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**Development of Climate Change Monitoring, Reporting and Verification (MRV) System**

RFP 635

**DELIVERABLE 2:**

Comprehensive document of revised NDCs for the Republic of Serbia

December 20th, 2020

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**TO BE SUBMITTED TO THE UNFCCC**

**DRAFT Nationally Determined Contribution (NDC)   
of the Republic of Serbia for the period 2021 – 2030**

**Introduction**

The Republic of Serbia is a Party to the United Nations Framework Convention on Climate Change (UNFCCC) since 2001 and to the Paris Agreement since 2017. In 2015, the Government of the Republic of Serbia submitted its Intended National Determined Contributions (INDCs), anticipating a 9.8% GHG emissions reduction by 2030 compared to base year emissions (1990). The first NDC also refers to losses and damages associated with extreme weather events and indicates the need to adapt to climate change.

The Republic of Serbia hereby communicates its updated Nationally Determined Contribution (NDC). In accordance with the Articles 3 and 4 of the Paris Agreement and paragraphs 22 and 24 of Decision 1 CP/21:

Increasing its ambition to the GHG emission reduction of 13,2% compared to 2010 level (i.e. 33,3% compared to 1990.) by 2030, and

Anticipating that in the period 2015-2020 period, Serbia suffered damages of minimum EUR 1.8 billion, additional to EUR 5 billion the period 2000-2015, caused by climate change and extreme weather events.

Revised GHG emission reduction target is defined in the Low Carbon Development Strategy (LCDS) with Action plan (LCDS) prepared in the period 2016 – 2019.

Serbia is a land locked country. Energy is one of the largest sectors of the Serbian economy, and the most of the electricity is produced in thermal power plants (about 70% of electricity) using domestic low-calorific lignate. The most of the remaining 30% is hydro-energy. Electricity consumption is very high, mostly due to the use of electricity for heating and a very low level of energy efficiency.

The mean annual temperature increased in the period 2008-2017 relative to the reference period 1961-1990 by 1.5°C, and in the western and eastern parts of the country exceeded 2°C. Such trend will continue up to 2-4.3°C until the end of the century. The annual precipitation increased up to 10%, and in the southern part of the country up to 20% relative to the reference period15 The change in the mean annual precipitation will not be as pronounced as in the case of temperature change, but will be characterized by interannual precipitation redistribution, while during the summer season, the deficit of rainfall will be strongest.

Vulnerability of water resources, agriculture, forestry, including biodiversity and health is already confirmed, while experience in the last few decades shows negative effects of climate change to energy, infrastructure, transport and Serbian economy in a whole. In addition, COVID-19 pandemic impacts social aspects of Serbian society, implying job loss of 34,700 women and net increase of 1,500 more jobs for men in the second quarter of 2020[[1]](#footnote-2).

Further detailed information necessary for clarity, transparency and understanding (ICTU) of the Nationally Determined Contribution (NDC) could be found at:

Following the decisions 1/CP.21, 4/CMA.1, 9/CMA.1, 18/CMA.1, the following NDC related quantifiable information is hereby submitted:

