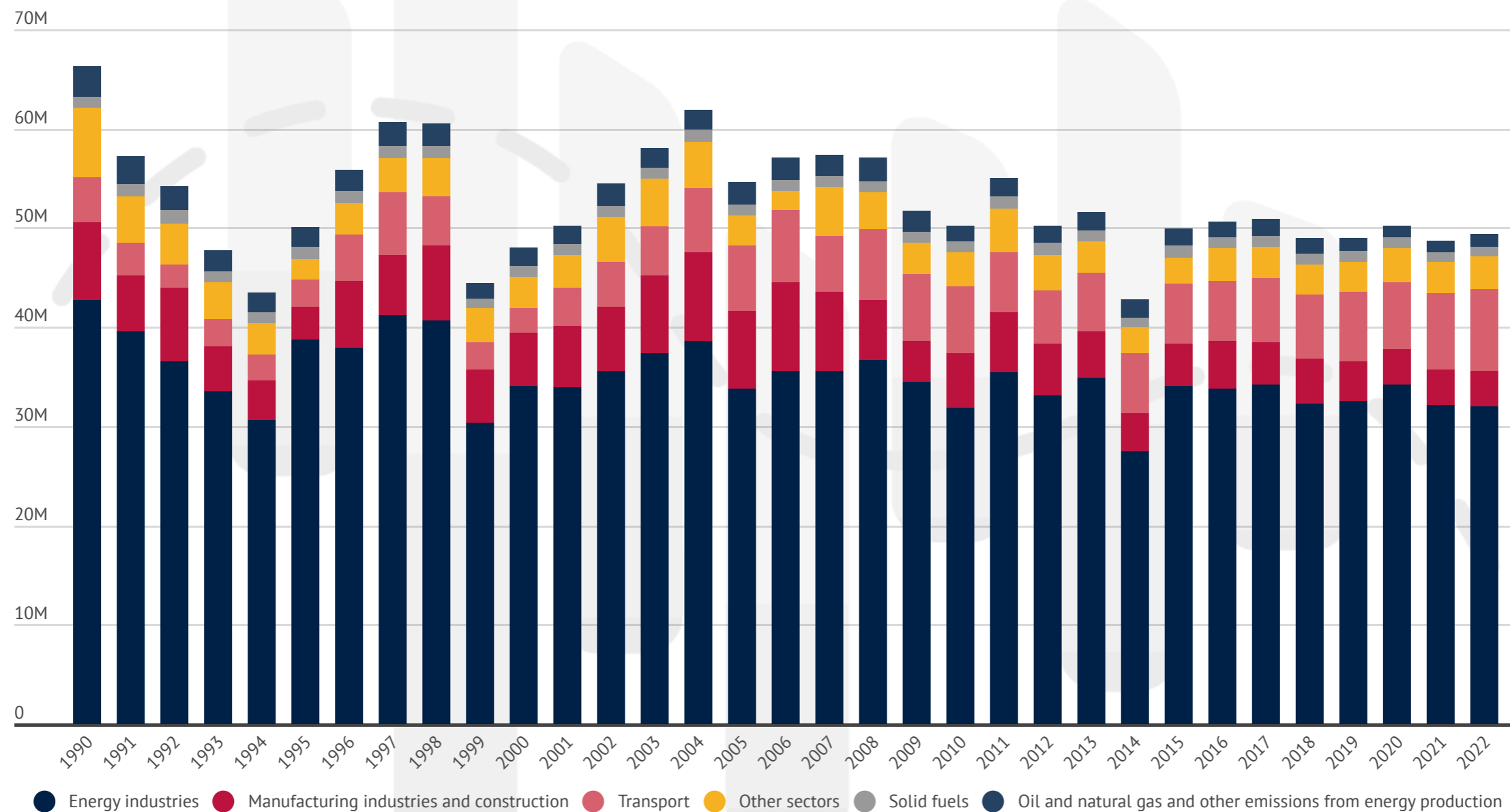


IPCC National Greenhouse Gas Inventories Programme

IGES

# GHG emissions | Serbia

Fossil fuel Combustion in energy industries, manufacturing, transport, and residential sectors



# IPCC 2006 - Volume 3 IPPU

## Industrial Processes and Product use

### Non-combustion emissions from chemical reactions in industrial processes

#### Cement, metals, chemicals, electronics

Covers major industrial sectors where processing raw materials releases GHGs (e.g., steel, aluminum, ammonia, semiconductors, iron, lead..)

