


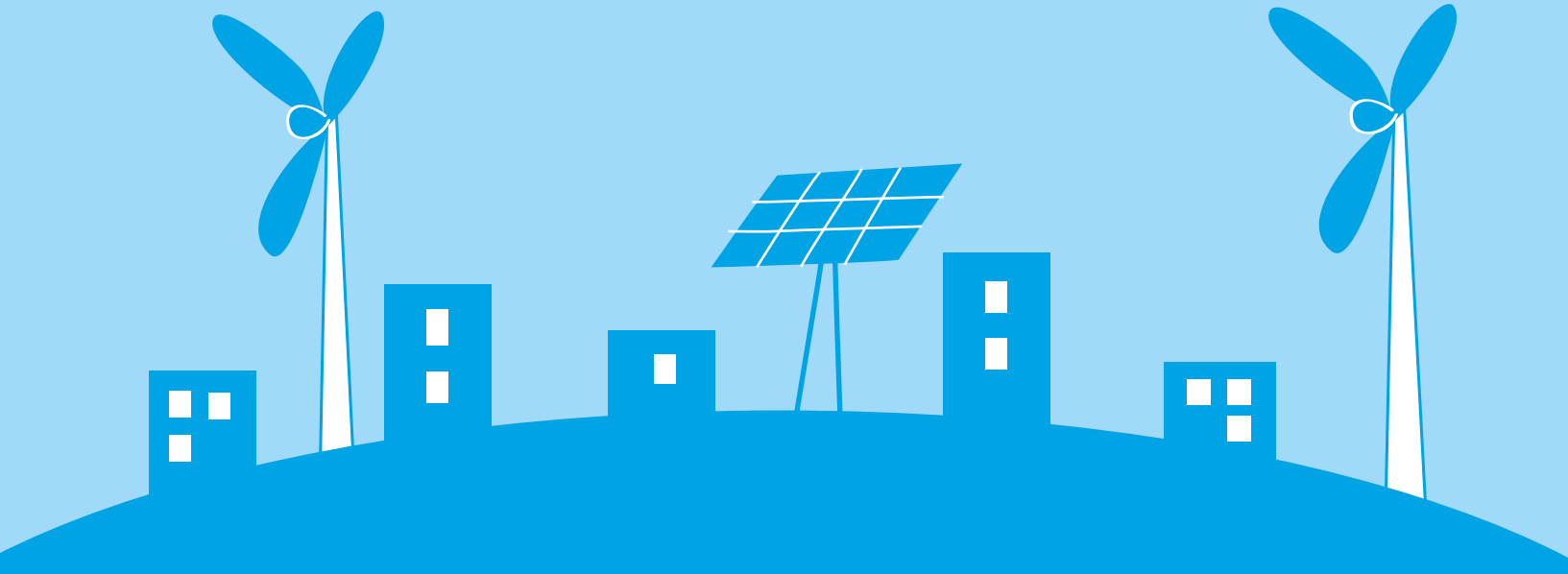

FIRST BIENNIAL UPDATE REPORT OF THE REPUBLIC OF SERBIA under the United Nations Framework Convention on Climate Change

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First Biennial Update Report of the Republic of Serbia under the United Nations Framework Convention on Climate Change

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Numerous national and international experts, representatives of universities, scientific and research institutes and relevant national institutions have been involved in the preparation of the report.

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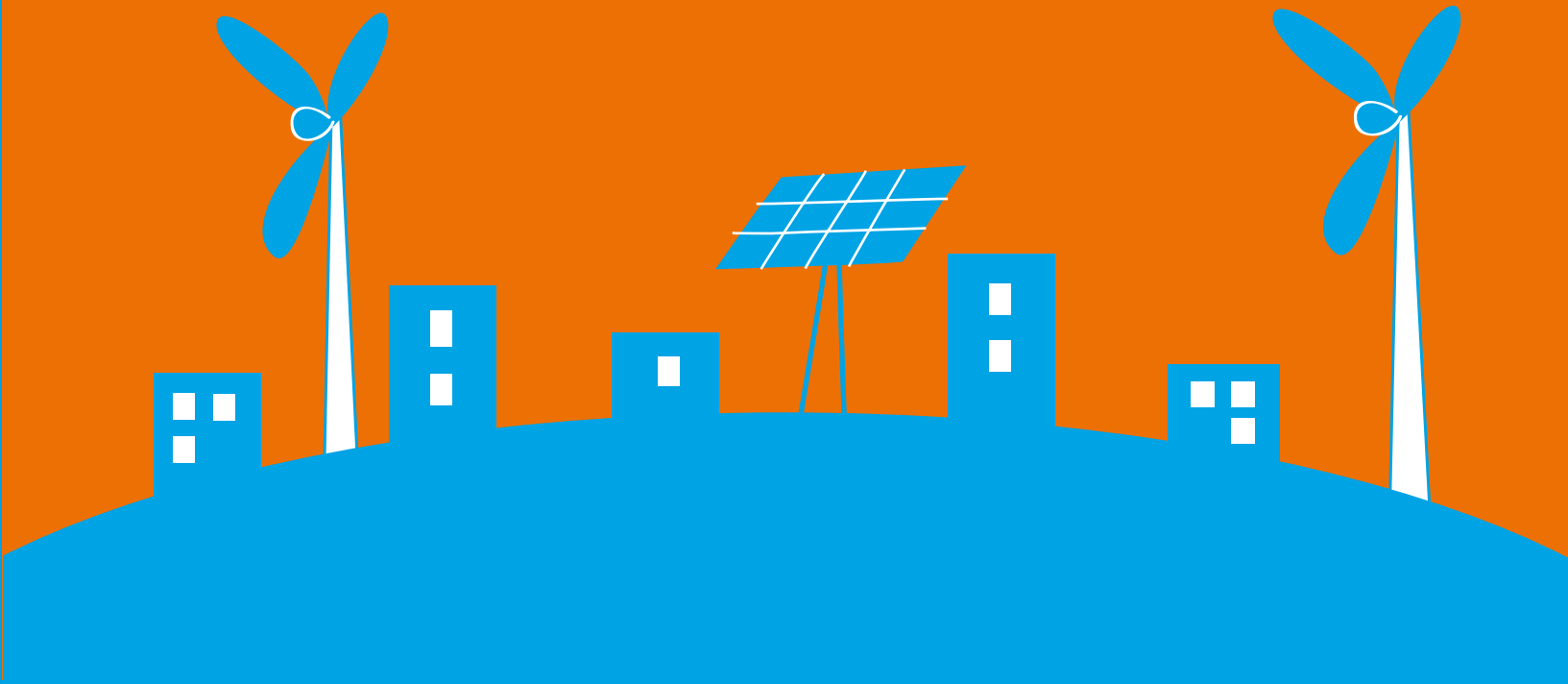
ABBREVIATIONS

AFOLU	Agriculture, Forestry and other Land Use
BUR	Biennial update report
CDM	Clean Development Mechanism
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gases
INC	Initial National Communication under the UNFCCC
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
MAEP	Ministry of Agriculture and Environmental Protection
MRV	Monitoring, Reporting and Verification
NAMAs	National Appropriate Mitigation Actions
QA/QC	Quality Assurance/Quality Control
SEPA	Serbian Agency for Environmental Protection
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

1. SUMMARY



1.1. INTRODUCTION – OBLIGATION UNDER THE UNFCCC

The Republic of Serbia has been part of the United Nations Framework Convention on Climate Change (UNFCCC) (Convention) since 2001 and the Kyoto Protocol (hereinafter: Protocol) since 2008 as a developing country (non-Annex I country). The Ministry of Agriculture and Environmental Protection (MAEP) is national focal point for the implementation of the Convention and the Protocol.

The preparation of Serbia's First Biennial Report (FBUR) is required under the United Nations Framework Convention on Climate Change. The FBUR provides an overview of activities in the field of climate change, including information on current and expected levels of greenhouse gas (GHG) emissions, opportunities and methods for its reduction, monitoring, reporting and verification, as well as identifying constraints and needs. The Global Environmental Facility (GEF) financially supports the development of Serbia's FBUR, with the assistance of the United Nations Development Programme (UNDP Serbia).

In addition to biennially updated reports, the Republic of Serbia is required to prepare and submit national communications to the Secretariat of the Convention.

1.2. NATIONAL CIRCUMSTANCES

Geographic profile

The Republic of Serbia is located in southeastern Europe, in the central part of the Balkan Peninsula, while the smaller, northern part of the country belongs to Central Europe, covering a total surface area of 88,361 km^2. Northern Serbia is predominantly flatland, while its central parts are hilly regions. Further south, the hills gradually give way to mountains. The State Rivers belong to the basins of the Black, Adriatic and Aegean Seas. Three rivers are navigable along the entire length of Serbia: the Danube, the Sava and the Tisa. The Danube is the longest river, which flows through Serbia for 588 km of its 2,783 km course.

Climate profile

The climate of Serbia is moderately continental, with more or less pronounced local characteristics and a gradual transition between seasons. During the 1960 - 2012 period an increase in the mean annual temperature in almost all parts of Serbia was observed. The hottest year was 2000, with a positive anomaly of 1.86°C followed by 2008, 2007, 1994, and 2012. The most sever heat wave recorded in Serbia was in 2007. Serbia has a continental precipitation regime, with higher amounts in the warmer half of the year, apart from the southeastern areas which have the most rainfall in autumn. Snow cover is typical for the period from November to March and sometimes in April and October.

Socio-political system

The Republic of Serbia is an independent democratic state (since 2006), with a multiparty parliamentary system. The governmental system is based on a division of power into the legislative, executive and judiciary branches. The responsibilities of the different government bodies are divided between the central government and the provincial and municipal authorities.

In March 2012, Serbia was granted EU candidate status. Integral parts of the Republic of Serbia are the Autonomous Province of Vojvodina and the Autonomous Province of Kosovo and Metohija with forms of territorial autonomy. The Autonomous Province of Kosovo and Metohija is in the South and on the basis of United Nations Security Council Resolution 1244. adopted on June 10, 1999, is under the interim civil administration of the United Nations.

Population

In the period from 2000 to 2013, two Censuses were conducted, in 2002 and 2011. According to the results of the 2011 Census, the population is estimated to include 7,186,862 inhabitants. The results of the 2002 and 2011 Census have to be taken with caution because they were not conducted across the entire territory. Nevertheless, the results of the 2011 Census, when compared to the results of the previous census in 2002, indicate that the population decreased by nearly 311,139 persons because of negative natural increase and continued emigration. According to the 2011 Census, the largest cities in the Republic of Serbia are Belgrade, the capital, (1,659,440 inhabitants), Novi Sad (341,625), Niš (260,237) and Kragujevac (179,417). The average life expectancy of the male and female population in the Republic of Serbia has increased over the last ten years – from 69.9 years to 72.5 years for men, and from 75.1 to 77.7 years for women. The majority population is Serbian; however, 37 other nationalities live in Serbia.

Economy

Economic and political reforms in Serbia started at the beginning of 2001. The recession strongly affected the Serbian economy as it was heavily dependent on trade partners. The negative tendency began with the second wave of the economic crisis in the second half of 2011, and continued throughout 2012, which put the Serbian economy into recession at the end of 2012. Macroeconomic trends in 2013 were characterized by a growth of economic activity and import, with an annual GDP growth of 2.6%.

The unemployment rate in 2013 was 22.1%. An increase in average salary was also recorded, from 129.1 USD in 2001 to 475.83 USD in 2012.

Energy

Energy accounts for 10% of the GDP. Production of primary energy is based on burning low quality lignite in existing powered thermal power plants and using hydro potential. The share of renewables in gross final electricity consumption is 21.2% in 2009, and 19.1% in 2013). General consumption in households, public and communal activities sectors increased significantly comparing to the energy consumption in industry.

Industry

According to data from 2013, industry accounts for 22.4% of the GDP. The average growth rate in the period from 2001 to 2012 was 0.4% and presented an above average rate of industrial growth of 3.8%. Industrial

production in Serbia had an increase in 2013 compared to 2012 of 5.5%, because of growth in the Mining and quarrying section, Manufacturing, Electricity, gas steam and air conditioning supply.

The "high technological" sectors such as the manufacture of motor vehicles, manufacture of electrical and electronic equipment and information technologies have an increasing share of total production. Manufacturing still has the highest share in the Serbian economy due to investments in the manufacture of motor vehicles, electrical and electronic equipment, the manufacturing of machinery, equipment, the textile industry, and metallurgy.

Transport

The transportation sector took important steps toward modernization and more environmental friendly ways of transportation were introduced. Economic recovery, opening markets and the transport of goods and people influenced, in general, an increase in transportation volumes. Road and air transport were increased in the previous period. Passenger rail transport has been in continuous decline from 2004 (annually reductions of between 5-15%), arriving at 50% fewer passengers in 2013, compared to 2000. The main reasons are the low level of investment, the poor state of infrastructure facilities and vehicles, the low quality of services, increasing debt and inadequate organization of the system overall.

Agriculture

Agriculture is an important part of the Serbian economy, as the country's larger employer and the third largest contributor to the national GDP, it accounts for 7.9% of the economy (2013). During 2000 - 2012 period, the index of physical volume of agricultural production increased twice, with an average annual growth of 9.4%, as the only sector with a positive foreign trade balance and the sector with the largest contribution to total exports. According to the Agricultural Census (2012) there are 631,522 agricultural holdings out of which 628,955 are family agricultural holdings and 2,567 are holdings of legal entities and unincorporated enterprises. The number of members and employees of farms is 1,442,628. Approximately 90% of arable land is privately owned and 10% belongs to the government.

Land-use change and forestry

In the period 2000-2013, 1.15% of total land area was subjected to a change in land use. The most significant changes occurred in urban areas, where pastures and agricultural land was converted into construction land.

According to the National Forest Inventory, the Republic of Serbia can be considered an average afforested country. According to data from the National Forest Inventory, in 2009 forests covered 2,254,400 ha or 29.1% of the total territory. State forests covered 53.0% of total forest area and private owned land accounted for 47%. However, in 2011 forests covered 1,962,335 ha, out of which state forests covered 47.3%, and private forests 52.7% of the territory. State forests (in total 97.6%) are managed by state enterprises: Public Enterprise "Srbijašume", Public Enterprise "Vojvodinašume", four public enterprises which manage National parks; Public enterprise „Borjak", Vrnjacka spa; the Faculty of Forestry (0.6%) and other organizations (1.8%).

Waste management

Waste management contributes to 1.2% of the national GDP, with a real growth rate of 0.3% in 2012. According to the data gathered in 2010, 2.65 million tonnes of waste were generated, and the quantity of collected and disposed waste was around 1.59 million tonnes. In 2011 and 2012, a similar quantity of waste was collected, 2.71 tonnes and 2.62 tonnes. During the last twenty years, the *average waste composition* has continuously changed in accordance with the social and social-economic situation in the country. Approximately 72% (2010) of the generated municipal waste was collected by organized waste collection systems, which is developed only in urban areas. Other areas, particularly rural ones, are not served by municipal waste collection services. Collected waste is disposed of at disposal sites that are unsanitary dumps.

1.3. NATIONAL GREENHOUSE GASES INVENTORY

The national greenhouse gas (GHG) inventory was initially conducted by the Serbian Agency for Environmental Protection (SEPA) based on its legal jurisdiction. Inventories were revised and improved, including the GHG inventory for the year 1990.

The GHG inventory for the Republic of Serbia was prepared according to the Tier 1 approach of the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for the National Greenhouse Gas Inventories for 1990, as the base year, and for the years from 2010 until 2013. The calculations of the GHG emissions for the period 2010-2013 do not include data relative to the Autonomous Province Kosovo and Metohija. As input data, the official data published by the Statistical Office of the Republic of Serbia energy balances were used.

Total GHG emissions, excluding removals, for 1990 and the period 2010-2013 were: 83,519.50; 64,813.65; 68,027.00; 60,958.89 and 62,520.88 Gg CO_2eq, for each year respectively. Total GHG emissions including removals, in 1990 were 66,664.14 Gg CO_2eq, or 48,254.78; 51,293.83; 44,225.72 and 46,783.83 Gg CO_2eq for each year respectively, in the period 2010 – 2013.

The largest share in the total GHG emissions in 1990 came from the energy sector and represented 78.70% of the total GHG emissions. In the period 2010-2013, GHG emissions decreased differently in different sectors, but the share in total emissions remained the same. Emissions from the energy sector contributed to 79.4% of the total emissions in 2013, while 10.9% of the total GHG emissions were emitted by the agriculture sector. The emission of GHG from the waste sector contributed 5.1% of the total GHG emissions, while the industrial sector contributed the least at 4.8%

Figure 1.1. Share of GHG emissions in the total emissions, by sector, 1990 and the period 2010-2013.

Removals by sinks in forestry in 2013 amounted to -15,737.06 Gg CO_2eq.

As in the case of sectoral distribution, in the total GHG emissions the share of individual GHG in the total emissions in 1990 and in the period 2010-2013 remains the same. The main greenhouse gas in 2013 was carbon dioxide (CO_2), accounting for 78.9% of the total GHG emissions, followed by methane (CH_4) expressed in CO_2 equivalent with 13.9% and nitrous oxide (N_2O) with 7.0% of the total GHG emissions. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.2% of the total GHG emissions in the country in 2013.

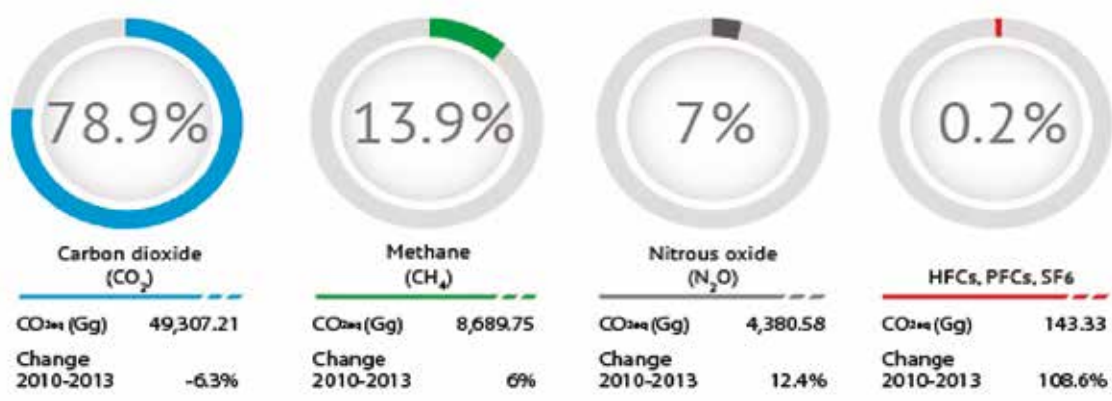


Figure 1.2. Share of greenhouse emissions by gas in the total GHG emissions, 1990, and the period 2010-2013 (Gg CO_2eq)

Due to the global economic crisis, the total GHG emissions in 2013 decreased by 3.5% in comparison to 2010. During 2010, the economy of the Republic of Serbia had started to recover from the impact of the global crisis, but this did not significantly affect the growth of emissions in the period 2010-2013. At the same time, activities have started to establish a legislative framework and the groundwork for the affirmation of cleaner and more energy efficient technologies, as well as to increase energy efficiency and the use of renewable energy sources that would lead to further economic development, accompanied by a reduction of GHG emissions.