| 1. Quantifiable information on the reference point (including, as appropriate, a base year) | |
| --- | --- |
| (a) Reference year(s), base year(s), reference period(s) or other starting point(s) | **Base year:** 2010  During the revision of the first NDC, the recalculation of the GHG inventory and QA/QC process identified the 2010 as the base year. In order to compare efforts between the first and the second NDC the GHG emission levels were compared to those in 1990 and also presented.  GHG emissions total in 2010 was 62,650 Gg CO2eq as presented in the Second BUR and subject to change due to inventories’ recalculation.  **Reference year of the projections:** 2015 |
| (b) Quantifiable information on the reference indicators, their values in the reference year(s), base year(s), reference period(s) or other starting point(s), and, as applicable, in the target year; | Further quantifiable information on the reference indicators are available in the **National GHG Inventories** |
| (c) For strategies, plans and actions referred to in Article 4, paragraph 6, of the Paris Agreement, or polices and measures as components of nationally determined contributions where paragraph 1(b) above is not applicable, Parties to provide other relevant information; | Not applicable |
| (d) Target relative to the reference indicator, expressed numerically, for example in percentage or amount of reduction; | (A) **Relative economy-wide target** - reduction of GHG emissions by 2030:  - 13.2 % compared to 2010  - 33.3% compared to 1990  (B) **Conditionally** upon appropriate financial, technical, and capacity building support by the international community, reduction of GHG emissions by 2030:  - 28.7% compared to 2010  - 45.2% compared to 1990 |
| (e) Information on sources of data used in quantifying the reference point(s) | **National GHG inventory for the time series 1990 – 2015**  Prepared by the Serbian Environmental Protection Agency (SEPA) and presented in the Second Biennial update report (BUR2). |
| (f) Information on the circumstances under which the Party may update the values of the reference indicators. | The **National GHG emissions** in **base year and reference year** may be **updated and recalculated** due to **methodological changes and refinements**.  In addition, changes in GDP and other macro-economic parameters, as those recognized in COVID-19 Socio-Economic Response Plan for Serbia[[2]](#footnote-3) may lead to update of the values of the reference indicators.    Information on recalculations will be provided in the relevant chapters of the Biennial Update Report (BUR) and Biennial Transparency Report (BTR), respectively. |

|  |  |
| --- | --- |
| 2. Time frames and/or periods for implementation | |
| (a) Time frame and/or period for implementation, including start and end date, consistent with any further relevant decision adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) | The time-frame for implementation is from **1st January 2021 to 31st December 2030**. |
| (b) Whether it is a single-year or multi-year target, as applicable. | **Single-year target established for 2030** |