#### HFCs, PFCs, and SF<sub>6</sub> as substitutes for ODS

Tracks synthetic gases used in refrigeration, air conditioning, aerosols, and insulation as substitutes for ozone-depleting substances

#### Product use & non-energy fuel use

Emissions from the use of products like solvents, foams, lubricants, and fuels not burned for energy (e.g., waxes, asphalt).

Provides methods and EF to estimate CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, unspecified mix of HFCs and PCFs, SF<sub>6</sub>, NF<sub>3</sub>, NO<sub>x</sub>, NMVOC and SO<sub>2</sub>



2006 IPCC Guidelines for  
National Greenhouse Gas Inventories

Volume 3

### Industrial Processes and Product Use

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe

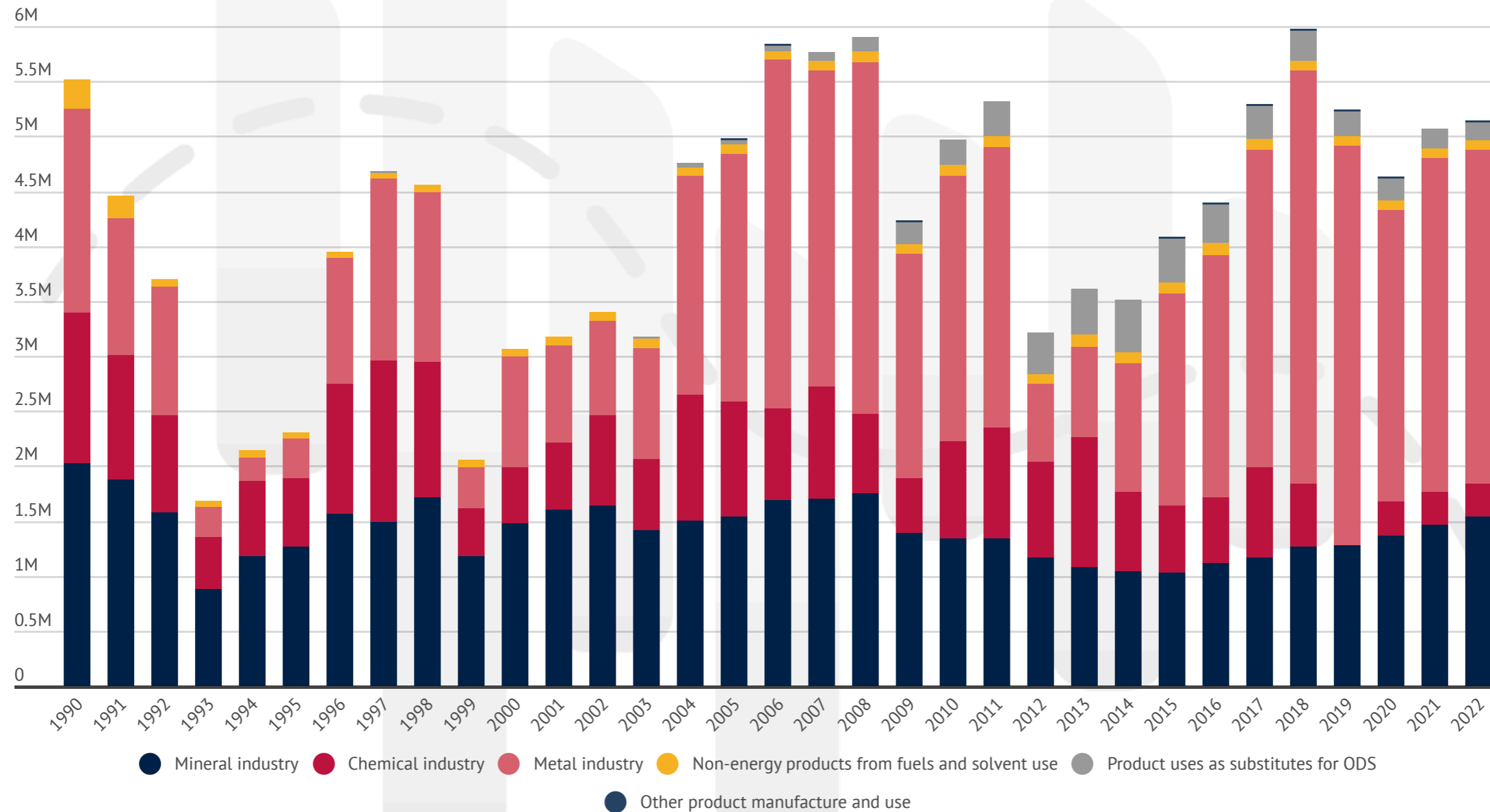


IPCC National Greenhouse Gas Inventories Programme

IGES

# GHG emissions | Serbia

## Industrial Processes and Product use



# IPCC 2006 - Volume 4 AFOLU

Agriculture, Forestry and Other Land Use

**GHG emissions and carbon removals from land use, land use change, forestry and agriculture**

## **Agriculture**

Methane and nitrous oxide from livestock, manure, rice cultivation, and soil management (including wetlands soils)

## **Land use, Land-use change & forestry**

CO<sub>2</sub> emissions/removals from forests, croplands, grasslands, wetlands, settlements, other lands and land-use conversions

**Provides methods, EF and default carbon stock to estimate CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O**



 Intergovernmental Panel on Climate Change 

2006 IPCC Guidelines for  
National Greenhouse Gas Inventories

Volume 4

**Agriculture, Forestry  
and Other Land Use**

Edited by Simon Eggleston, Leandro Buendia,  
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe

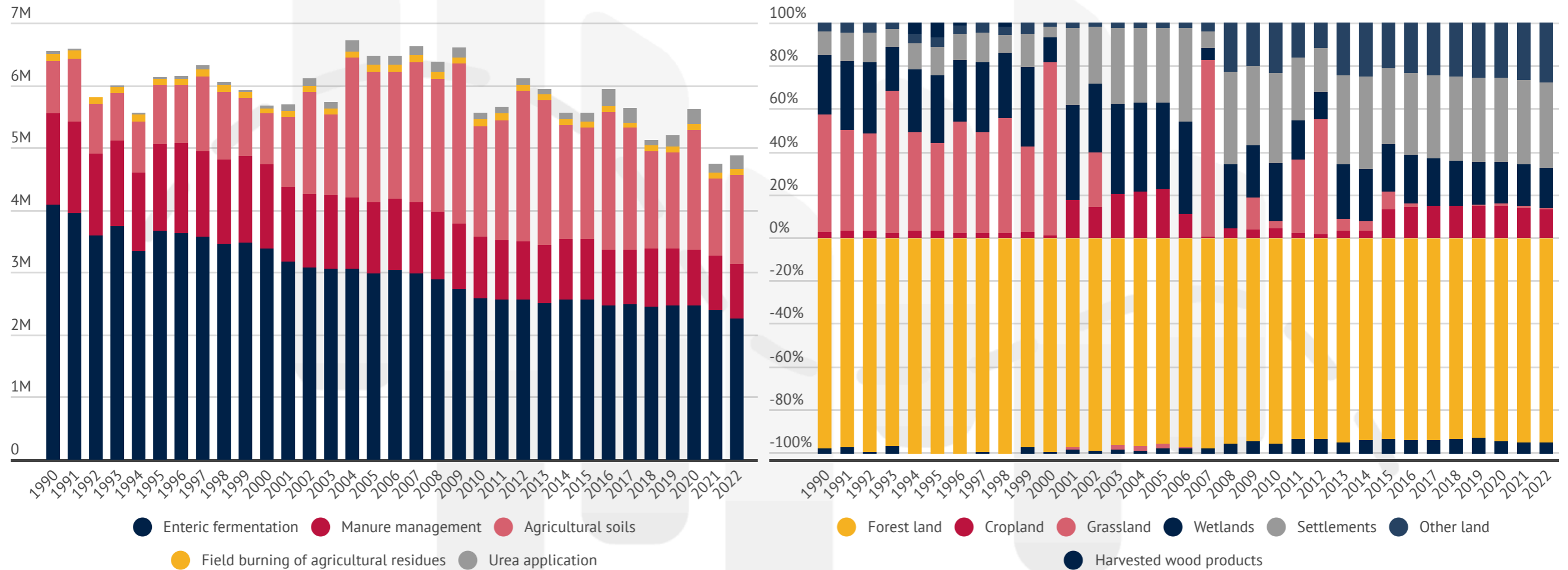


IPCC National Greenhouse Gas Inventories Programme

**IGES**

# GHG emissions | Serbia

## Agriculture, Forestry and Other Land Use



Source: NIR, 2024

# IPCC 2006 - Volume 5 Waste

## Emissions from waste generation, treatment, and disposal

### GHG emissions released during waste handling, treatment, and disposal

#### Solid waste disposal

CH<sub>4</sub> emissions from decomposing organic waste in landfills, both managed and unmanaged.

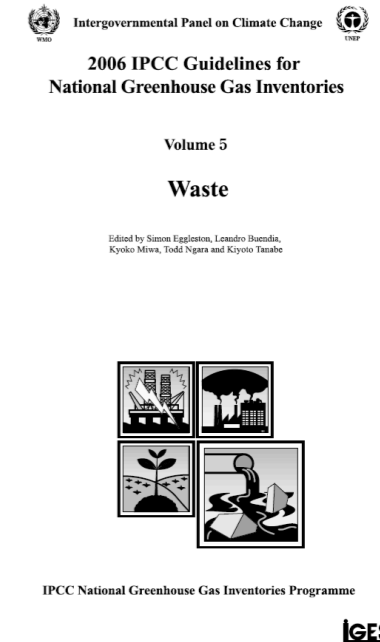
#### Biological and thermal treatment

Emissions from composting, anaerobic digestion (biogas), incineration, and open burning.