Energy sector

In 2013, emissions from the energy sector amounted to 49,661.06 Gg CO2eq, or 79.4% of total GHG emissions. Since 2010, emissions have decreased by 2.6%, mainly as a result of lower consumption of diesel and gasoline in road transport and fuel consumption in manufacturing industries and construction

Industrial processes sector

In 2013, emissions from the industrial processes sector amounted to 3,031.42 Gg CO_2eq, or 4.8% of total GHG emissions. Since 2010, emissions from this sector decreased by 27.9%. The key drivers for such a significant fall in emissions in the period 2010-2013 are reduced market demand for Portland cement, iron, and steel, which consequently led to a lower utilization of production capacities in these industries.

Agriculture, Forestry and Other Land Use sectors (AFOLU)

Agriculture, forestry and other land use sectors (AFOLU) participated in the total GHG emissions in 2013 with 9.116,10 Gg CO_2eq.

Emissions sources in 2013, within the AFOLU sector, emitted 6,257.79 Gg CO_2eq, which is 47.5% of the total sector's emission, i.e. 3,142.50 Gg CO_2eq, mainly as a result of direct and indirect emissions of CH_4 and N_2O due to enteric fermentation and manure management (livestock biochemical processes).

On the other hand, forest land (forestry) and the use of harvested wood products (HWP) represent a category of sinks which have been removed -15,735.64 Gg CO_2eq in 2013, or -1.42 Gg CO_2eq, respectively per subsector.

In the 2010-2013 period, emissions of entire AFOLU sector decreased by 9.7%, but the structure of the sector in relation to the contribution of subsectors remained almost unchanged in this period.

Waste management sector

In 2013, emissions from the waste management sector amounted to 3,207.45 Gg CO2eq, or 5.1% of total GHG emissions. In 2010, emissions increased by 2.1% due to higher emissions rate from wastewater treatment and discharge. Within the sector, and remaining almost the same throughout the 2010-2013 period, approximately 62% of the emissions were from source category solid waste disposal on land, followed by 38% of emissions in the wastewater treatment subsector.

1.4. PROJECTED GHG EMISSIONS FOR THE PERIOD UNTIL 2020

Projections of GHG emissions on sectoral and total levels are made for three scenarios: "a basic scenario", a scenario "with measures" and a scenario "with additional measures". Projections were made until 2020, including the 2015 emission level. As a starting point for projections, the year 2010 was chosen.

In general, the basic scenario implies the implementation of policies and measures that were in force in 2010. The scenario "with measures" assumes improving the implementation of existing policies and measures so that the objectives and obligations of the state would be achieved. The scenario "with additional measures" implies a further reduction in final energy consumption, leading to the further reduction of GHG

emissions. Three GHG emission scenarios were developed for total GHG emissions, as well as GHG emissions by relevant sectors.

Levels of total GHG emissions in 2020, including 2015, based on the three scenarios (the basic scenario, the scenario "with measures" and the scenario "with additional measures") are:

Table 1.1. **Levels of total GHG emissions for three scenarios, for 2015 and 2020.**

Total emissions (*Gg CO_2eq*)	2015.	2020.
Basic scenario	70,783.23	79,442.37
Scenario with measures	68,410.42	70,966.54
Scenario with additional measures	66,015.15	65,164.09

Trends and projections of total GHG emissions in the period 2010-2020 developed from the three scenarios are:

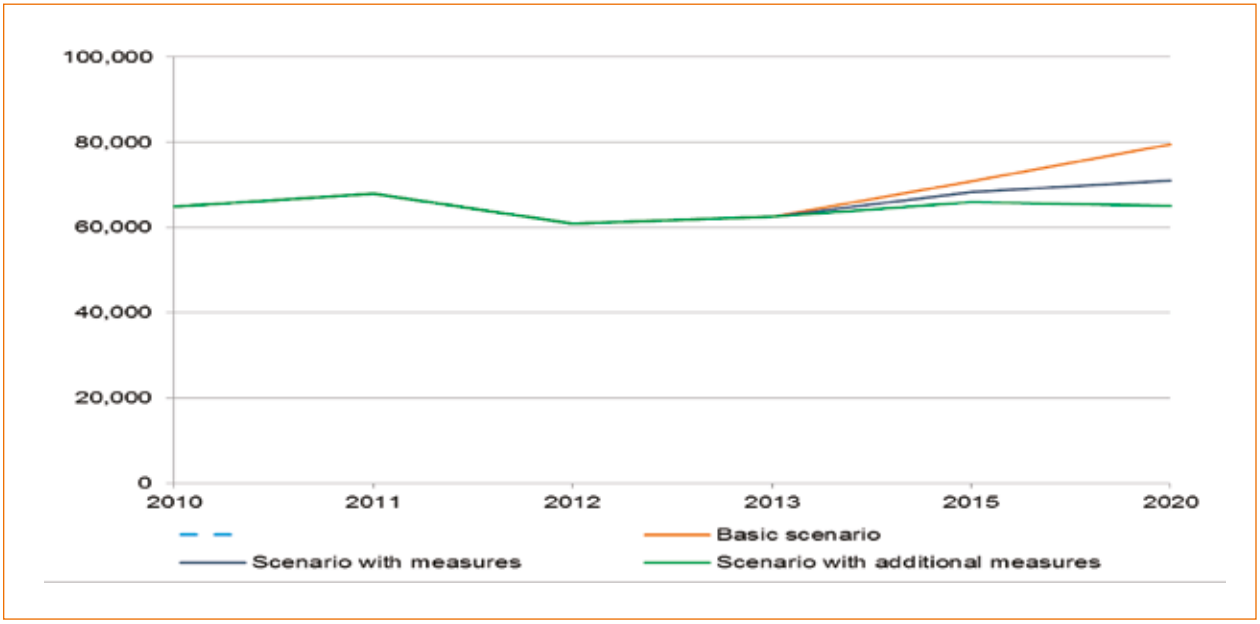


Figure 1.3. **Trend of GHG emissions in the period 2010-2020, Gg CO_2eq**

In 2020, GHG emission reduction if applying the scenario "with measures" will be 11% compared to the basic scenario, and an 18% reduction under the scenario "with additional measures".

1.5. MITIGATION MEASURES TO REDUCE GHG EMISSIONS

Special attention with regard to the planned and necessary activities in relevant sectors, which will lead to reaching the potential GHG emissions reduction estimated in the "scenario with measures" and "scenario

with additional measures", was given to the Energy sector due to its share in total GHG emissions and the potential for total GHG emission reduction. The production capacity of renewable energy sources to achieve final energy consumption and energy in each of the two scenarios developed for GHG emission reduction by 2020 is assumed. The planned energy efficiency measures include measures in the residential building sector, the public and commercial services sector, the industrial sector and the transport sector. Measures include legislative and infrastructure measures, which will lead to the reduction of final energy consumption.

In the Industrial processes sector the technical requirements of industries were identified.

In the Waste management sector, the need was identified for a number of regional centers with recycle waste separation plants and more recycling centers with the aim of doubling the level of recycling, as well as the construction of plants for the mechanical-biological treatment of municipal waste. Moreover, the need to build facilities for anaerobic digestion of municipal waste and plants for the thermal treatment of waste in Belgrade, Novi Sad and Nis and increasing the capacity of recycling centers to a new level of recycling of 15% in 2020 were also identified.

Specific activities that will ensure the GHG emissions reduction were identified as NAMA projects.

1.6. MONITORING, REPORTING AND VERIFICATION (MRV)

Establishing a system of monitoring, reporting and verification (MRV) is one of the key requirements of the UN Framework Convention on Climate Change and EU legislation. Recognizing the importance of the MRV monitoring system, and improved planning and implementation of policies relevant to the fight against climate change, the Republic of Serbia has established some of the important elements of this system.

The establishment of a complete MRV or a system to collect data and information relevant to climate change was initiated with financial and technical assistance from the EU (through the IPA project "Establishing a mechanism for the implementation of MMR," IPA 2013) with the ministry in charge of environmental issues and climate change responsible for the implementation of these activities. The expected date for this system to start functioning is 2019.

Some of the components of this system were established through the IPA project (IPA 2012) such as the establishment of a legislative and institutional framework for the MRV system for EU ETS. The law that establishes the obligation to collect, report and verify data on GHG emissions from industrial and power plants should come into force in 2017 at the latest.

The Ministry of construction, transport and infrastructure has established a Central Registry of energy passports - CREP. Through this information system energy passports for buildings are made as well as unified database that contains information on: authorized organizations which meet the requirements for the issuance of certificates of energy performance of buildings, the engineers responsible for the energy efficiency of buildings who are employed in these organizations and issued certificates on energy performance of buildings - Energy passports, but also on CO_2 emissions (kg / kWh). The data are publicly available.

1.7. CONSTRAINTS AND PRIORITY NEEDS

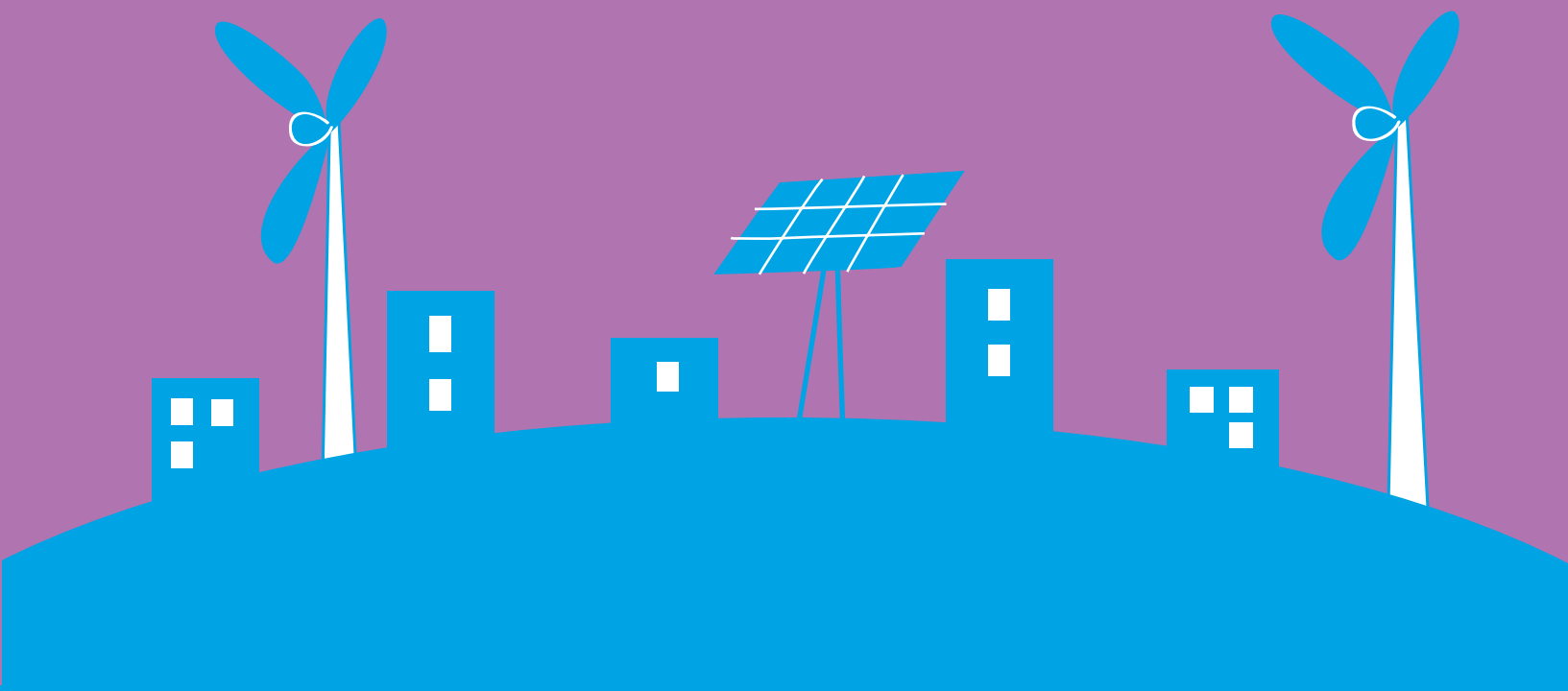
The Republic of Serbia has established an important component of the institutional and legal framework for fighting climate change. At the same time, there is still a need for improvement, as well as capacity building and expanding the knowledge of responsible and competent institutions, both at the national and local level, and among the general public.

In this context, it is necessary to strengthen the capacity of the Agency for Environmental Protection and the Climate Change Department within the Ministry of Agriculture and Environmental Protection.

The multi-sectoral nature of climate change and the current level of knowledge and awareness certainly indicate the need for systematic and continuous activities to raise awareness of this issue among the general public.

Certainly, in planning and implementing these activities, technical and financial assistance from the international community and the European Union are crucial.

2. OBLIGATIONS UNDER THE UN FRAMEWROK CONVENTION ON CLIMATE CHANGE



2.1. NATIONAL REPORTING

The Republic of Serbia has been part of the United Nations Framework Convention on Climate Change (UNFCCC) since 2001 and the Kyoto Protocol (Protocol) since 2008 as a developing country (non-Annex I country). The Ministry of Agriculture and Environmental Protection (MAEP) is the national focal point for the implementation of the Convention and the Protocol.

The Republic of Serbia, as a non-Annex I country, is required to report regularly on emissions, mitigation measures and adaptation through the development of national reports (national communications and biennially updated reports). In 2010, the Republic of Serbia submitted the First National Communication under the UNFCCC. The Second National Communication of the Republic of Serbia under the UNFCCC is in the process of preparation.

The First Biennial Update Report was produced through the Project, during 2014-2015, with the financial support of the Global Environmental Facility (GEF) (the total budget of the project was US$352,000). In the preparation of the Report expert teams, Governmental institutions and agencies, as well as general public were involved.

The Ministry of Agriculture and Environmental Protection implemented the project, with the technical support of the United Nations Development Programme (UNDP).

The development of the First Biennial Update Report is required of the Republic of Serbia by the United Nations Framework Convention on Climate Change. The Report is important because it provides an overview of the activities in the area of climate change, including information on current and expected levels of greenhouse gas (GHG) emissions, opportunities and methods for its reduction, as well as information on monitoring, reporting and verification, constrains and needs.

2.2. OTHER RELEVANT ACTIVITIES

The first Clean Development Mechanism (hereinafter CDM) project of the Republic of Serbia was registered by the UNFCCC in November 2011. Seven CDM projects were registered by June 2013. Out of the seven CDM projects registered so far, four are wind energy projects.

In 2012, 12 Nationally Appropriate Mitigation Actions (NAMA) plans, seeking support for implementation, were submitted to the NAMA Registry operated by the UNFCCC Secretariat. NAMAs plans mainly refer to the energy supply sector (65%), construction (29%) and transport (6%). The identification of these NAMAs and preparation of the necessary documentation was accomplished through the project "Strengthening capacity to prepare nationally appropriate mitigation actions" in cooperation with the Japan International Cooperation Agency (JICA).

In order to strengthen cooperation and exchange of information between the relevant Governmental institutions, scientific and other professionals, and local communities with regard to climate change issues and policy, as well as to popularize this problem at the national level, the Government of the Republic of Serbia established the *Climate Change Committee* in November, 2014. The Committee will: monitor development and implementation of national policies on climate change, sectoral policies and other planning documents, in terms of consistency with national climate change policies and propose measures for improving and coordinating policies, measures and actions in this field; monitor the fulfillment of international obligations of the Republic of Serbia in the field of climate change; review reports with regard to fulfillment of UNFCCC obligations, propose measures to mitigate climate change, greenhouse gas emission reductions, and adaptation measures; discuss amendments to laws and regulations relevant to climate change issues and provide its opinion to the Government; propose actions to combat climate change especially in the process of negotiation with the EU; monitor implementation and propose measures to improve the National Strategy on Climate Change with the accompanying Action Plan; promote the fight against climate change and mainstream climate change concerns into sectoral policies; initiate changes in policies, legislation and measures with regard to climate exchange in accordance with European regulations and United Nations' standards, as well as draft decisions important for the implementation of relevant projects and other activities in the field of climate change.

Members of the Committee are representatives of all relevant ministries and other governmental institutions, as well as representatives of universities and scientific institutions, including the: Ministry of Agriculture and Environmental Protection; Ministry of Finance; Ministry of Mining and Energy; Ministry of Economy; Ministry of Construction, Transport and Infrastructure; Ministry of the Interior; Ministry of Education, Science and Technological Development; Ministry of Health; Ministry of Foreign Affairs; Serbian European Integration Office; Office for Cooperation with Civil Society; Agency for Environmental Protection; Republic Hydrometeorological Service of Serbia; Statistical Office of the Republic of Serbia; Institute for nature conservation of Serbia; Provincial Secretariat for Urban Planning, Construction and Environmental Protection; Provincial Secretariat for Energy and Mineral Resources; Secretariat for Environmental Protection; City of Belgrade University of Belgrade; University of Novi Sad; Rector, University of Nis; and Standing Conference of towns and municipalities. The decision to establish the Climate Change Committee also envisages the possibility to include representatives of other institutions in the work of the Committee, including representatives of civil society.

The Republic of Serbia has started the process of harmonizing national legislation with the EU legislation framework. This process will obviously contribute to the improvement of fulfilling the obligations of the Republic of Serbia under the Convention. As a result of this process, the preparation of the institutional and legislative structure for monitoring, reporting and verification of data was initiated as well as information relevant to climate change, including the EU Emission Trading System.

Preparation of the National Climate Change Strategy, with an action plan, is in the initial phase and will provide a clear framework of activities in the fight against climate change during the period 2020 and 2030, as well as the framework for 2050. All these activities, which are related to the process of harmonization of the national with the EU legislation, are implemented with the financial and technical support of the EU.

2.3. CLIMATE CHANGE AND SECTORAL POLICY

The basis for reducing GHG emissions is strategic planning in relevant sectors in a way that will ensure further economic growth accompanied by low GHG emissions. Some sectoral documents have identified the problem of climate change, and defined it as one of the key risks that need to be included in further development planning. Other documents, although not directly analyzing the problem of climate change, anticipate activities and measures that will necessarily lead to a reduction of GHG emissions.