#### Wastewater treatment & Discharge

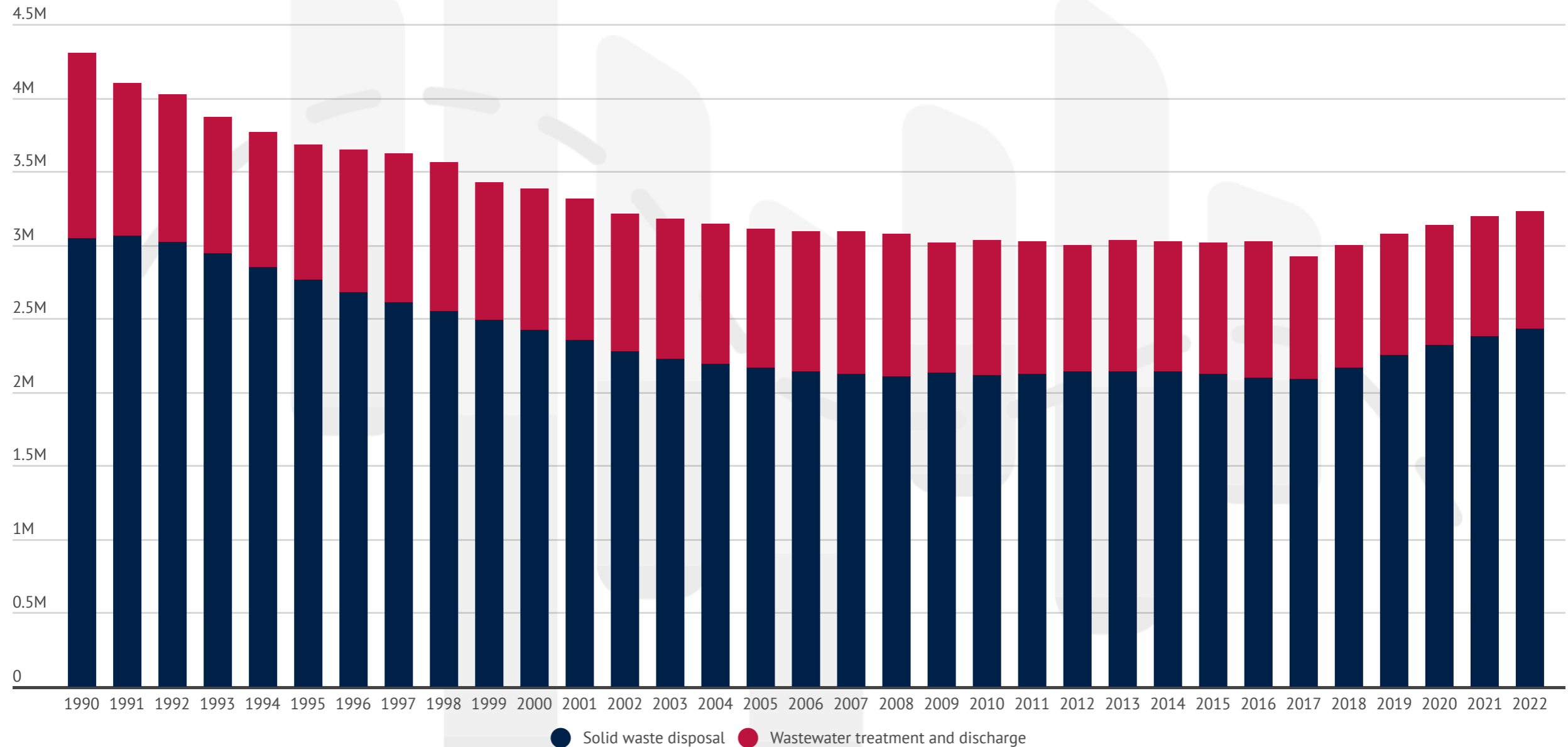
Emissions from composting, anaerobic digestion (biogas), incineration, and open burning.

Provides methods and EF to estimate CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O



# GHG emissions | Serbia

Emissions from waste generation, treatment, and disposal



# Reporting to UNFCCC

**National communications (NC)** every 4/5 years. Comprehensive reports on national climate actions. Includes: GHG inventories, mitigation, adaptation, support needs/received, education, and more.