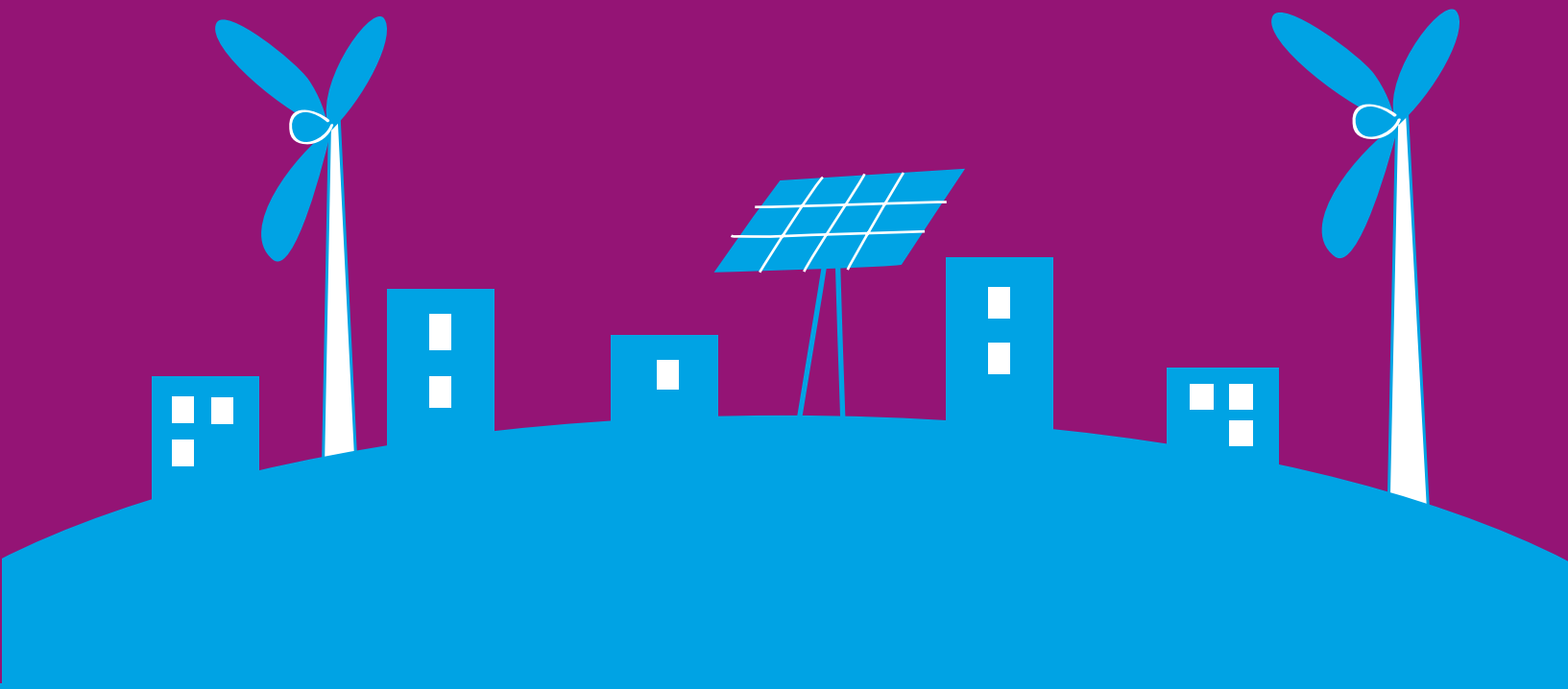
Some of these national documents are: the Environmental Approximation Strategy for the Republic of Serbia for the period 2011-2019 (2011) and the Waste Management Strategy of the Republic of Serbia for the period from 2010 to 2019 (2010).

Energy policy, as the key factor for GHG emission reduction, is defined in the following strategies: the Draft Energy Development Strategy until 2025 with projections to 2030 (2015), based on the energy balances (which Government adopts on an annual basis), the Second Energy Efficiency Action Plan of the Republic of Serbia for the period from 2013 to 2015 (2013), the National Renewable Energy Action Plan of the Republic of Serbia (2013), the Decree on Incentive Measures for Privileged Energy Producers – Decree on feed-in tariffs (2013). The Draft Energy Development Strategy until 2025 with projections to 2030 is analyzing the climate change issue in a direct way (as separate chapter), while the implementation of the remaining documents has a direct impact on reducing GHG emissions.

However, the National Climate Change Strategy, with an action plan, which is in the initial phase, will provide a clear framework of activities in the fight against climate change in the period 2020 and 2030, as well as the framework for 2050. Strategy will include all relevant sectors taking into account embarrassment of the sector and possibilities of their adaptation to the climate change conditions.

In general, the level of integration of climate change issues in the sectoral and the general development strategies, the level of knowledge, institutional and individual capacities, the available technology and, above all, the financial resources are not sufficient for effective and prompt response to climate change and to combat its impacts and effects. Due to these reasons, the strengthening of cooperation at the bilateral, regional and international levels, as well as continuation of cooperation with the GEF is essential.

3. NATIONAL CIRCUMSTANCES



3.1. Geographic profile

The Republic of Serbia is located in southeastern Europe, in the central part of the Balkan Peninsula, while the smaller, northern part of the country belongs to Central Europe and covers an area of 88,361 km^2. Plains cover the northern region, while the central parts are hilly. Further south, the hills gradually give way to mountains.

A few mountain peaks rise above 2,000m and the highest is Đeravica in the Prokletija Range (2,656 m).

Serbia has three major geographical areas: the Pannonian Plain, hilly areas with lower mountains and lowlands and mountainous areas.

The primary rivers belong to the basins of the Black, Adriatic and Aegean Seas. Three rivers are navigable across the whole length of Serbia: the Danube, the Sava and the Tisa. The Danube is the longest river, which flows through Serbia for 588 km of its 2,783 km course.

The total length of the artificial channels is 939.2 km. The largest canal system is located in the plains region of the country and is known as the Danube–Tisa–Danube Canal, the names of the Rivers that it connects.

Serbia does not have large natural lakes, but it does have nine artificial lakes larger than 4km^2, created by damming riverbeds to create waterpower for electricity production. The largest of these is Đerdap Lake on the Danube.

3.2. Climate profile

The climate of Serbia is moderately continental, with more or less pronounced local characteristics and a gradual transition between seasons.

From 1960 to 2012 the mean annual temperatures rose in almost all parts of Serbia. The temperature increases were higher in the northern than in the southern parts of the country. July is the warmest month, and January is the coldest.

The hottest year was 2000, with a positive anomaly of 1.86°C followed by 2008, 2007, 1994 and 2012. The most severe heat wave recorded in Serbia was in 2007.

Serbia has a continental precipitation regime, with higher amounts in the warmer half of the year, apart from the southeastern areas, which have the most rainfall in autumn. June is the rainiest month. The least rainy months are February and October.

Snow cover is typical from November to March and sometimes in April and October

Northwesterly and westerly winds dominate the warmer period of the year, while easterly and southeasterly winds (the Košava) blow during the coldest period of the year.

The annual sums of sunshine duration range from 1,800 to 2,100 hours, with only Požega having around 1,550 hours a year.

3.3. Socio-political system

The Republic of Serbia is an independent democratic state (since 2006) with a multiparty parliamentary system. In March 2012, Serbia was granted EU candidate status.

The governmental system is based on the division of power into legislative, executive and judiciary branches.

The responsibilities of the different government bodies are divided between the central government and provincial and municipal authorities.

Integral parts of the Republic of Serbia include the Autonomous Province of Vojvodina and the Autonomous Province of Kosovo and Metohija with forms of territorial autonomy. The Autonomous Province of Vojvodina is located in the northern part of the Republic of Serbia. In the south, the Autonomous Province of Kosovo and Metohija is under the interim civil administration of the United Nations, based on United Nations Security Council Resolution 1244, adopted on June 10, 1999, According to the international standard NUTS (Nomenclature of Territorial Units for Statistics), Serbia is divided into two parts – the North (Vojvodina and Belgrade) and the South (the rest of the country). The country is further divided into five statistical regions: Vojvodina, Belgrade, Šumadija and Western Serbia, Southern and Eastern Serbia, and Kosovo and Metohija.

The territory of the Republic of Serbia includes 30 administrative districts, 24 cities , 28 city municipalities and 150 municipalities. The city of Belgrade, as the capital, has a special status as regulated by law and the statute of the capital city of Belgrade. The Republic of Serbia has 6,158 settlements, of which 193 are urban settlements.

3.4. Population

From 2000 to 2013, two census were conducted, in 2002 and 2011. According to the results of the 2011 Census, the population is estimated at 7,186,862 inhabitants. The results of the 2002 and 2011 Census should be taken with caution because they were not conducted across the entire territory. According to the 2011 Census, compared to the results of the previous Census in 2002, the population decreased by 311,139 persons as a result of negative natural increase and continued emigration, due to economic transition and a lack of employment opportunities. According to the 2011 Census, the largest cities in Serbia are the capital city of Belgrade (1,659,440 inhabitants), Novi Sad (341,625), Niš (260,237) and Kragujevac (179,417).

The average life expectancy of the male and female population in Serbia has grown over the last ten years – from 69.9 years to 72.5 years for men, and from 75.1 to 77.7 years for women.

The majority of the population are Serbs, with another 37 nationalities also living in the country.

According to the official projected movement of the population from 2002 to 2032 a further depopulation can be expected, and almost every fourth resident will be over 65 in 2032.

3.5. Main characteristics in relevant sectors

3.5.1. Economy

Economic and political reforms in Serbia began at the beginning of 2001. The recession strongly affected the Serbian economy, as it is heavily dependent on trade partners. The negative tendency started with the second wave of the economic crisis during the second half of 2011, and continued throughout 2012, which put the Serbian economy into recession at the end of 2012. Macroeconomic trends in 2013 are characterized by a growth of economic activity and import, with an annual GDP growth of 2.6%.

Table 3.1. Serbian GDP in the period 2010-2013.

	2010	2011	2012	2013
GDP, total, in mil €	29,766	33,423	31,683	34,262
GDP per capita in €	4,082	4,620	4,401	4,783
GDP real growth in %	0.6	1.4	-1.0	2.6

The unemployment rate was 22.1% in 2013. The lowest unemployment rate is in the Belgrade region (17.9%) and the highest is in Southern and Eastern Serbia (27.3%).

The number of persons who are beneficiaries of pensions is higher each year, due to the increase in the number of people older over 65.

An increase in average salary was also recorded, starting from 129.1 USD in 2001 to 475.83 USD in 2012, as a result of economic growth, opening of markets, competitiveness and foreign investments, but average salaries are still low.

3.5.2. Energy

The energy sector accounted for 10% of the GDP. This sector consists of the oil and natural gas industry, coal mines, an electric power system, and a decentralized municipal district for heating and industrial energy.

Electricity production is based on the combustion of low quality domestic lignite in existing power plants and the use of hydropower potential in the existing impoundment and reservoir-pumped hydro power plants. The share of renewables in gross final electricity consumption is 21.2% in 2009, and 19.1% in 2013).

General consumption in households and the public and communal activities sectors increased significantly compared to the energy consumption in industry, due to a fall in production activities, the lack of imported energy-generated products and unrealistically low electricity prices.

The total consumption of all distribution companies and consumers in the electricity market and the consumption of electricity production is high. High consumption is greatly affected by the use of electricity for household heating and the low energy efficiency of buildings (mainly built in the 1970s and 1980s).

3.5.3. Industry

According to data from 2013, the industrial sector accounts for 22.4% of the GDP. The average growth rate in the period from 2000 to 2010 (except for 2003 and 2009) was 0.4%. Industrial production in the Republic of Serbia increased in 2013 compared to 2012 by 5.5%, because of growth in the mining and quarrying sector, and in manufacturing, electricity, gas steam and air conditioning supply.

Manufacture of motor vehicles, manufacture of electrical and electronic equipment and information technologies have an increasing share of total production.

Manufacturing still has the highest share in the Serbian economy, due to investments in the manufacture of motor vehicles, electrical and electronic equipment, in the manufacture of machinery, equipment, and in the textile industry and metallurgy.

3.5.4. Transport

In the transport sector, significant steps were taken towards modernization and the introduction of more environmentally friendly modes of transport. This sector includes road, rail, inland waterways and air modes, and intermodal transportation. The transport infrastructure of the Republic of Serbia consists of 44,604 km of roads, 3,819 km of railways, 1,680 km of inland waterways, four airports used for commercial purposes, of which two service international flights and three are partly developed intermodal terminals. Road transport traditionally represents the most developed mode of transportation.

Economic recovery, opening markets and the transport of goods and people influenced the increase in transportation volumes, but figures show oscillations. Road and air transportation showed an increase from the previous period.

The main forms of freight traffic are the railway and roads, with a significant contribution from inland waterway transport. The growth in passenger transport operations started in 2008, and that trend continued into 2013. Passenger rail transport has been in continuous decline since 2004 (at an annual rate of between 5-15%), arriving at 50% fewer passengers in 2013 compared to 2000. The main reasons include a low level of investment, the poor state of infrastructure facilities and vehicles, the low quality of services, increasing debt and the inadequate organization of the system.

One of the priorities of transport development is to reduce the volume of road transport, railway revitalization and improvement of water transport.

3.5.5. Agriculture

Agriculture is an important part of the Serbian economy and the third largest contributor to Serbia's GDP, accounting for 7.9% of GDP (2013).

During 2000-2012, the index of the physical volume of agricultural production has doubled, with an average growth of 9.4%. It is the only sector with a positive foreign trade balance and the sector with the largest

contribution to total exports. With respect to the revenues from international trade, agriculture has contributed mostly through meat, vegetable and fruit export. From 2000 to 2013 the agriculture sector managed to recover to pre-1990 levels.

The Statistics Office of the Republic of Serbia conducted a Census of Agriculture in 2012 showing 631,522 agricultural holdings, of which 628,955 are family agricultural holdings and 2,567 are holdings of legal entities and unincorporated enterprises. The total number of farm owners and employees is 1,442,628. The census recorded 108,230 households engaged in agriculture production for their own use but as not qualifying as a farm. Approximately 90% of arable land is privately owned and 10% belongs to the government.

3.5.6. Land-use change and forestry

In 2000-2013 period, 1.15% of total land area was subjected to a change in land use. The most significant changes occurred in urban areas, where pastures and agricultural land was converted into construction land.

According to the National Forest Inventory, the Republic of Serbia can be considered an average afforested country. The inventory results showed that in 2009 forests covered 2,254,400 ha or 25.5% of the total territory. State forests covered 53.0% of total forest area and 47% were privately owned. According to the data provided in the Statistical Yearbook of Serbia 2014, in 2011 forests covered 1,962,335 ha, out of which 47.3% were state owned forests and 52.7% were privately owned.

The present condition of state-owned forests is characterised by an insufficient production fund, unfavorable stand conditions, insufficient forest percentage and forest density, an unfavorable forest structure and tree species according to silvicultural principles, and an unsatisfactory state of forest health. The current state of the forest sector is the result of the inherited influence of transition and unfinished reforms.

State forests (in total 97.6%) are managed by state enterprises: Public Enterprise "Srbijašume", Public Enterprise "Vojvodinašume", four public enterprises which manage National parks; Public enterprise „Borjak" - Vrnjacka banja; the Faculty of Forestry (0.6%) and other organizations (1.8%).

3.5.7. Waste management sector

The waste management sector contributes to 1.2% of the national GDP, with a real growth rate of 0.3% in 2012. According to data from 2010, 2.65 million tonnes of waste was generated, and the quantity of collected and disposed waste was around 1.59 million tonnes. In 2011 and 2012 a similar quantity of waste was collected, 2.71 tonnes and 2.62 tonnes.

During the last twenty years, the *average waste composition* has continuously changed as a result of the social and social-economic situation in the country. The improved quality of life achieved during the most recent years, has resulted in an increased quantity and "quality" of generated waste. Waste generated in 2012 is shown by waste category in Figure 3.1.

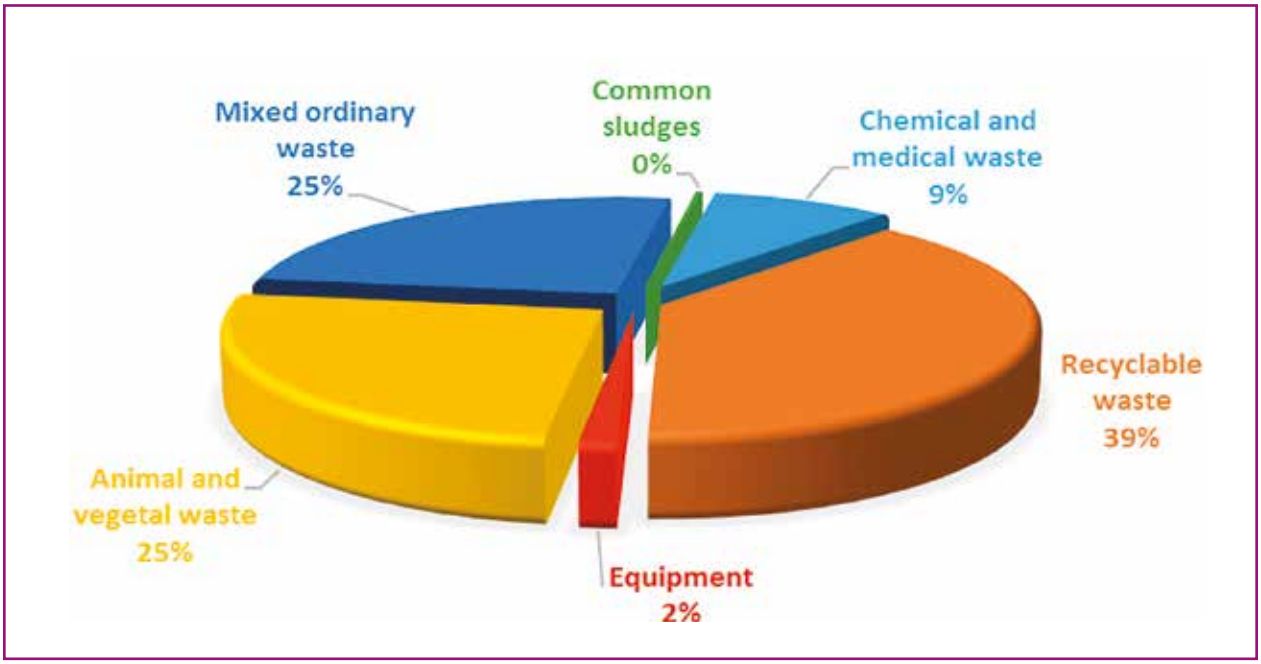


Figure 3.1. Waste generated by waste category (2012)

Approximately 72% (2010) of the generated municipal waste is collected by organized waste collection systems, which is developed only in urban areas. Other areas, particularly rural ones, are not served by municipal waste collection services. The equipment of public utility companies is inadequate, outdated and poorly maintained. The collected waste is disposed of at disposal sites that are unsanitary dumps.

Waste collection, treatment and disposal activities include 653 enterprises, engaging 17,870 employed persons with an annual turnover of 80,031 million RSD in 2012.

4. NATIONAL GREENHOUSE GAS INVENTORY

4.1. Methodology

The greenhouse gas inventory was initially prepared by the Serbian Environmental Protection Agency (hereinafter: SEPA) in accordance with its legal jurisdiction. These inventories were revised and improved through the process of developing the First Biennial Report, including the GHG inventory for the year 1990, which is presented in the Initial National Communication of the Republic of Serbia under the UN Framework Convention on Climate Change.

The GHG inventories are prepared using the official data published by the Statistical Office of the Republic of Serbia and energy balances, and according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter: IPCC), and employing the Tier 1 Method for all inventoried years, i.e. 1990, as the base year, and the years from 2010 until 2013. Calculations of the GHG emissions for the period 2010-2013 do not include data relative to the Autonomous Province Kosovo and Metohija. The GHG emissions are expressed in CO_2 equivalent in accordance with the IPCC's 4th Assessment Report (Global warming potential values are 1 for CO_2, 25 for CH_4 and 298 for N_2O).

4.2. GHG Inventory by sector for 1990 and the 2010-2013 period

The total GHG emissions in the referent year 1990, after revision of data described in Serbia's First National Communication under the United Nations Framework Convention on Climate Change (2010) and employing 2006 IPCC Guidelines, excluding removals, was 83,519.50 Gg CO_2eq.

Total GHG emissions, excluding removals, for the period 2010-2013 were 64,813.65; 68,027.00; 60,958.89 and 62,520.88 Gg CO_2eq, for each year respectively. Total GHG emissions including removals, in 1990 were 66,664.14 Gg CO_2eq, or 48,254.78; 51,293.83; 44,225.72 and 46,783.83 Gg CO_2eq for each year respectively, in the period 2010 – 2013 (Table 4.1).

The largest share in the total GHG emissions in 1990 came from the energy sector and represented 78.70% of the total GHG emissions. Intense agricultural production (biochemical processes in stockbreeding and farming) influenced on the agriculture sector to emit 10.97% of the total GHG emissions. The emission of GHG from industrial processes, including production and consumption of raw mineral material such as cement, lime, limestone and sodium carbonate, the production of chemicals (above all, ammonia), iron and other metals, and other products was 5.83% of the total GHG emissions. In addition, the emission of GHG from the waste sector contributed 4.60 % of the total GHG emissions.