**Biennial transparency report (BTR)** every 2 years : A regular report under the Paris Agreement's Enhanced Transparency Framework. Includes GHG inventories, NDC progress, climate finance (provided/received), and adaptation (optional).

**National greenhouse gas inventories (nGHGi)** every year for annex I countries

**Nationally determined contribution (NDC)** every 5 year

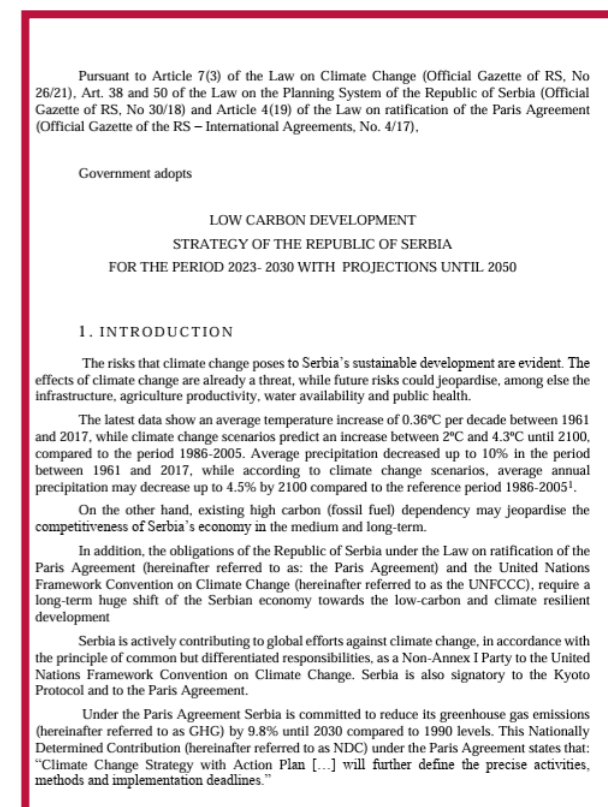
**Adaptation communication**, a voluntary report on adaptation efforts and priorities.