Table 4.1. Total emissions and GHG emissions by sectors, 1990, 2010-2013

Source and sink category	1990.	2010.	2011.	2012.	2013.	Промена 2010–2013.
Emissions	CO_2 *equivalents (Gg)*					%
Energy	65,730.38	51,004.86	53,919.72	48,671.48	49,661.06	-2.6
Industrial processes	4,871.13	4,201.66	4,482.80	2,662.35	3,031.42	-27.9
AFOLU sector (Agriculture, and other Land Use)	9,078.22	6,466.23	6,459.43	6,378.09	6,620.96	2.4
Waste	3,839.77	3,140.90	3,165.05	3,246.97	3,207.45	2.1
Total emissions excl. removals	**83,519.50**	**64,813.65**	**68,027.00**	**60,958.89**	**62,520.88**	**-3.5**
Removals	CO_2 *equivalents (Gg)*					%
AFOLU sector (Forestry)	-16,855.36	-16,558.87	-16,733.17	-16,733.17	-15,737.06	-5.0
Total emissions incl. removals	**66,664.14**	**48,254.78**	**51,293.83**	**44,225.72**	**46,783.83**	**-3.0**

Removals by sinks in forestry in 2013 were 16,855.36 Gg CO_2eq or 20.2% of the total GHG emissions in 1990, and in the period 2010-2013: 16,558.87; 16,733.17; 16,733.17 and 15,737.06 Gg CO_2eq, for each year respectively.

In the period 2010-2013, GHG emissions decreased at different rates in different sectors, but the share in total emissions remained the same. Emissions from the energy sector contributed to 79.4% of the total emissions in 2013, and 10.9% of the total GHG emissions were emitted by the agriculture sector. The emission of GHG from the waste sector contributed 5.13% of the total GHG emissions, while the industrial sector contributed the lowest emissions at 4.85% (Figure 4.1).

Removals by sinks in forestry in 2013 amounted to -15,737.06 Gg CO_2eq.

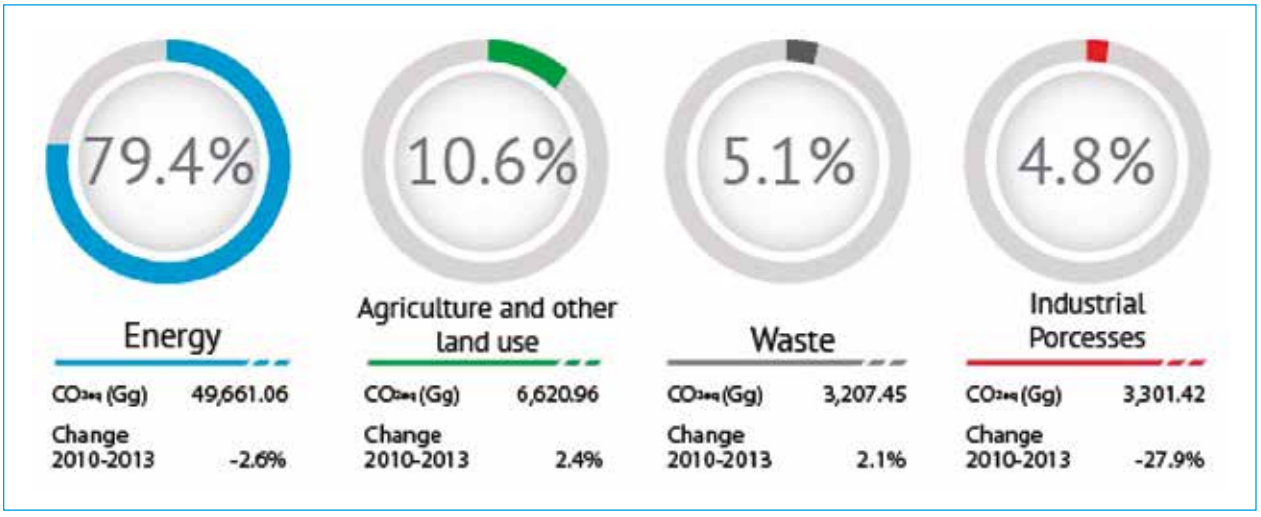


Figure 4.1. Share of GHG emissions in the total emissions, by sectors, 2013.

4.3. GHG Inventory by gas in 1990 and in the 2010-2013 period

As in the case of the sectoral distribution in the total GHG emissions, the share of individual greenhouse gases remains the same, in terms of the total emissions in 1990 and in the period 2010-2013 (Table 4.2).

The main greenhouse gas in 2013 was carbon dioxide (CO_2), accounting for 78.9% of the total GHG emissions, followed by methane (CH_4) expressed in CO_2 equivalent with 13.9% and nitrous oxide (N_2O) with 7.0% of the total GHG emissions. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 0.2% of the overall GHG emissions in 2013 (Figure 4.2). In 2004, the recording of import and consumption, that is, the available quantities of HFCs, PFCs and SF_6, began, and therefore since that time it has been possible to develop inventories for these gases as well.

Table 4.2. Greenhouse gas emissions, by gas, 1990, 2010-2013.

Greenhouse gas	1990.	2010.	2011.	2012.	2013.	Change 2010–2013.
Emissions	***CO_2 equivalents (Gg)***					**%**
CO_2	67,453.74	52,647.76	55,452.26	48,098.22	49,307.21	-6.3
CH_4	10,960.93	8,200.09	8,447.43	8,725.14	8,689.75	6
N_2O	5,104.83	3,897.07	4,047.20	4,028.43	4,380.58	12.4
HFCs	0.00	68.72	80.11	107.10	143.33	108.6
PFCs	0.00	0.00	0.00	0.00	0.00	-
SF_6	0.00	0.00	0.00	0.00	0.00	-
Total emissions excl. removals	**83,519.50**	**64,813.65**	**68,027.00**	**60,958.89**	**62,520.88**	**-3.5**
Removals	***CO_2 equivalents (Gg)***					**%**
CO_2	-16,855.36	-16,558.87	-16,733.17	-16,733.17	-15,737.06	-5
Total emissions incl. removals	**66,664.14**	**48,254.78**	**51,293.83**	**44,225.72**	**46,783.83**	**-3**

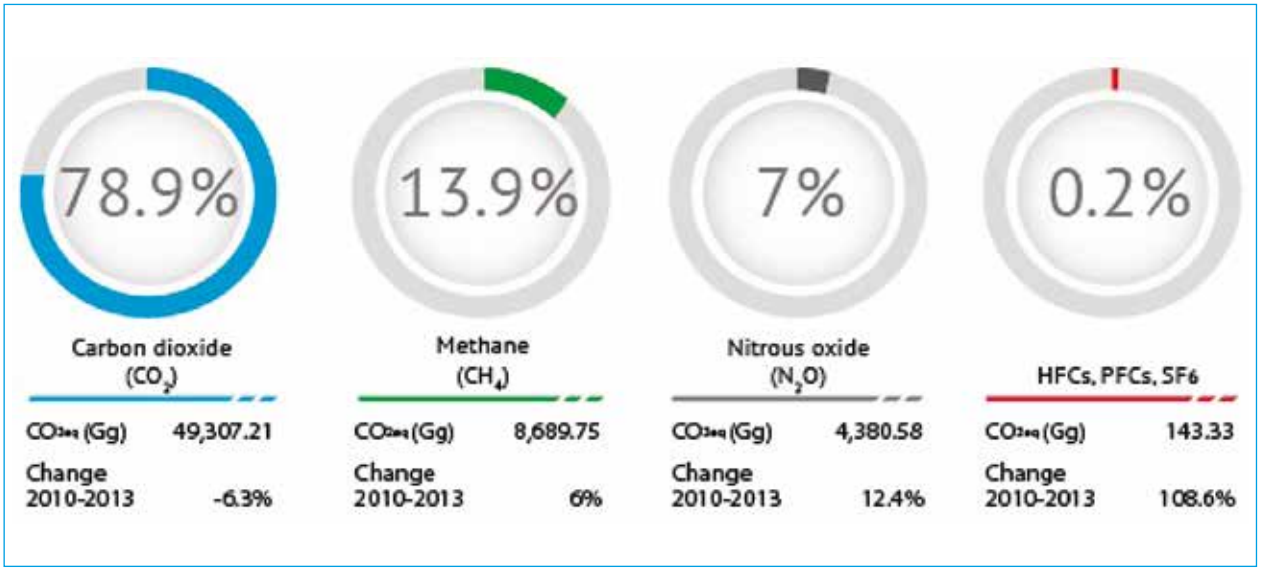


Figure 4.2. Share of greenhouse emissions by gas in the total GHG emissions, 2013.

The share of CO_2 in the total GHG emissions in 2013 decreased by 2.4%, while the share of CH_4 and N_2O increased by 1.2% and 1.0%, respectively, compared to their share in total emissions in 2010.

4.4. Trends in the total GHG emissions and GHG emissions by sector in the 2010-2013 period

The total GHG emissions in 2013 decreased by 3.5%, in comparison to 2010. The trend of the total, as well as sectoral GHG emissions for the 2010-2013 period is a consequence of the global economic crisis due to which halted economic recovery and the upward trend of Serbia's GDP. A key cause for the significant decrease in emissions in the 2010-2013 period is the lower market demand for Portland cement, iron and steel, which resulted in a lower utilization of production capacity in these industries. During 2010, the economy of the Republic of Serbia began to recover from the impact of the global crisis, but it has not significantly affected the growth of emissions in the period 2010-2013. At the same time, activities have started to establish a legislative framework and the groundwork for the affirmation of cleaner and more energy efficient technologies, as well as to increase energy efficiency and the use of renewable energy sources that would lead to further economic development, accompanied by a reduction of GHG emissions.

Trends of GHG emissions for the period 2010-2013 and the reasons for such trends are explained in the subsections below.

4.4.1. Energy sector

In 2013, emissions from the energy sector amounted to 49,661.06 Gg CO2eq, or 79.4% of total GHG emissions. Since 2010, emissions have decreased by 2.6%, mainly as a result of lower consumption of diesel and gasoline in road transport and fuel consumption in manufacturing industries and construction (Table 4.3).

Table 4.3: Total emissions and GHG emissions from source categories within the Energy sector, 1990, 2010-2013.

Energy sector	1990.	2010.	2011.	2012.	2013.	Change 2010–2013, %
1 – Energy	**65,730.38**	**51,004.86**	**53,919.72**	**48,671.48**	**49,661.06**	-2.6%
1.A - Fuel Combustion Activities	61,272.15	47,780.42	51,100.06	46,032.98	46,938.07	-1.8%
1.A.1 - Energy Industries	40,746.42	34,122.91	37,190.07	32,989.09	34,338.47	0.6%
1.A.2 - Manufacturing Industries and	5,715.04	4,027.38	4,375.11	4,395.50	3,824.22	-5.0%
1.A.3 - Transport	4,952.13	6,677.40	6,033.37	5,334.05	5,829.74	-12.7%
1.A.4 - Other Sectors	9,738.34	2,297.65	2,696.60	3,314.34	2,945.65	28.2%
1.A.5 - Non-Specified	120.22	655.09	804.90	0.00	0.00	-100.0%
1.B - Fugitive emissions from fuels	4,458.23	3,224.44	2,819.67	2,638.50	2,722.99	-15.6%
1.B.1 - Solid Fuels	970.42	1,004.51	1,099.05	1,020.23	1,070.75	6.6%
1.B.2 - Oil and Natural Gas	3,487.81	2,219.93	1,720.62	1,618.26	1,652.24	-25.6%
1.B.3 - Other emissions from Energy Production	0.00	0.00	0.00	0.00	0.00	-
1.C - Carbon dioxide Transport and Storage	0.00	0.00	0.00	0.00	0.00	-
1.C.1 - Transport of CO_2	0.00	0.00	0.00	0.00	0.00	-
1.C.2 - Injection and Storage	0.00	0.00	0.00	0.00	0.00	-
1.C.3 - Other	0.00	0.00	0.00	0.00	0.00	-

In the total emissions from the energy sector, in 2013, the result of fuel combustion activities was 94.5%. Within the sector, 69.1% of the emissions were from energy industries, followed by 11.7% from transport, 7.7% from manufacturing industries and construction and 5.9% from other sectors. The remaining 5.5% were from fugitive emissions from fuels, out of which 60.7% were from oil and natural gas and 39.3% from solid fuels.

Figure 4.3 shows trends of GHG emissions from source categories within the energy sector. The main characteristic of the period after the 1990s is a significant reduction in emissions in all energy source categories, except in the transport sector. This change is the result of cutting down all economic and other activities, due to specific national circumstances that are characteristic for the period until 2000 (international sanctions). The period 2010-2013 is characterized by approximately the same values of GHG emissions, both in total emissions, and by the shares of individual sub-sectors in the total emissions from the energy sector (Figure 4.3).

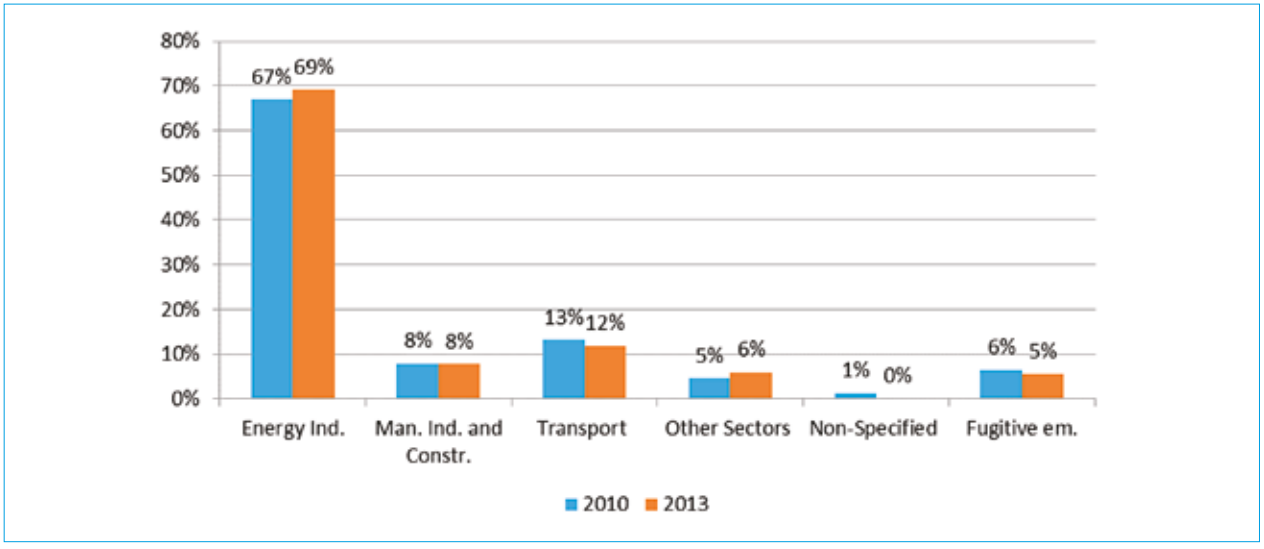


Figure 4.3. Comparative view on shares of GHG emissions from source categories within the energy sector in 2010 and 2013.

4.4.2. Industrial processes sector

In 2013, emissions from the industrial processes sector amounted to 3,031.42 Gg CO_2eq, or 4.8% of total GHG emissions. Since 2010, emissions from this sector have decreased by 24.0%. The key drivers for such a significant fall in emissions in the period 2010-2013 are reduced market demand for Portland cement, iron, and steel which consequently led to lower utilization of production capacities in these industries (Table 4.4).

In 2013, within the industrial processes sector the highest emissions (35.0%) were from the mineral industry, where cement production was the highest individual contributor (25.5%). Chemical industry contributed 34.1% to total emissions from this sector, with nitric acid contributing 17.9%, petrochemical and carbon black production contributing 8.7% and ammonia production contributing 7.6%. Iron and steel production in the metal industry contributed 21.8% to total sectoral emissions. The remaining emission sources included product uses as substitutes for Ozone Depleting Substances (4.7%), N_2O from product uses (2.2%) and lubricant and paraffin wax use (2.0%).

Табела 4.4. Total and GHG emissions from source categories within the industrial processes sector in 1990 and in the period 2010 - 2013.

Industrial processes and Product Use	1990.	2010.	2011.	2012.	2013.	Change 2010–2013, %
2 - Industrial Processes and Product Use	**4,871.13**	**4,201.66**	**4,482.80**	**2,662.35**	**3,031.42**	-27.85
2.A - Mineral Industry	1,937.33	1,317.49	1,316.05	1,131.19	1,061.23	-19.45
2.A.1 - Cement production	1,340.26	1,050.52	1,031.96	877.66	772.02	-26.51
2.A.2 - Lime production	410.47	184.39	210.76	183.69	214.92	16.56
2.A.3 - Glass Production	27.07	4.22	3.31	2.42	3.35	-20.62
2.A.4 - Other Process Uses of Carbonates	159.53	78.36	70.01	67.41	70.94	-9.47
2.A.5 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-
2.B - Chemical Industry	1,242.17	722.85	852.91	745.26	1,034.52	43.12
2.B.1 - Ammonia Production	215.13	69.75	143.69	162.57	229.84	229.52
2.B.2 - Nitric Acid Production	633.61	337.93	458.62	504.22	541.76	60.32
2.B.3 - Adipic Acid Production	0.00	0.00	0.00	0.00	0.00	-
2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production	0.00	0.00	0.00	0.00	0.00	-
2.B.5 - Carbide Production	0.00	0.00	0.00	0.00	0.00	-
2.B.6 - Titanium Dioxide Production	0.00	0.00	0.00	0.00	0.00	-
2.B.7 - Soda Ash Production	0.00	0.00	0.00	0.00	0.00	-
2.B.9 - Fluorochemical Production	393.43	315.17	250.59	78.47	262.92	-16.58
2.Б.9 – Производња флуорохемикалија	0.00	0.00	0.00	0.00	0.00	-

2.B.10 - Other (Please specify)	0.00	0.00	0.00	0.00	0.00	-
2.C - Metal Industry	1,497.59	1,995.20	2,131.71	576.24	662.46	-66.80
2.C.1 - Iron and Steel Production	1,423.50	1,985.61	2,126.48	572.56	660.95	-66.71
2.C.2 - Ferroalloys Production	0.00	0.00	0.00	0.00	0.00	-
2.C.3 - Aluminium production	0.00	0.00	0.00	0.00	0.00	-
2.C.4 - Magnesium production	29.69	4.79	0.00	0.00	0.00	-100.00
2.C.5 - Lead Production	3.12	4.81	5.23	3.68	1.51	-68,61
2.C.6 - Zinc Production	41.28	0.00	0.00	0.00	0.00	-
2.C.7 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-
2.D - Non-Energy Products from Fuels and Solvent Use	194.04	39.50	44.80	44.21	61.90	56.71
2.D.1 - Lubricant Use	194.04	37.14	41.85	41.26	58.95	58,72
2.D.2 - Paraffin Wax Use	0.00	2.36	2.95	2.95	2.95	25.00
2.D.3 - Solvent Use	0.00	0.00	0.00	0.00	0.00	-
2.D.4 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-
2.E - Electronics Industry	0.00	0.00	0.00	0.00	0.00	-
2.E.1 - Integrated Circuit or Semiconductor	0.00	0.00	0.00	0.00	0.00	-
2.E.2 - TFT Flat Panel Display	0.00	0.00	0.00	0.00	0.00	-
2.E.3 - Photovoltaics	0.00	0.00	0.00	0.00	0.00	-

Industrial processes and Product Use	1990.	2010.	2011.	2012.	2013.	Change 2010–2013, %
2.E.4 - Heat Transfer Fluid	0.00	0.00	0.00	0.00	0.00	-
2.E.5 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-
2.F - Product Uses as Substitutes for Ozone Depleting Substances	0.00	68.72	80.11	107.10	143.33	108.57
2.F.1 - Refrigeration and Air Conditioning	0.00	68.72	80.11	107.10	143.33	108.57
2.F.2 - Foam Blowing Agents	0.00	0.00	0.00	0.00	0.00	-
2.F.3 - Fire Protection	0.00	0.00	0.00	0.00	0.00	-
2.F.4 - Aerosols	0.00	0.00	0.00	0.00	0.00	-
2.F.5 - Solvents	0.00	0.00	0.00	0.00	0.00	-
2.F.6 - Other Applications (please specify)	0.00	0.00	0.00	0.00	0.00	-
2.G - Other Product Manufacture and Use	0.00	57.90	57.23	58.35	67.97	17.39
2.G.1 - Electrical Equipment	0.00	0.00	0.00	0.00	0.00	-
2.G.2 - SF6 and PFCs from Other Product Uses	0.00	0.00	0.00	0.00	0.00	-
2.G.3 - N_2O from Product Uses	0.00	57.90	57.23	58.35	67.97	17.39
2.G.4 - Other (Please specify)	0.00	0.00	0.00	0.00	0.00	-
2.H - Other	0.00	0.00	0.00	0.00	0.00	-
2.H.1 - Pulp and Paper Industry	0.00	0.00	0.00	0.00	0.00	-
2.H.2 - Food and Beverages Industry	0.00	0.00	0.00	0.00	0.00	-
2.H.3 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-

During 2010, the Serbian economy began recovering from the impact of the global crisis, which has led to an increase in emissions from the chemical industry by 43.1%, non-energy products from fuels and solvent use by 56.7%, product uses as Ozone Depleting Substances by 108.6% and N2O from product uses by 17.4% in the period up to 2013 (Table 4.4 and Figure 4.4).