**Long term low emission development strategies (LT-LEDS)**. Voluntary. Include strategies for achieving low GHG emissions development by mid-century. **76 LT-LEDS submitted so far** →

nGHGi - Common reporting tables (CRT)

BTR - Common Table Format (CTF)

Serbia's LT-LEDS  
submitted early 2024



# CTR

The **Common Reporting Tables (CRTs)** play a pivotal role in the **accurate and consistent reporting of greenhouse gas (GHG) emissions to the UNFCCC**

The CRTs serve as a **standardized framework** that enables countries **to report their emissions** data in a **clear, transparent, and comparable** manner

The CRTs are organized into a **series of tables and sub tables**, each designed to capture specific aspects of GHG emissions and removals

By using CRTs, countries are required to provide detailed information about their emissions sources, methodologies, and data quality. This **transparency helps build trust among nations and allows for a thorough review of reported data.**

**TABLE 3 SECTORAL REPORT FOR AGRICULTURE**

(Sheet 1 of 1)

2022

SRB-CRT-2024-V0.2

Serbia

[Back to Index](#)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC	SO <sub>x</sub>	Total GHG emissions (t) CO <sub>2</sub> equivalents (kt) <sup>(2)</sup>
	(kt)							
<b>3. Total agriculture</b>	216.84	102.34	6.78	9.05	86.09	16.63	0.65	4,878.68
<b>3.A. Enteric fermentation</b>		81.16						2,272.44
3.A.1. Cattle <sup>(3)</sup>		59.49						1,803.94
<i>Option A:</i>								
3.A.1.a. Dairy cattle		34.80						974.41
3.A.1.b. Non-dairy cattle		24.69						691.25
3.A.2. Sheep		15.49						433.65
3.A.3. Swine		4.24						118.61
3.A.4. Other livestock		1.95						54.52
<b>3.B. Manure management</b>		18.33	1.30			12.99		857.03
3.B.1. Cattle <sup>(3)</sup>		6.47	0.54			8.54		325.57
<i>Option A:</i>								
3.B.1.a. Dairy cattle		2.30	0.38			5.50		165.02
3.B.1.b. Non-dairy cattle		4.17	0.17			3.03		160.55
3.B.2. Sheep		0.45	0.06			0.12		28.54
3.B.3. Swine		9.86	0.60			1.56		434.95
3.B.4. Other livestock		1.54	0.09			2.78		67.97
3.B.5. Indirect N <sub>2</sub> O emissions			0.00					
<b>3.C. Rice cultivation</b>		NO				NO		NO
<b>3.D. Agricultural soils<sup>(4,5)</sup></b>		NO	5.41	6.08	NO	3.00		1,432.83
3.D.1. Direct N <sub>2</sub> O emissions from managed soils			3.91					1,036.75
3.D.1.a. Inorganic N fertilizers			2.39					632.95
3.D.1.b. Organic N fertilizers			0.34					90.05
3.D.1.c. Urine and dung deposited by grazing animals			0.13					33.31
3.D.1.d. Crop residues			1.06					280.26
3.D.1.e. Mineralization/immobilization associated with loss/gain of soil organic matter			NO					NO
3.D.1.f. Cultivation of organic soils (i.e. histosols)			0.00					0.18
3.D.1.g. Other			NO					NO
3.D.2. Indirect N <sub>2</sub> O Emissions from managed soils			1.49					396.08
<b>3.E. Prescribed burning of savannahs</b>		NO	NO	NO	NO	NO	NO	NO
<b>3.F. Field burning of agricultural residues</b>		2.85	0.07	2.97	86.09	0.65	0.65	99.54
<b>3.G. Liming</b>	NE							NE