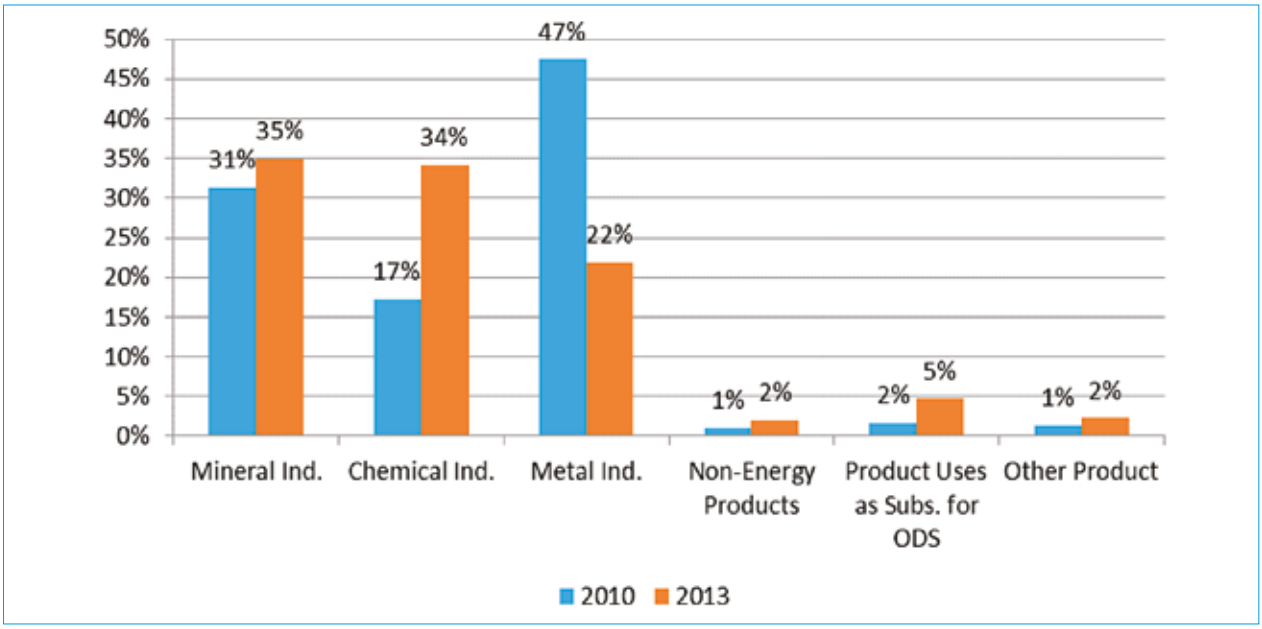


Figure 4.4. Comparative view of shares of GHG emissions from source categories within the Industry processes sector in 2010 and 2013.

4.4.3. Agriculture, Forestry and Other Land Use sector (AFOLU)

Agriculture, forestry and other land use sector (AFOLU) have participated in the total GHG emissions in 2013 with 9.116,10 Gg CO_2eq (Table 4.5).

Emissions sources in 2013, within the AFOLU sector, emitted 6,259.21 Gg CO_2eq, which is 47.5% of total sector's emission, i.e. 3,142.50 Gg CO_2eq, mainly as a result of direct and indirect emissions of CH_4 and N_2O as a result of enteric fermentation and manure management (livestock biochemical processes).

Direct and indirect emissions of CH_4 and N_2O from the Livestock sector, including subsectors of enteric fermentation and manure management (livestock biochemical processes) were 3,142.50 Gg CO_2eq or 47.5% of total emissions without removals by sinks from AFOLU sector in 2013.

GHG emissions from aggregate sources and non-CO_2 land emissions sources, which include emissions from biomass burning, urea application, soils management and manure management, represent 47.1% of the total emissions from this sector, i.e. 3,116.71 Gg CO_2eq. Other emissions, which represent less than 4% of the emissions from this sector come from different categories of land, such as croplands, grasslands, wetlands, settlements and other land.

On the other hand, the share of emissions from the Land sector and others, or more precisely the subsectors covering forest land (forestry) and the use of harvested wood products, are in the category of removals by sinks in the amount of -15,735.89 Gg CO_2eq (forestry) and -1.42 Gg CO_2eq (harvested wood products) in 2013.

Табела 4.5. Total emissions and GHG emissions from sources and removal categories in the AFOLU sector, 1990, 2010-2013.

AFOLU sector	1990.	2010.	2011.	2012.	2013.	Change 2010–2013, %
3 - Agriculture, Forestry, and Other Land Use	**-7,777.13**	**-10,092.64**	**-10,273.74**	**-8,415.84**	**-9,116.10**	-9.7%
3.A - Livestock	5,109.26	3,222.84	3,177.80	3,165.19	3,142.50	-2.5%
3.A.1 - Enteric Fermentation	3,554.08	2,118.80	2,106.03	2,095.23	2,058.97	-2.8%
3.A.2 - Manure Management	1,555.19	1,104.04	1,071.78	1,069.96	1,083.53	-1.9%
3.B - Land	-16,560.97	-16,198.52	-16,368.77	-14,430.90	-15,373.89	-5.1%
3.B.1 - Forest land	-16,855.17	-16,558.11	-16,730.18	-14,791.84	-15,735.64	-5.0%
3.B.2 - Cropland	110.04	221.03	222.86	222.38	223.19	1.0%
3.B.3 - Grassland	102.27	5.25	5.25	5.25	5.25	0.0%
3.B.4 - Wetlands	30.44	21.64	21.64	21.64	21.64	0.0%
3.B.5 - Settlements	43.07	110.57	110.57	110.57	110.57	0.0%
3.B.6 - Other Land	8.36	1.10	1.10	1.10	1.10	0.0%
3.Ц – 3.B.6 - Other Land -CO_2 emissions sources on land	3,674.77	2,883.79	2,920.21	2,851.95	3,116.71	8.1%

3.C.1 - Emissions from biomass burning	3.59	1.35	5.46	20.00	1.51	11.8%
3.C.2 - Liming	0.00	0.00	0.00	0.00	0.00	-
3.C.3 - Urea application	32.18	97.48	94.46	91.45	88.44	-9.3%
3.C.4 - Direct N_2O Emissions from managed soils	2,452.82	1,882.83	1,917.73	1,833.92	2,062.83	9.6%
3.C.5 - Indirect N_2O Emissions from managed soils	785.31	570.56	585.21	583.70	631.86	10.7%
3.C.6 - Indirect N_2O Emissions from manure management	400.86	331.58	317.35	322.88	332.08	0.1%
3.C.7 - Rice cultivations	0.00	0.00	0.00	0.00	0.00	-
3.C.8 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-
3.D - Other	-0.19	-0.75	-2.99	-2.09	-1.42	87.8%
3.D.1 - Harvested Wood Products	-0.19	-0.75	-2.99	-2.09	-1.42	87.8%
3.D.2 - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-

In 2010-2013, emissions of the entire AFOLU sector decreased by 9.7%. Since 2010, emissions from the Livestock source category, decreased by 2.5%, mainly as a result of the decrease in the total number of dairy cows (an 11% decrease in 2010-2013). GHG emissions from aggregate sources and non-CO_2 emission sources on land have increased by 8.1% due to the higher application of nitrogen based synthetic fertilizers on managed land (44% increase in 2010-2013).

Despite the high values of the sinks, they decreased in 2013 compared to 2010 in the forest land (forestry) source category. Such a reduction of the sinks in this category, in 2010-2013 period, is the result of a significant drop of forest mass increment due to drought in 2012.

Figure 4.5 provides a comparative view of shares of GHG emissions, without removals by sinks, from source categories within the AFOLU sector in 2010 and 2013. Worth noting is that the structure of the sector concerning the contribution of key source categories to the total GHG emissions remains consistent in the observed years.

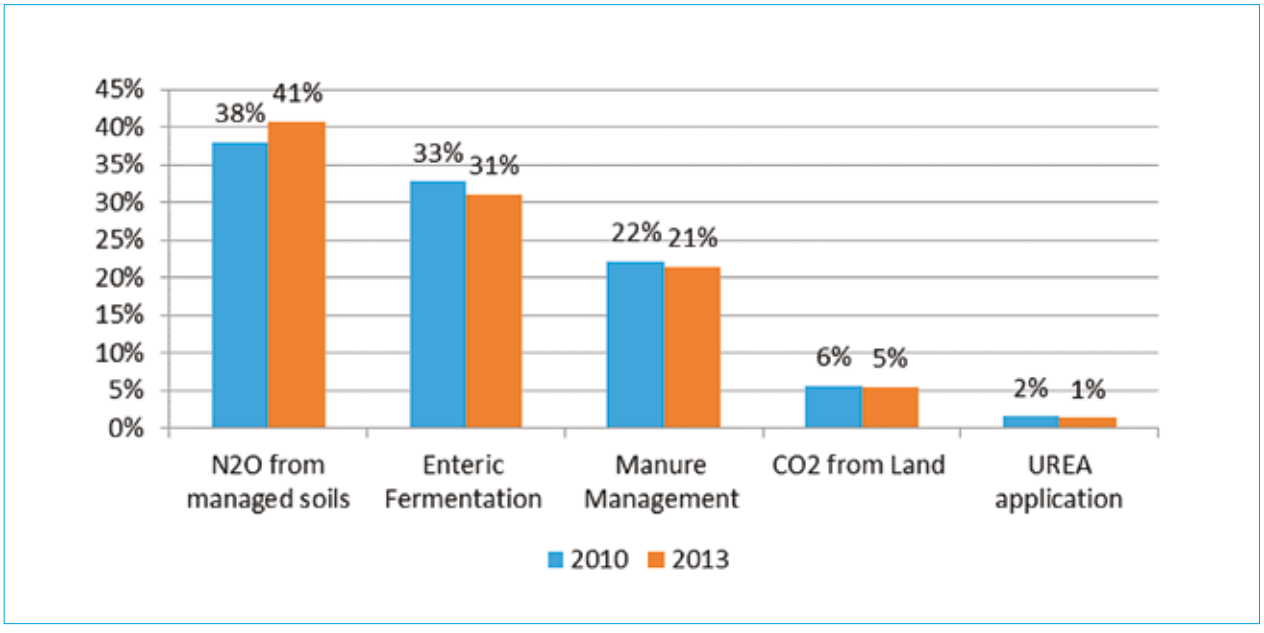


Figure 4.5. Comparative view of shares of GHG emissions from source categories within the AFOLU sector in 2010 and 2013.

4.4.4. Waste management sector

In 2013, emissions from the waste management sector amounted to 3,207.45 Gg CO2eq, or 5.1% of total GHG emissions. In 2010, emissions increased by 2.1% due to a higher emissions rate from wastewater treatment and discharge (Table 4.6).

Table 4.6. Total emissions and GHG emissions from source categories within the Waste sector, 1990, 2010-2013.

Waste sector	1990.	2010.	2011.	2012.	2013.	Change 2010–2013, %	Change 1990–2013, %
4 - Waste	**3,839.77**	**3,140.90**	**3,165.05**	**3,246.97**	**3,207.45**	2.1%	-16.5%
4.A - Solid Waste Disposal	2,362.58	1,993.05	1,990.37	1,991.15	1,986.32	-0.3%	-15.9%
4.B - Biological Treatment of Solid Waste	0.00	0.00	0.00	0.00	0.00	-	-
4.C - Incineration and Open Burning of Waste	0.00	0.00	0.00	0.00	0.00	-	-
4.D - Wastewater Treatment and Discharge	1,477.19	1,147.85	1,174.68	1,255.82	1,221.13	6.4%	-17.3%
4.E - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-	-
5 - Other	0.00	0.00	0.00	0.00	0.00	-	-
5.A - Indirect N_2O emissions from the atmospheric deposition of nitrogen in NO_x and NH_3	0.00	0.00	0.00	0.00	0.00	-	-
5.B - Other (please specify)	0.00	0.00	0.00	0.00	0.00	-	-

Within the sector, approximately 62% of the emissions were from the solid waste disposal on land source category, followed by 38% of emissions from the wastewater treatment subsector.

Although waste management and waste water management have improved in the past few years, the total number of operators, and thus the amount of treated waste and sewage is still negligible with the result that the share of GHG emissions from these subsectors remains almost constant in 2010-2013 (Figure 4.6.).

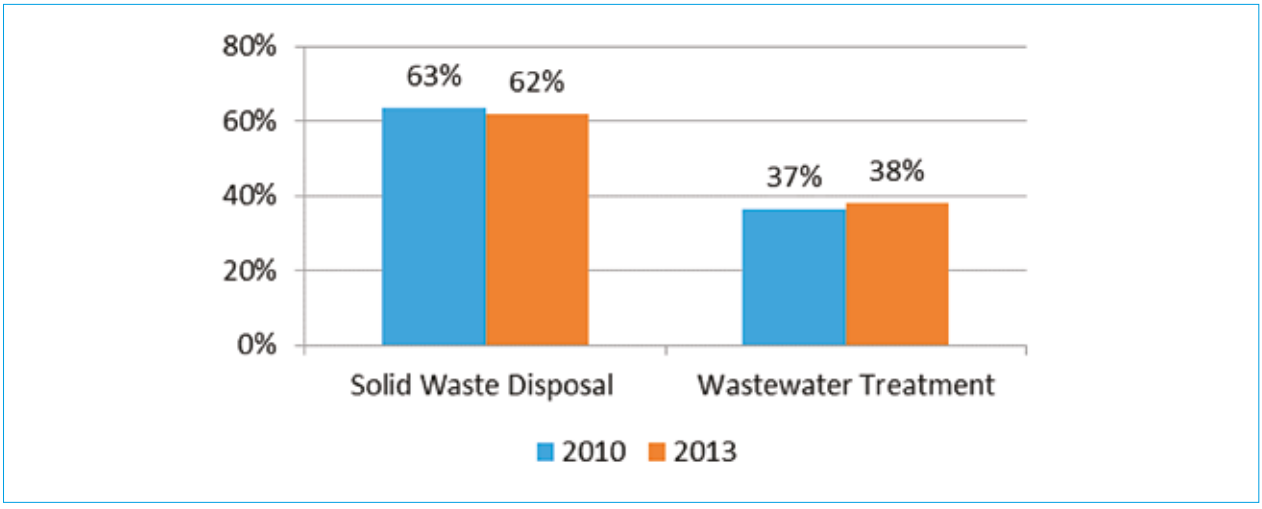


Figure 4.6. Comparative view of shares of GHGH emissions from source categories within the waste sector in 2010 and 2013.

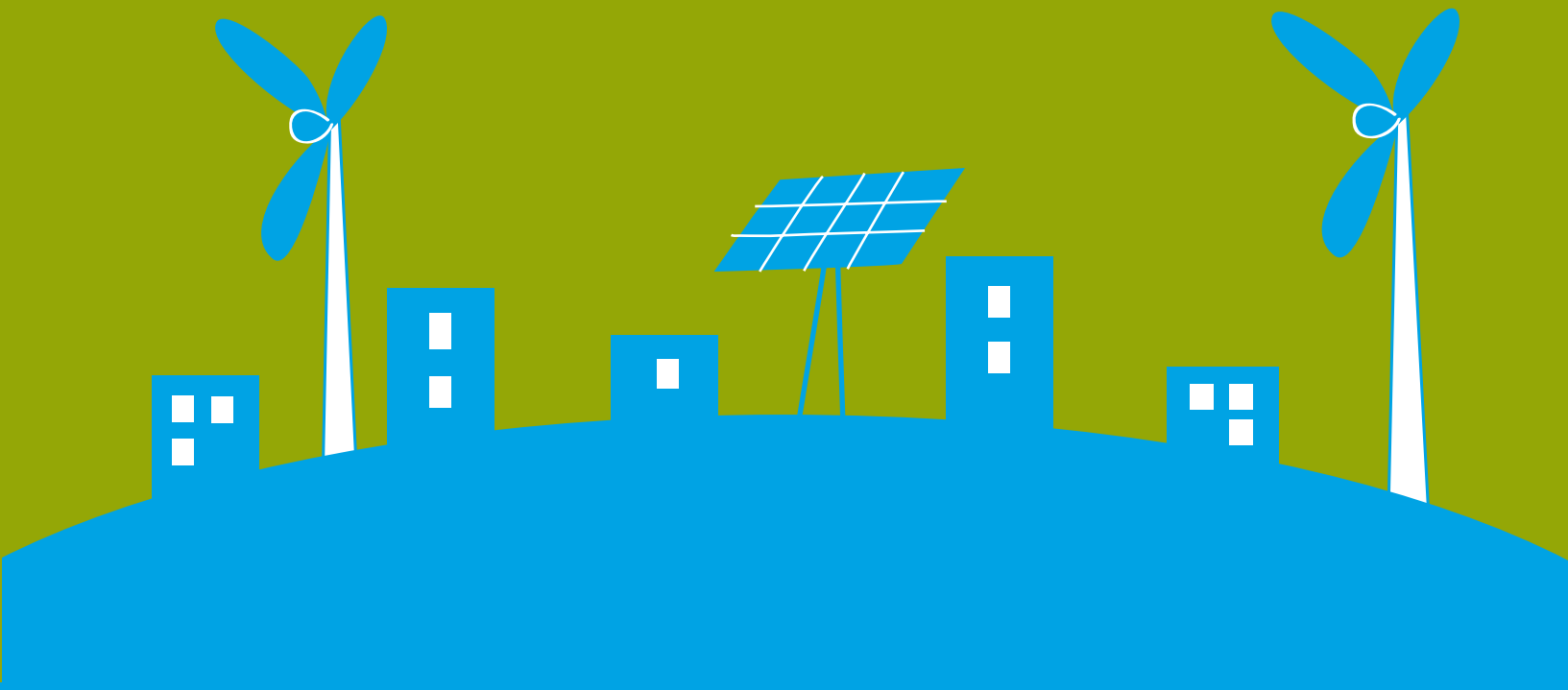
4.5. Uncertainties in calculation and verification

The uncertainty of the projected GHG emissions is determined based on the 2006 IPCC Guidelines, Tier 1 method. For the period 1990-2013, uncertainty of emission trend is 3.4%, in addition to the fact that the uncertainty of imported data rises to 35%, mainly due to some years of an incomplete national database in the national inventory.

The uncertainty of used emission factors is 5%.

The calculation of energy consumption of available/combusted fossil fuels in the energy sector and the carbon dioxide emissions according to the Reference approach and the Sectoral approach has resulted in a difference of 4% for solid fuels, 11% for liquid fuels and 20% for gaseous fuels.

5. PROJECTED GHG EMISSIONS FOR THE PERIOD UNTIL 2020



Projections of GHG emissions on the sectoral and total levels are created for three scenarios: "a basic scenario", a scenario "with measures" and a scenario "with additional measures". Projections were made until 2020, including 2015. As the starting point for projections, the year 2010 was chosen. The LEAP (Long-range Energy Alternatives Planning System) was used for developing all projections

In developing scenarios, the highest attention was paid to the energy sector, as the most important source of GHG emissions in Serbia. For the agriculture sector only one scenario was developed. This is because current policies and measures do not relate to changes in emissions, based on the sectoral strategic development aims until 2024, which include: production growth and producer's income stability, improvement of competitiveness with adjustments to the requirements of domestic and international markets and the technological and technical improvement of the sector, the improvement of the quality of life in rural areas and poverty reduction, efficient public policy management and improvement of the institutional framework for agricultural and rural area development.

The key policy documents that shape the future development of the industrial sector in the Republic of Serbia and, *inter alia,* outline policies and measures that directly or indirectly contribute to GHG emission reduction in industrial processes and product use, are: the Strategy and Policy of Industrial Development of the Republic of Serbia from 2011 to 2020 and the Draft of the Energy Development Strategy of the Republic of Serbia for the period until 2025 with projections up to 2030. Based on these documents, a key assumption is the significant recovery in industrial production, in relation to which the expected growth is doubled in that period, which was used as an assumption in all scenarios for the Industrial processes sector, with the corrections that have occurred as a result of the negative economic trends in 2011 and 2012.

In general, the basic scenario implies the implementation of policies and measures that were in force in 2010. The Scenario "with measures" assumes improving the implementation of existing policies and measures so that the objectives and obligations of the state will be achieved. The Scenario "with additional measures" implies a further reduction in final energy consumption leading to the further reduction of GHG emissions.

5.1. Scenarios of the total GHG emissions for the period until 2020

5.1.1. Basic scenario

The basic scenario was developed based on the following assumptions for the main sectors:

- Energy sector: share of renewable energy sources and energy efficiency will stay at the 2010 level;
- Industrial processes: the main industrial sectors (the production of cement, iron and steel) remain high energy-intensity dependent, i.e. have a high energy consumption per unit of product;
- Agriculture: stabilization until 2015, and gradual recovery of livestock number

- Waste management sector: composition of municipal waste and dominant waste treatment will not change, which means a continuation of the disposal of poorly separated municipal waste at landfills.

Based on those assumptions the projected level of the total GHG emissions in 2020 is 79,442.37 Gg CO_2eq, out of which the Energy sector has the highest share with 81.3%, and the Waste sector has the smallest with 3.4% (Table 5.1).

Table 5.1. Projections of total GHG emissions and GHG emissions by sector in the basic scenario, Gg CO_2eq

Basic scenario	1990.	2015.	2020.
Energy	65,730.38	56,554.04	64,628.68
Industrial Processes	4,871.13	4,868.97	5,373.90
Agriculture	9,078.22	6,672.16	6,753.00
Waste	3,839.77	2,688.06	2,686.79
Total emissions	**83,519.50**	**70,783.23**	**79,442.37**

5.1.2. Scenario "with measures"

The highest absolute mitigation potential based on the scenario "with measures" is identified in the energy sector. In the process of developing this scenario the following assumptions are:

- Energy sector: higher use of renewable energy resources in production, in accordance with national economy-wide mandatory targets which, on the level of whole economy, are:
  - 27% share of renewable energy in gross final consumption;
  - 10% share of renewable energy in gross final energy consumption in the transport sector.
- Industrial processes: technological modernization of the industrial process, increasing energy and material efficiency and unselective catalytic reduction.

Projected values for these two sectors are highly uncertain, taking into account that the development of these sectors is highly dependent on the global market, as well as on the start of implementation of the EU ETS system.

- Agriculture: stabilization until 2015, and then gradual recovery of livestock numbers.
- Waste sector: improvement of waste management practices, including a decrease in the biodegradable component of waste disposed to landfill and the increase of recycling.

Based on these projected assumptions, the total GHG emissions in 2020 are 70,966.54 Gg CO_2eq, out of which the energy sector has the highest share (80.7%), and the waste sector has the smallest share (3.8%) (Table 5.2). The scenario "with measures" results in a GHG emission reduction of 7,369 GgCO_2eq by 2020,

compared to the basic scenario. Based on this scenario, the energy sector has the highest emission reduction, which amounts to a 7,369.25 GgCO_2eq emissions reduction.

Table 5.2. **Projections of total GHG emissions and GHG emissions by sectors in scenario" with measures", Gg CO_2eq**

Scenario with measures	1990.	2015.	2020.
Energy	65,730.38	55,136.49	57,259.53
Industrial processes	4,871.13	3,859.11	4,255.84
Agriculture	9,078.22	6,672.16	6,753.00
Waste sector	3,839.77	2,742.66	2,698.16
Total emissions	**83,519.50**	**68,410.42**	**70,966.54**

5.1.3. Scenario "with additional measures"

The scenario "with additional measures" is developed based on the following assumptions:

- Energy sector: increasing energy efficiency (in production and consumption), according to nationally binding targets, and increasing energy efficiency and technological changes in the production process, i.e. implementation of measures with the aim to reduce final energy consumption in the residential, commercial and public-service sector, the industrial sector and the transport sector.

  Indicative economy – wide targets for reducing final energy consumption in the period 2020-2018, which are used in developing this scenario, are:

  - To achieve a cumulative decrease of the final energy consumption of 752 ktoe (9%). The indicative target is distributed among the following sub-sectors:
    - Manufacturing industry and construction: 272.0 ktoe;
    - Transport: 196.7 ktoe;
    - Commercial/Institutional sector: 220.0 ktoe;
    - Residential sector: 83.1 ktoe.
- Industrial processes: the additional increase of energy efficiency and technological changes in the production process, i.e. improvement of the combustion process, the use of waste heat from production processes, replacing existing electric motors, process control of energy use and the introduction of measures and procedures of energy management.
- Agriculture: stabilization by 2015, and then gradual recovery of livestock numbers;
- Waste sector: a larger percentage of municipal waste treated by biological treatment options, mainly by using anaerobic digestion and less composting. Plants with thermal treatment of waste and heat recovery is planned only for big cities (Belgrade, Novi Sad, Niš).

Based on the previous assumptions, the projected total GHG emissions in 2020 are 65,164.09 Gg CO_2eq, out of which 80.4% is from energy sector, and the smallest share of 3.5% belongs to waste sector (Table 5.3). The scenario "with additional measures" can bring GHG emission reduction to 14,278.28 GgCO_2eq by 2020, compared to the basic scenario. The highest contribution according to this scenario comes from the energy sector, with a 12,217.22 Gg CO_2eq emission reduction.

Table 5.3. Projections of total GHG emissions and GHG emissions by sector in the scenario "with additional measures", Gg CO_2eq

Scenario with additional measures	1990.	2015.	2020.
Energy	65,730.38	53,307.56	52,411.46
Industrial processes	4,871.13	3,642.71	3,714.85
Agriculture	9,078.22	6,672.16	6,753.00
Waste sector	3,839.77	2,392.72	2,284.77
Total emissions	**83,519.50**	**66,015.15**	**65,164.09**

5.2. Levels and trends of total GHG emissions by 2020

The levels of total GHG emissions in 2020, including 2015, developed based on the three scenarios (the basic scenario, the scenario with measures and the scenario with additional measures), are summarized in the Table 5.4.

Table 5.4. Levels of total GHG emissions in 2020, including 2015, for the three scenarios, Gg CO_2eq

Total emissions (*Gg CO_2eq*)	2015.	2020.
Basic scenario	**70,783.23**	**79,442.37**
Scenario with measures	**68,410.42**	**70,966.54**
Scenario with additional measures	**66,015.15**	**65,164.09**

Trends and projections of the total GHG emissions for the period 2010-2020 developed from the three scenarios are presented in the Graphic 5.1.

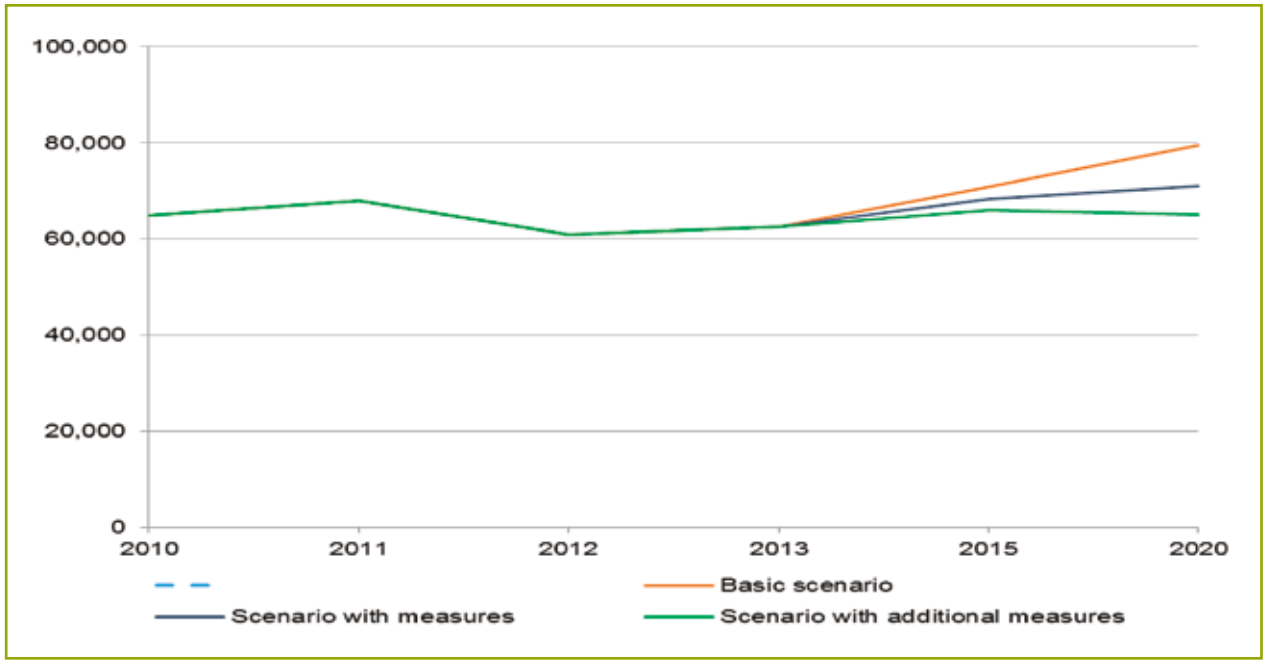


Figure 5.1: Trend of GHG emissions for the period 2010-2020, Gg CO_2eq

In 2020, the GHG emission reduction if applying the "scenario with measures" will be 11% compared to the basic scenario, and an 18% reduction in the "scenario with additional measures".

5.3. GHG emissions scenarios by sector by 2020

5.3.1 Energy sector

Emissions from the energy sector, based on the three scenarios, by 2020, and including 2015, are summarized in Table 5.5.

Table 5.5. Projections of GHG emissions from Energy sector, three scenarios, Gg CO_2eq

Scenario	1990.	2015.	2020.
Basic scenario	65,730.38	56,554.04	64,628.68
Scenario "with measures"	65,730.38	55,136.49	57,259.53
Scenario "with additional measures"	65,730.38	53,307.56	52,411.46

The level of emissions in 2020 according to the "scenario with measures" is 57,259.53 Gg CO_2eq i.e. a reduction of 7,369.38 Gg CO_2eq compared to the emissions in the basic scenario. Under the "scenario with additional measures", emissions are at 52.411.46 Gg CO_2eq i.e. a reduction of 12,217.22 Gg CO_2eq compared to the basic scenario. Therefore, by 2002 establishing the "scenario with measures" will lead to emission reduc-

tions in the energy sector of 11.4% and 18.9% under the "scenario with additional measures" compared to the basic scenario. Scenarios for the energy sector are:

Basic scenario

Under the basic scenario for the energy sector, the assumptions are that the share of renewable energy sources and energy intensity will remain the same as in the base year of the scenario (20.9% in 2010), and that all newly planned production capacities (2900 MW) will be based on the utilization of fossil fuels. According to these assumptions, the projected GHG emissions in source categories within the energy sector would be those presented in Table 5.6.

Table 5.6. Projections of GHG emissions in source categories within the energy sector, basic scenario, Gg CO_2eq

	2015.	2020.
1 - Energy	**56,554**	**64,629**
1A - Fuel Combustion Activities	53,728	61,399
1A1 - Energy Industries	37,679	42,519
1A2 - Manufacturing Ind. and Const.	4,738	5,367
1A3 - Transport	7,660	9,550
1A4 - Other Sectors	3,651	3,962
1A5 - Other	0	0
1B - Fugitive Emissions from Fuels	2,826	3,230
1B1 - Solid Fuels	989	1,130
1B2 - Oil and Natural Gas	1,837	2,099

The main assumptions used for developing the "scenario with measures" and the "scenario with additional measures" are[1]:

- annual GDP growth in the production sector is estimated to be 3% by 2020;
- population by 2020 is estimated to be in the range of 6.72 to 6.85 million;
- growth of final energy consumption is in direct relationship with GDP growth;
- electricity consumption growth is 5.6% in 2020 and 17% in 2030;

1 The Draft Strategy of Energy Sector Development by 2025, with projections until 2030

- in the transport sector, the average EU vehicle per capita rate will be reached after Serbia's accession to the EU;
- Accession to the EU will lead to a significant increase in the flow of goods and capital, i.e. a significant increase in passenger-kilometers is expected, and vehicle-specific emissions will increase due to liberalization of the import of used vehicles.

Scenario "with measures"

The scenario "with measures" assumes that the Republic of Serbia will reach the national goal of 27% share of renewable energy sources in gross final consumption and 10% share of biofuels in transport by 2020. This scenario also assumes an increase of energy use in transport due to the rise of GDP and economic activities, which will be 0.5% per annum. Based on these assumptions, GHG emissions by source categories for the energy sector in the scenario with measures" is shown in Table 5.7.

Table 5.7. Projections of GHG emissions in source categories within the energy sector, scenario with measures, Gg CO_2eq

	2015.	2020.
1 - Energy	**55,136**	**57,260**
1A - Fuel Combustion Activities	52,381	54,398
1A1 - Energy Industries	36,536	36,797
1A2 - Manufacturing Industry and Construction	4,657	5,270
1A3 - Transport	7,592	8,858
1A4 - Other Sectors	3,596	3,473
1A5 - Other	0	0
1B - Fugitive Emissions from Fuels	2,755	2,861
1B1 - Solid Fuels	964	1,001
1B2 - Oil and Natural Gas	1,791	1,860

At all emissions levels, GHG emission reductions based on electricity production from renewable energy sources (RES) in the "scenario with measures", are shown in Table 5.8.

Table 5.8. **GHG emissions level due to increased use of RES, "scenario with measures", Gg CO_2eq**

Year	2015.	2020.
Electricity and heat production	1,143	5,722
Industry	81	97
Transport	68	692
Other sectors	55	490
Other sectors	71	368
Total	**1,418**	**7,369**

Scenario "with additional measures"

The "scenario with additional measures" starts from the assumptions that the Republic of Serbia will reach its national goal of a 27% share of renewable energy sources in gross final consumption and a 10% share of biofuels in transport in 2020 and implement energy efficiency measures to achieve a 9% reduction in final energy consumption compared to the previous scenario. This scenario includes the implementation of measures with the aim to reduce final energy consumption in the building sector, the commercial and public service sector, and the industrial and transport sector. Consequently, the relative reduction in energy consumption (reduction per unit of GDP) in the manufacturing and service sectors will be accomplished. As a result, energy efficiency will become a "new energy source".

Based on these assumptions, GHG emissions by source category for the energy sector, under the "scenario with additional measures" are shown in Table 5.9.

Table 5.9. **Projections of GHG emissions by source category in the Energy sector, "scenario with additional measures", Gg CO_2eq**

	2015.	2020.
1 - Energy	**53,308**	**52,411**
1A - Fuel Combustion Activities	50,644	49,792
1A1 - Energy Industries	35,651	34,003
1A2 - Manufacturing Ind. and Const.	4,035	3,782
1A3 - Transport	7,489	8,948
1A4 - Other Sectors	3,468	3,060
1A5 - Other	0	0

1B - Fugitive Emissions from Fuels	2,664	2,619
1B1 - Solid Fuels	932	917
1B2 - Oil and Natural Gas	1,732	1,702

GHG emission reductions based only on electricity production from renewable energy sources in the "scenario with additional measures" are shown in Table 5.10.

Table 5.10. **Projections of GHG emissions by using renewable energy sources, "scenario with additional measures", Gg CO_2eq**

Year	2015.	2020.
Electricity and heat production	1,899	8,195
Industry	81	97
Transport	68	692
Other sectors	55	490
Fugitive emissions	111	498
Total	**2,214**	**9,972**

Based on these assumptions with regard to energy efficiency (the First Energy Efficiency Plan of the Republic of Serbia for the Period from 2010 to 2012 (2010) and the Draft Strategy of Energy Sector Development until 2025, with projections until 2030), GHG emission reductions which are developed under the scenario "with additional measures" are shown in Table 5.11.

Table 5.11. **Projection of GHG emissions reduction potential by implementing energy efficiency by source categories, "scenario with additional measures", Gg CO_2eq**

Year	2015.	2020.
Electricity and heat production	128	322
Industry	621	1,489
Transport	103	459
Other sectors	128	413
Fugitive emissions	52	112
Total	**1,032**	**2,245**

5.3.2. Industrial processes

GHG emissions in the industrial processes sector, according to three scenarios, are shown in Table 5.12.

Table 5.12. Projections of GHG emissions in the Industry processes sector, three scenarios, Gg CO_2eq

Scenarios	1990.	2015.	2020.
Basic scenario	4,871.13	4,868.97	5,373.90
"Scenario with measures"	4,871.13	3,859.11	4,255.84
"Scenario with additional measures"	4,871.13	3,642.71	3,714.85

GHG emissions in 2020, based on the "scenario with measures" are 4,255.84 Gg CO_2eq i.e. a reduction of 1,118.06 Gg CO_2eq compared to the basic scenario. The "scenario with additional measures" assumes a 3.714,85 Gg CO_2eq emissions reduction in 2020, i.e. a reduction that is greater by 1,659.05 Gg CO_2eq compared to the level of emissions defined in the basic scenario. Therefore, in 2020 the implementation of the "scenario with measures" would lead to emission reductions in the industry processes sector of 20.8%, and the "scenario with additional measures" arrives at 30.9% emissions reduction compared to the basic scenario.