TABLE 3 SECTORAL REPORT FOR AGRICULTURE

(Sheet 1 of 1)

2022

SRB-CRT-2024-V0.2

Serbia

[Back to Index](#)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NM VOC	SO <sub>x</sub>	Total GHG emissions (m)
	(kt)							CO <sub>2</sub> equivalents (kt) <sup>(2)</sup>
<b>3. Total agriculture</b>	216.84	102.34	6.78	9.05	86.09	16.63	0.65	4,878.68
<b>3.A. Enteric fermentation</b>		81.16						2,272.44
3.A.1. Cattle <sup>(3)</sup>		59.49						1,803.94
<i>Option A:</i>								
3.A.1.a. Dairy cattle		34.80						974.41
3.A.1.b. Non-dairy cattle		24.69						691.25
3.A.2. Sheep		15.49						433.65
3.A.3. Swine		4.24						118.61
3.A.4. Other livestock		1.95						54.52
<b>3.B. Manure management</b>		18.33	1.30			12.99		857.03
3.B.1. Cattle <sup>(3)</sup>		6.47	0.54			8.54		325.57
<i>Option A:</i>								
3.B.1.a. Dairy cattle		2.30	0.38			5.50		165.02
3.B.1.b. Non-dairy cattle		4.17	0.17			3.03		160.55
3.B.2. Sheep		0.45	0.06			0.12		28.54
3.B.3. Swine		9.86	0.60			1.56		434.95
3.B.4. Other livestock		1.54	0.09			2.78		67.97
3.B.5. Indirect N <sub>2</sub> O emissions			0.00					
<b>3.C. Rice cultivation</b>		NO				NO		NO
<b>3.D. Agricultural soils<sup>(4,5)</sup></b>		NO	5.41	6.08	NO	3.00		1,432.83
3.D.1. Direct N <sub>2</sub> O emissions from managed soils			3.91					1,036.75
3.D.1.a. Inorganic N fertilizers			2.39					632.95
3.D.1.b. Organic N fertilizers			0.34					90.05
3.D.1.c. Urine and dung deposited by grazing animals			0.13					33.31
3.D.1.d. Crop residues			1.06					280.26
3.D.1.e. Mineralization/immobilization associated with loss/gain of soil organic matter			NO					NO
3.D.1.f. Cultivation of organic soils (i.e. histosols)			0.00					0.18
3.D.1.g. Other			NO					NO
3.D.2. Indirect N <sub>2</sub> O Emissions from managed soils			1.49					396.08
<b>3.E. Prescribed burning of savannahs</b>		NO	NO	NO	NO	NO	NO	NO
<b>3.F. Field burning of agricultural residues</b>		2.85	0.07	2.97	86.09	0.65	0.65	99.54
<b>3.G. Liming</b>	NE							NE



# Module 2 | Key notes takeaway

The **Intergovernmental Panel on Climate Change (IPCC)** provides internationally recognized **guidelines for compiling national greenhouse gas inventories**. These inventories are **essential tools for reporting emissions and assessing progress under frameworks like the UNFCCC and the Paris Agreement**

The CRTs serve as a **standardized framework** that enables countries **to report their emissions** data in a **clear, transparent, and comparable** manner

**Energy sector:** emissions from all activities involving the combustion of fuels, as well as fugitive emissions during fuel extraction, production, transport and CCS

**IPPU sector:** emissions not related to fuel combustion, but rather chemical and physical processes in industrial activities and from the use of products that release GHGs.

**AFOLU sector:** emissions from agricultural activities and land-use changes, capturing both emissions and removals (e.g., carbon sequestration in forests)

**Waste sector:** emissions from the disposal and treatment of waste, including solid waste and wastewater

**nGHGi Serbia:** the energy is the dominant source of GHG emissions, about 80% of the national emissions. Forest and HWP are the only carbon removal "activities"