The basic scenario is developed based on the assumption that a high consumption of energy per unit of production in industry is the main source of GHG emissions (from the production of cement, iron and steel). The "scenario with measures" assumes that an increase in overall industrial production and consequently GHG emissions from this sector, will follow an increase of final energy consumption in the manufacturing industries, with the implementation of measures of technological modernization of industrial processes, the increase of energy and material efficiency and the implementation of non-selective catalytic reduction. For the "scenario with additional measures", the assumption is an increase in energy efficiency and the implementation of technological changes in the production process. These measures relate to: the improvement of the combustion process by replacing existing burners with efficient ones, higher use of waste material as an energy-generated product and changes in the structure of used energy products, the introduction of technical oxygen into the combustion process, modernizing the construction of industrial furnaces and boilers, the use of waste heat from production processes, replacing existing electric motors and the improvement of the monitoring and management process.

5.3.3. Agriculture

Only one scenario has been developed for the agriculture sector by using a regression analysis of trends and expert assumptions, because at this moment there are no implemented, adopted or planned measures in the agriculture sector that specifically target GHG reduction.

From data on livestock numbers over the 2008-2013 period, it is appears that for some categories of livestock there is a linear downward (dairy cows) or upward (other cattle) trend. The trend for other categories of livestock (swine, sheep) shows strong fluctuations that could be a result of changes in market demand and/or the support of Governmental instruments. Expert assessments assume that this decreasing trend of

livestock number will continue until 2015, taking into account a new supportive government policy, after which a period of stabilization and gradual increase/recovery will arrive during and after 2020. Additionally, it is important to stress that for categories with significant fluctuations in number, an average value in the period 2008-2013 was taken as a proxy value for future projections.

Concerning GHG source categories in aggregate sources and non-CO_2 emission sources on land, it is clear from GHG emissions inventory that the following source categories represent key emission sources:

- CO_2 emissions from urea application on cropland;
- Direct N_2O emissions from soils management;
- Indirect N_2O emissions from soils management;
- Indirect N_2O emissions from manure management.

Projections of emission from these source categories depend on the amount of urea and nitrogen (N) applied to the land and where nitrogen might originate from different sources, including synthetic fertilizers, animal manure, urine and dung deposited, along with crop residues. It was assumed that the amount of urea applied to the land would remain constant following the trend in 2008-2013. The amount of animal manure, urine and dung deposited and crop residues will remain constant since their historical trends are more or less stable. The amounts of nitrogen synthetic fertilizers applied to land are assumed to moderately increase, especially in the period after 2020. All these projections are based on the assumptions of the intensive development of agriculture, but also the implementation of good practices, which are used in EU member states.

Emissions from cropland, grassland, wetlands, settlements and other land, except forest land, are estimated as net emissions in the latest GHG emissions inventory, and these values were not changed in the period 2010-2013. The same level of emissions was assumed for the entire projection period.

Based on expert assumptions, the calculated emission projections in sources categories and the whole of the agriculture sector is shown in Table 5.13.

Table 5.13. Projections of GHG emissions in Agriculture sector, three scenarios, Gg CO_2eq

Basic scenario	1990.	2015.	2020.
3.A. Livestock	5,109.26	3,069.36	3,109.47
3.B. Land	294.19	360.93	360.93
3.C. Aggregate sources and non-CO_2 emissions sources on land	3,674.77	3,241.88	3,282.61
Total emissions	**9,078.22**	**6,672.16**	**6,753.00**

Projected emissions in 2020 are 6,753.00 Gg CO_2eq, or in source categories: Livestock 3,109.47 Gg CO_2eq, Land 360.93 Gg CO_2eq, and Aggregate sources and non-CO_2 emissions sources on land - 3,282.61 Gg CO_2eq.

5.3.4. Waste management sector

The basic assumptions in projections for all three scenarios in the waste management sector are that in the previous period, the average annual increase of generated waste was approximately 0.5% per year, but in the future significant growth can be expected (in line with economic development and rising living standards). However, the decrease in population, particularly after 2020, will affect to the amount of waste generated.

In order to define the basic scenario, it is assumed that the morphological composition of waste will be unchanged until 2020. In addition, the assumption that the current state of waste management treatment practice will not change in the future was taken also into account. Accordingly, the projections show that the total GHG emissions in the observed period until 2020 are 12,066.40 Gg CO_2eq, or on average 1,723.8 Gg CO_2eq.

In the wastewater management sector, the main assumption is that wastewater treatment plants will increase by approximately 20%, which will influence GHG emission in the waste management sector according to this scenario.

In the "scenario with measures", the main assumption is that generated waste will increase by 8%, i.e. for 1.3% per year compared to the base year. Another assumption is that the share of biodegradable categories (garden and food waste) will be reduced by 6.9% and that the current share of 48.8% of this type of communal waste will be decreased to 45.4% in 2020. In addition, projections indicate that in 2020, the percentage of paper and cardboard will amount to 10.2%, plastic 13.4%, glass 5% and metal 1.9%, while all other categories of waste together have a projected share of 24.0% of the total amount.

The scenario "with measures" assumes that the disposal of solid municipal waste will be 77.6% of total generated waste, recycling of municipal waste will be two times higher in 2020, the thermal treatment of communal waste will be at the level of 4.5% and biological waste treatment at 8.4%. Thermal methods for the treatment of municipal waste, despite projected growth in the future, will not have a significant share in comparison to other options. According to projections, the value of 4.5% of municipal waste treated in this way is far less than the 22.1%, which was recorded on average in EU countries in 2011. In contrast, the biological methods for the treatment of municipal waste based on the results of modeling show the greatest growth trend when compared to other forms of treatment. With the current assumed share of 2.0%, this value is projected to increase to almost 8.4% in 2020.

The "scenario with additional measures" is based on assumptions that 30% of municipal waste will be treated by anaerobic digestion and 10% by thermal treatment methods (Belgrade, Novi Sad, Niš). The assumed quantities of municipal waste that will be recycled is 15%. As a result of these measures, additionally disposed municipal waste will be reduced (50%), and this scenario assumes that all landfills are sanitary and almost all amounts of methane will be utilized.

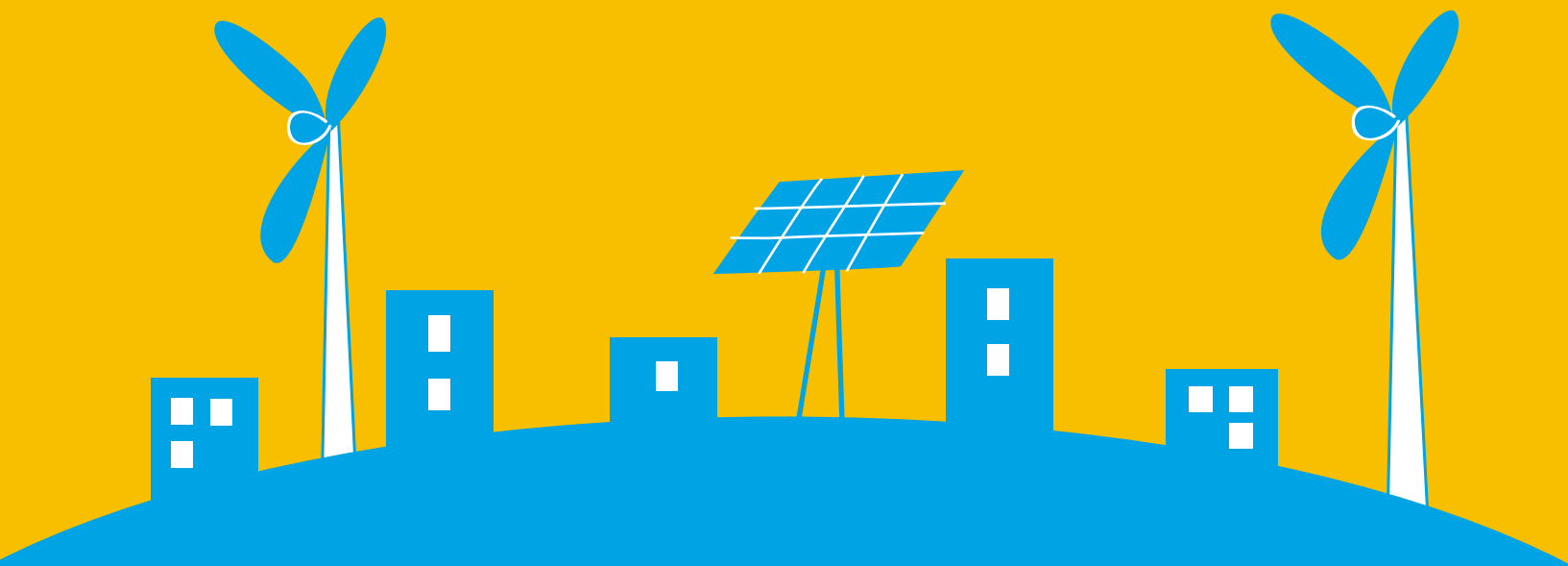
Based on previous assumptions, projections of GHG emissions in the waste management sector, including disposal of municipal waste and wastewater treatment, for the three scenarios are shown in Table 5.14.

Table5.14. **Projections of GHG emissions for the Waste management sector, three scenarios, Gg CO_2eq**

Scenarios	1990.	2015.	2020.
Basic scenario	3,839.77	2,688.06	2,686.79
"Scenario with measures"	3,839.77	2,742.66	2,698.16
"Scenario with additional measures"	3,839.77	2,392.72	2,284.77

According to the scenario "with measures", GHG emissions in 2020 will be 2,698.16 Gg CO_2eq, i.e. emissions will rise (due to the growth of generated municipal waste) by 11.37 Gg CO_2eq compared to levels of emissions given in the basic scenario. Projections of GHG emissions in 2020, according to the scenario "with additional measures" is 2,284.77 Gg CO_2eq i.e. reduced by 402.02 Gg CO_2eq compared to GHG emissions in the basic scenario, which represents a 15% improvement compared to the basic scenario.

6. MITIGATION MEASURES TO REDUCE GHG EMISSIONS



The planned and necessary activities in all relevant sectors, which will lead to reaching the potential GHG emissions reduction estimated under the two scenarios of GHG emissions, the "scenario with measures" and the "scenario with additional measures", are presented in the following subchapters. Special attention is given to the Energy sector due to its share in total GHG emissions and its potential for total GHG emission reduction.

6.1. Energy sector

6.1.1. Renewable energy sources (RES)

The assessment of the potential to reduce GHG emissions is based on planned capacities to use renewable energy sources in final energy consumption and the energy sector.

Table 6.1. shows the capacities of renewable energy sources which will be reached in final energy consumption and the energy sector, under the two scenarios for GHG emissions reduction by 2020.

Table 6.1. Capacity added and energy produced from renewable energy sources

RES source	Scenario		"With measures"	"With additional measures"
	Year		2020.	2020.
RES for electricity				
Hydro	Installed capacity	MW	438	540
	Energy produced	GWh	1,831	2,257
		ktoe	157	194
Wind	Installed capacity	MW	500	650
	Energy produced	GWh	1,250	1,625
		ktoe	107	140
Sun	Installed capacity	MW	10	75
	Energy produced	GWh	14	105
		ktoe	1	9
Biomass	Installed capacity	MW	143	238
	Energy produced	GWh	1,001	1,666
		ktoe	86	143
Geothermal	Installed capacity	MW	1	1
	Energy produced	GWh	7	7
		ktoe	0.6 ~1	0.6 ~1

RES for transport				
Biofuels	Energy produced	ktoe	246	246
RES for heat				
Biomass	Energy consumed	ktoe	84	84
Geothermal	Energy consumed	ktoe	10	10
Solar thermal	Energy consumed	ktoe	55	55

The assumed installed additional capacity of renewable energy sources used in the "scenario with additional measures" would be feasible due to the decreasing costs of building and maintaining wind and photovoltaic and solar power plants, improving electric power system for energy supply from the so-called. intermittent sources of renewable energy, safety assurance and the regulation of power system with the higher share of RES, growth of GDP etc.

Activities that could assure the assumed use of renewable energy sources and in that way the projected GHG emissions reduction identified as NAMA projects, which in 2012 has status as described in Table 6.2:

Table 6.2. **NAMA projects - RES**

Name	National Implementing Entity	Status	Estimated emission reduction
NS-33 – Use of Solar energy for domestic hot water production in the heat plant "Cerak" in Belgrade	Public Utility Company District Heating Plants of Belgrade and Business Association "Heating Serbia"	Seeking support for implementation	12,220 t CO_2eq (20 years) Methodology applied for estimation: General calculation method used in IPCC Guidelines Estimated annual emission reduction: 611 t CO_2eq/year
NS-37 – Revitalization of the Existing Small Hydropower Plants and Construction of New Small Hydropower Plants (SHPPs)	Public Enterprise Electric Power Industry of Serbia	Seeking support for implementation	4.10 Mt CO_2eq; estimation is calculated based on the 40 years of technical life time from installation Estimated annual emission reduction: 102,500 t CO_2eq/year
NS-35 – Introduction 1000 MW of small biomass boilers in Serbia	Ministry of Energy, Development and Environmental Protection	Seeking support for implementation	Total reductions 10.36 Mt CO_2eq for 25 years Estimated annual emission reduction: 414,400 t CO_2eq/year

6.1.2. Energy efficiency (EE)

Increased energy efficiency, in line with EU goals and the national goals set during the EU accession negotiations should reduce the consumption of domestic fossil fuel reserves, increase energy independence, reduce GHG emissions and the emissions of pollutants and increase the implementation of economically viable measures.

The planned energy efficiency measures include measures in the residential building sector, the public and commercial services sector, the industrial sector and the transport sector. Measures include legislative and infrastructure measures, which will lead to the reduction of final energy consumption (Second National Energy Efficiency Action Plan of the Republic of Serbia) shown in Table 6.3:

Table 6.3: **Indicative targets per sector of final energy consumption**

Classification of indicative targets per sector of final energy consumption					
Sector	Final energy consumption y 2008.	Targets until 2012.	Share of target until 2012.	Targets until 2018.	Share of target until 2018.
	Mtoe	Mtoe	%	Mtoe	%
Residential buildings + public and commercial services	3,219	0,0235	19	0,2749	37
Industry	2,832	0,0566	45	0,2668	35
Transport	2,310	0,0453	36	0,2107	28
TOTAL	8,360	0,1254	100	0,7524	100

Concrete infrastructure activities as energy efficiency measures also require the following NAMA projects submitted to the NAMA Registry in 2012:

Table 6.4. NAMA projects – energy efficiency

Name	National Implementing Entity	Status	Estimated emission reduction
NS-46 – Improvement of old residentialbuildingenvelopes (exterior doors, windows and thermal insulation) in Serbia	Ministry of Construction and Urban Planning	Seeking support for implementation	Total CO2 reduction for the 30-year period is 15,119,070 t CO_2 eq. The calculations were made with the assumption of the total floor areas to be rehabilitated in existing buildings and the total annual energy consumption before and after implementation. Estimated annual emission reduction: 503,969 t CO_2eq/year
NS-41 – Energy Efficiency Improvements in Public Buildings: 23 schools and 26 hospitals – Serbian Energy Efficiency Project (SEEP)	Ministry of Energy, Development and Environmental Protection	Seeking support for implementation	Total reduction: 208,150 Mt CO_2eq over 25 years Estimated annual emission reduction: 8,326 t CO_2eq/year
NS-36 – Rehabilitation of arterial roads in Serbia	Public Enterprise "Roads of Serbia"	Seeking support for implementation	Total reduction: 5,234 t CO_2eq (20 years) Methodology applied for estimation: Computer Programme to calculate Emissions from Road Transport (COPERT 4) Estimated annual emission reduction: 266,2 t CO_2eq/year

In addition to measures assumed for the RES sector and energy efficiency, concrete infrastructural activities in the energy sector, taking into account both defining scenarios (the scenario "with measures" and the scenario "with additional measures") include the following NAMA projects (Table 6.5) as defined in 2012:

Table 6.5. NAMA projects – infrastructural projects in the Energy sector

Name	National Implementing Entity	Status	Estimated emission reduction
NS-34 – Thermal Power Project with Capacity and Efficiency Increase II – TTP Nikola Tesla – Unit A3	Public Enterprise Electric Power Industry of Serbia	Seeking support for implementation	1.40 Mt CO_2eq; estimation is calculated based on the 15 years of technical lifetime of installation after reconstruction. Estimated annual emission reduction: 93,333 t CO_2eq/ year
NS-39 – Thermal Power Project with Capacity and Efficiency Increase I – TTP Nikola Tesla – Unit B2	Public Enterprise Electric Power Industry of Serbia	Seeking support for implementation	5.30 Mt CO_2eq; estimation is calculated based on the 15 years of technical lifetime of installation after reconstruction. Estimated annual emission reduction: 353,333 t CO_2eq/ year
NS-40 – Construction of a Super-critical Lignite power Plant TTP Kostolac B	Public Enterprise Electric Power Industry of Serbia	Seeking support for implementation	56.0 Mt CO_2eq; estimation is calculated based on the 40 years of technical life time after installation Estimated annual emission reduction: 1,400,000 t CO_2eq/ year
NS-50 – Replacement and Construction of a New Natural Gas Cogeneration Plant CHP Novi Sad	Public Enterprise Electric Power Industry of Serbia	Seeking support for implementation	36.00 Mt CO_2eq; estimation is calculated based on the 35 years of technical life time after installation Estimated annual emission reduction: 1,028,571 t CO_2eq/ year

NS-31 – Expansion of existing heating network in Valjevo	City of Valjevo	Seeking support for implementation	252,270 t CO_2eq (30 years) Methodology applied for estimation: General calculation method as used in IPCC Guidelines Estimated annual emission reduction: 8,409 t CO_2eq/year
NS-32 – Introduction of metering system and billing on the basis of measured consumption in district heating systems in Serbia	Public Utility Company District Heating Plants of Belgrade and Business Association "Heating Serbia"	Seeking support for implementation	6,582,340 t CO_2eq (20 years) Methodology applied for estimation: applied from the Initial National Communication, which is based on IPCC Guidelines Estimated annual emission reduction: 329,117 t CO_2eq/ year

6.2. Industrial processes

Activities in the scenario "with measures" and scenario "with additional measures" include the implementation of technical application in industries in accordance with the best available techniques, allocated based on the necessary financial investments. The levels of GHG emissions in the industrial processes sector based on the scenario "with measures" imply implementation of technical applications by industry, in line with the best available techniques in all existing installations, as follows:

Табела 6.6. **Specific activities in the Industrial processes sector based on the scenario "with measures"**

Industries	Cement production	Lime production	Ceramic industry	Ceramic industry	Ferrous metallurgy (Iron and Steel production	Chemical industry
Type of activities	Optimization of the process - automation process control; reduction of "bypass" flows	Process optimization: - Ensuring continuity of operation of the furnace (switching on/switching off furnaces); - Maintenance parameters to control the furnace according to the projected values; - Automation of process control	Reconstruction of furnaces and dryers: - Automatic control of the dryer; - Automatic control of humidity and temperature; - Improving the sealing of kills; - Improving the thermal insulation of furnaces	Optimization of the process by monitoring operating parameters: - Improving maintenance of smelter; - Application of techniques for combustion control	Improvement and optimization of the system to achieve stable production: -Automation of process -Introduction of gravimetric dosing systems; -Introducing preheating of air and materials; -Using waste heat	Automatic control of processes
	Using waste as fuel	Using waste as fuel (biomass, waste oils, solutions)	Using waste heat from furnace: -Reducing the length of the transport of waste, -Insulation of channels for waste gas	Using the "Cullen", i.e. glass that is a product of recycling processes (debris, crushed glass)	Reducing the use of basic raw materials, i.e. substitution of scrap metal	Optimization of the heat cycle of production

Industries	Cement production	Lime production	Ceramic industry	Ceramic industry	Ferrous metallurgy (Iron and Steel production	Chemical industry
	The substitution of natural raw materials (clay and limestone) with waste and certain types of materials that are by-products in other industrial processes (certain types of slag, ash, pyrite charred residues, etc.).		Replacement of oil fuel and solid fuels with lower emissions fuels	Using waste heat from boilers		Using surpluses of thermal energy "on-site" or "off-site"
	Reducing the clinker content in cement by adding fillers and/or appropriate supplements (blast furnace slag, limestone, fly ash and pozzolana)					
	Training furnaces' operators with the aim to manage the process with less energy and raw materials consumption					

Concrete activities by industries taken into account in developing the scenario "with additional measures" imply, beside the those included in the scenario "with measures", in accordance with the best available techniques, these activities as well:

Table 6.7. **Specific activities in Industrial processes sector based on the "scenario with additional measures"**

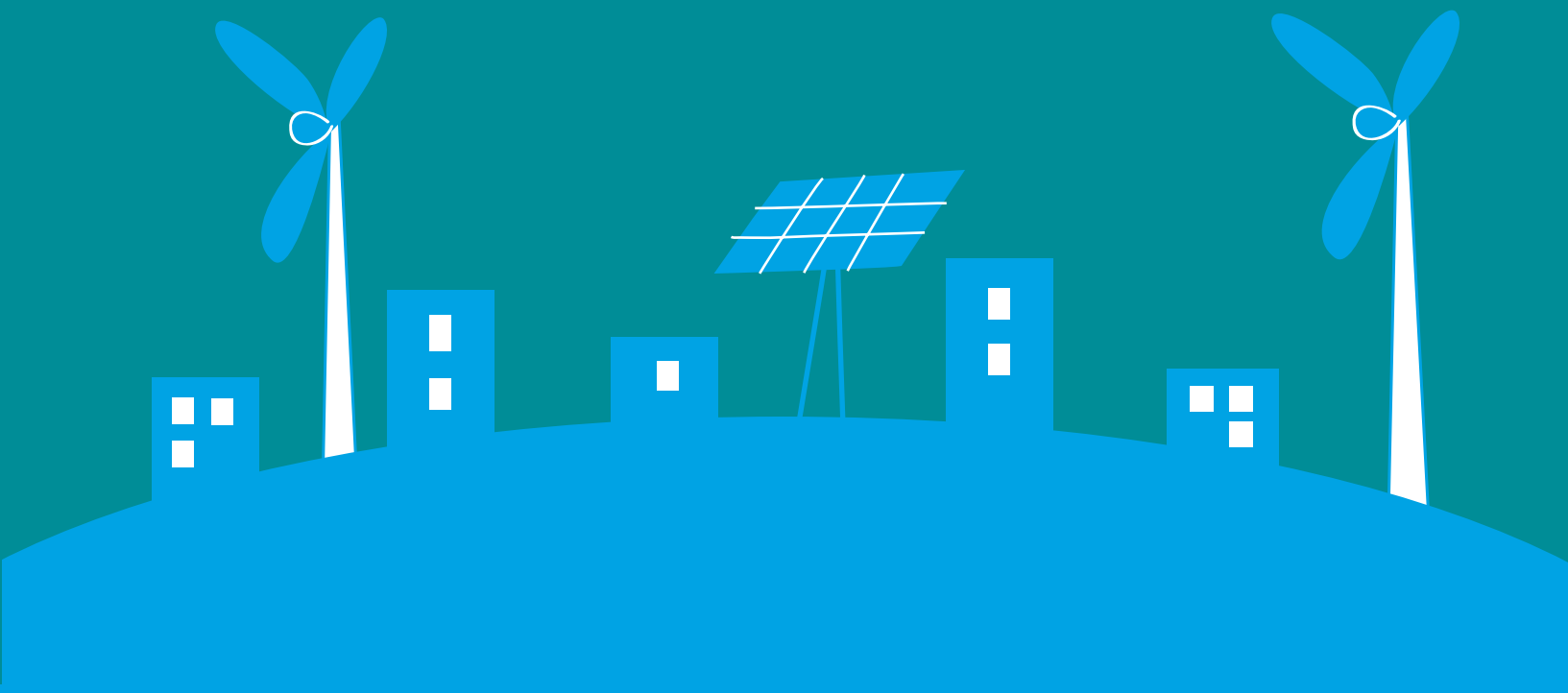
Industries	Cement production	Lime production	Ceramic industry	Ceramic industry	Ferrous metallurgy (Iron and Steel production	Chemical industry
Type of activities	Installing new dosing system	Installing new dosing system	The use of alternative fuels using waste materials with a high content of organic material, i.e. organic origin such as: waste oil, solvents, biomass, bone and meat meal, etc.	Optimization of the furnace work and design and the selection of melting techniques	Re-use of waste gas: -Using gas from the sinter cooler; -The use of gas and other parts of the sinter chain	Installation of "preheating" combustion air
	Installation or modernization of tanks, homogenization				Minimizing the release of gas from the furnace during charging "bell-less top"- primary and secondary equalizing; Return system of gas or ventilation; Using furnace gas to exert pressure on the top of the bunker	Modernization or installation of a highly efficient heat exchange
	Optimization by installing "pre-blending beds"				Using the isolated gas of furnaces as fuel	
	Installing new cooling clinkers					

6.3. Waste management sector

The level of GHG emissions in the waste management sector in 2020, based on the scenario "with measures", will be achieved by the construction of 26 regional centers with recycle waste separation plants and more recycling centers with the aim of doubling the level of recycling by 2020, as well as the construction of plants for the mechanical-biological treatment of municipal waste.

On the other hand, the scenario "with additional measures" can be achieved by building facilities for the anaerobic digestion of municipal waste; plants for the thermal treatment of waste in Belgrade, Novi Sad and Nis and increasing the capacity of recycling centers to a new level of recycling from 15% in 2020.

7. MONITORING, REPORTING AND VERIFICATION



Establishing a system of monitoring, reporting and verification (hereinafter: MRV) is one of the key demands of the UN Framework Convention on Climate Change and EU legislation. The recognition of the importance of the MRV monitoring system and the improved planning and implementation of policies relevant to fighting climate change in the Republic of Serbia has led to the establishment of several of the important elements of this system.

Preparation of the National GHG Inventory is a legal requirement of the Agency for Environmental Protection of the Republic of Serbia (SEPA). In addition, SEPA is responsible for the implementation of quality control procedures for ensuring the transparency, accuracy, completeness and consistency of input data, emission factors and other parameters, as well as for the calculation of GHG emissions and removals, in accordance with its QA/QC Plan.

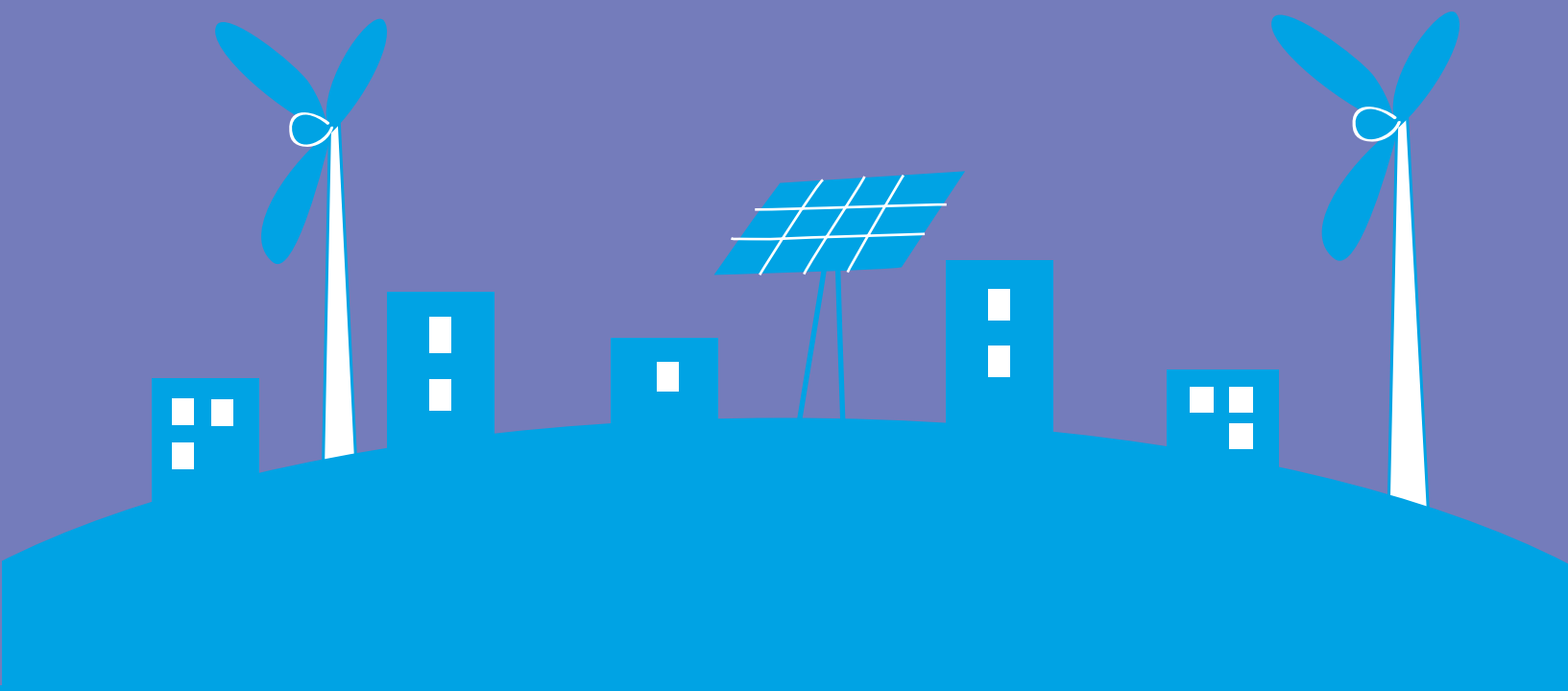
General procedures and methods for collection and archiving input data for the preparation of the National GHG Inventory are defined by the Regulation on methodology for collection of data needed for preparation of GHG inventory.

The establishment of a complete MRV, i.e. a system of data collection and information relevant for climate change, was initiated with EU financial and technical assistance (through the IPA project "Establishment of a mechanism for implementation of MMR", Programming for 2013), and responsible for the implementation of these activities is the Ministry in charge for environmental issues and climate change. A complete MRV system will include monitoring and reporting, not just on GHG emissions, but also on the policies, measures, and projections of GHG emissions and mitigation measures, as well as information relevant for planning adaptation to climate change. The completion of these activities is planned for 2018, and it is expected that the system will start in 2019.

Some components of this system have been established through the IPA project (Programming for 2012), particularly the establishment of a legislative and institutional framework for implementation of the EU ETS Directive. The law that establishes the requirement to collect, report and verify the data on GHG emissions from industrial and power plants should come into force in 2017, at the latest.

The Ministry of construction, transport and infrastructure has established a Central Registry of energy passports - CREP. Through this information system energy passports for buildings are made as well as unified database that contains information on: authorized organizations which meet the requirements for the issuance of certificates of energy performance of buildings, the engineers responsible for the energy efficiency of buildings who are employed in these organizations and issued certificates on energy performance of buildings - Energy passports, but also on CO2 emissions (kg / kWh). The data are publicly available.

8. CONSTRAINTS AND PRIORITY NEEDS



8.1. Institutional needs

The Republic of Serbia has established an important component of the institutional and legal framework to fight climate change. At the same time, there is still a need for improvement, as well as capacity building and greater knowledge by responsible and competent institutions, at the national and local levels, as well as by the general public.

The basis of good planning and policies to fight climate change are accurate, consistent and transparent data about GHG emissions (GHG Inventory). The credibility of the GHG inventory, largely depends on the quantity and quality of relevant data. In the forthcoming period, it is necessary to clearly and precisely define the responsibility for collecting and procedures for data submission and to improve data quality and the QA/QC procedures and the assessment of uncertainty, reporting and archiving.

In this context it is necessary, *inter alia*, to strengthen the capacity of the Agency for Environmental Protection, in order to prepare the GHG inventory and inventory report for the purposes of the BUR. Strengthening capacities means increasing the number of employees and their training, which requires detailed and precise planning. Estimates show that to implement these activities between 50-60 thousand euros per annum is necessary to establish a functional inventory system.

In addition, it is necessary to identify opportunities and legally define the modality and those responsible for the preparation of the remaining parts of the BUR, primarily those relating to projections and mitigation measures, and to establish the institutional organization at the governmental level that will ensure the timely preparation of the BUR and national communications.

Under these circumstances, it is necessary to strengthen the capacity of the Climate Change Department, within the Ministry of Agriculture and Environmental Protection. The Climate Change Department is the organizational unit responsible for the fulfillment of obligations under the UN Framework Convention on Climate Change at the national level, as well as for the preparation and implementation of legislation in the area of climate change, deriving from the process of preparing for EU membership. Estimations suggest the need to employ at least five officers in the engineering field with significant experience.

The multi-sectoral nature of climate change and the current level of expertise and awareness about the problem certainly indicate the need for systematic and continuous effort to raise awareness of this issue among the general public. To accomplish these activities, technical and financial assistance from the international community and the European Union are certainly crucial.

8.2. Infrastructural needs

Beside the legislative framework that guide and stimulate these types of activity, the reduction of GHG emissions is primarily determined by the implementation of concrete infrastructural projects. In order to achieve this potential to reduce GHG emissions by sector, the identified priority activities are in the energy, waste and forestry sectors, and to accomplish them technological and financial assistance are necessary from the international community, i.e. industrialized developed countries. These activities and the necessary funding for their implementation are given in Table 8.1.

Table 8.1. **Necessary financial needs for implementing activities on GHG emission reduction**

Energy	
Measures	**Necessary financial need (€)**
ТЕНТ Б3 (750 MW)	1,600,000,000
TPP Kolubara B (2 x375 MW)	1,500,000,000
TPP Kostolac B3 (350 MW)	450,000,000
TPP Novi Kovin (2 x 350 MW)	1,330,000,000
TPP Stavalj (300 MW)	650,000,000 750,000,000
TPP HP Novi Sad (340 MW)	400,000,000
HPP Velika Morava (147,7 MW)	360,000,000
HPP Ibar (117 MW)	300,000,000
HPP Srednja Drina (321MW)	819,000,000
PS HPP Bistrica (4 x 170MW)	560,000,000
PS HPP Djerdap 3 (I phase) (2 x 300 MW)	400,000,000
Mini HPP (387 MW)	500,000,000
Revitalisation, modernization and construction of heat sources	90,000,000
Revitalisation and construction of distribution network	105,000,000
Revitalisation and construction of heat substation	45,000,000
Finalisation of gasification in the Republic of Serbia and rehabilitation of existing gas system	500,000,000

Waste sector	
Measures	**Necessary financial need (€)**
Construction of sanitary landfills	94,470,000
Construction of centralized composting plants	18,100,000
Buying compost bins for rural households	41,540,000
Costs of additional cleaning of 164 registered dumpsites	48,280.000
Costs of closing 4,481 dumpsites	94,830,000
Forestry	
Measures	**Necessary financial need (€)**
Afforestation	82,076,510
Regeneration of high forests	58,457,292
Reconstruction of devastated forests	5,094,291
Indirect conversion of coppice forests	23,522,299
Direct conversion of coppice forests	117,952,426
Rehabilitation of stands damaged by abiotic and biotic factors	4,665,102
Rehabilitation of fire-damaged stands	62,604,091
Forest certification	900,000
Development of strategic documents for forestry sector	794,880
National forest inventory	730,000
Research (developing capacities and implementation of projects)	94,025,000

9. LITERATURE

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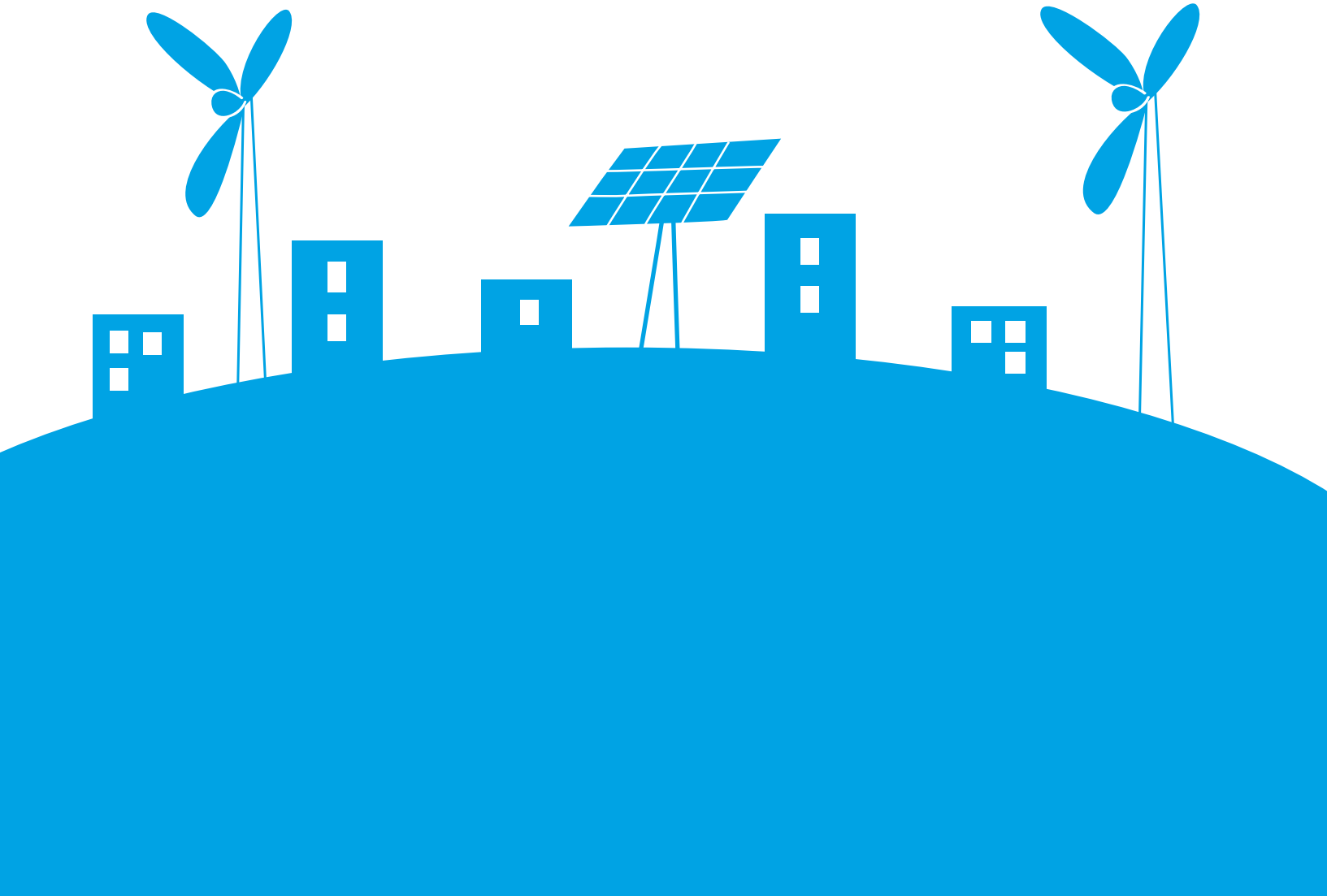

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