| 3. Scope and coverage | |
| --- | --- |
| (a) General description of the target; | The contribution determined for 2030 is an **economy-wide GHG reduction target**, expressed as relative reduction by 2030 compared to 2010. |
| (b) Sectors, gases, categories and pools covered by the nationally determined contribution, including, as applicable, consistent with Intergovernmental Panel on Climate Change (IPCC) guidelines; | **Included IPCC Sectors:** Energy, Industrial processes and product use (IPPU),  Agriculture, Waste  **Excluded IPCC Sectors:** Land use, Land use change and Forestry (LULUCF) - due to lack of sufficient activity data, emission factors and parameters necessary for accurate estimation of GHG emission reduction.  LULUCF was also not included in the first NDC. |
| **Gases covered:** all greenhouse gases (GHG) not controlled by the Montreal Protocol – carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3).  **Carbon pools**: not applicable |
| (c) How the Party has taken into consideration paragraph 31(c) and (d) of decision 1/CP.21; | **Applied IPCC Guidelines:** The national GHG inventory (emissions by sources and removals by sinks) is prepared in accordance with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the 2013 Supplement to the 2006 IPCC Guidelines for the National Greenhouse Gas Inventories - Wetlands (IPCC 2013 Wetlands Supplement).  The Republic of Serbia takes note of future application of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[[3]](#footnote-4).  There are several activities which cannot be estimated due to lack of data:   * Use of fluorinated gases as foam blowing agents, in fire protection equipment and electrical equipment; * Liming activities; * Open burning. |
| (d) Mitigation co-benefits resulting from Parties’ adaptation actions and/or economic diversification plans, including description of specific projects, measures and initiatives of Parties’ adaptation actions and/or economic diversification plans. | The implementation of the adaptation measures proposed in the Draft Low Carbon Development Strategy (LCDS) with Action plan and Adaptation Planning Framework will contribute to the achievement of the full mitigation potential in the sectors of agriculture, forestry and water as analysed in Serbia´s new report on nature based solutions[[4]](#footnote-5):  **Agriculture – food production**   * New irrigation systems construction and efficient use of existing ones * Multipurpose small accumulation lakes, ponds and reservoirs for water supply, irrigation, erosion control, ecosystem services   Adjustment of the technologies of agricultural plant and animal production (selection of species and agro technical measures, increasing the quality of soil and rational use of fertilizer, adaptation of crop rotation, adjusting zootechnical conditions in animal husbandry facilities)Appropriate selection of species might reduce water and nutrient supply, therefore reducing GHG emissions. Increased agricultural biomass production can partly (crop residues, waste) used for renewable energy production, replacing the use of fossil fuels[[5]](#footnote-6). Nutrient management’s mitigation potential was assessed to  1.09 Mt CO2 equ./yr. Optimal grazing management and grazing legumes in pastures have the potential to reduce GHG emissions by 0.27 Mt CO2 equ./yr.  **Forestry – bioenergy**   * Afforestation of new land using site mapping and climate change adapted tree species, * Reforestation, * Change of forest management practices towards close-to- nature forest management approach, * Introduction of a "climate smart forestry" approach * Fire management and * Integrated pest management   result in mitigation co-benefits by supporting the replacement of fossil fuels and construction materials by biomass. The mitigation potential of afforestation has been assessed at 25.9 Mt CO2 equ/yr. Effect of Sustainable Forest Management and Close to Nature Management is estimated at 1.008 Mt CO2 eq by the year 2030, from all three aspects (close to nature forest management, conversion of coppice forest and regeneration of over mature beech stands).  **Hydrology and Water Resources – hydro-electric production**   * Construction of flooding/torrential barriers and additional measures in the basin * Improvement of the system for observation, data collection and early warning systems for extreme climate and hydrological events and development of mathematical models for optimal management of hydro power plants (HPPs) * Increase in water storage capacity   Water availability is an important factor for the production of renewable energy (hydro power) and the production of biomass for the production of energy and construction material.  Mitigation co-benefits resulting from adaptation actions will be further elaborated in the National Adaptation Plan (NAP) that is under development and might increase the co-benefits mentioned above. |

| 4. Planning processes | |
| --- | --- |
| (a) Information on the planning processes that the Party undertook to prepare its nationally determined contribution and, if available, on the Party’s implementation plans, including, as appropriate: | The GHG emission reduction target presented in this NDC is determined based on the Draft **Low Carbon Development Strategy (LCDS)**, while its achievement is defined by an accompanying **Action Plan**. The planning and information relevant to the NDC are presented in Second BUR (BUR2).  Consultations during the process of preparation of the LCDS and AP included 15 events with app. 40 participants per event representing governmental institutions, public and private companies, NGOs, scientific and research institutions. Gender equality was considered during the preparation and realization of these events.  From June 2020 process of finalization of the NDC included additional 3 public events with app. participants. Moreover, the first version of the NDC was published for comments and suggestions from….to….  The NDC planning and revision took into account obligations resulting from the EU accession process as well as national circumstances and capacities.  Following the international and certain provisions of the EU legislation, involvement of the broad range of stakeholders was ensured through public consultation process, working groups responsible for preparation of the NDC, as well as on-line surveys and questionnaires. |
| 1. Domestic institutional arrangements, public participation and engagement with local communities and indigenous peoples, in a gender-responsive manner; | The **Ministry of Environmental Protection (MEP)** has as **national entity** the overarching cross-sectoral responsibility for coordination of monitoring and reporting on climate change PAMs implementation on national and international level.  The Draft **Law on Climate Change (LCC)** (to be adopted), defines roles and responsibilities of other ministries, agencies and organizations. It introduces reporting obligations to local communities as well as procedures relevant to climate change mitigation and climate change adaptation on the national and local level.  Moreover, gender sensitive data and indicators are identified and shall be part of the MRV system[[6]](#footnote-7) when the Law is adopted. |
| 1. Contextual matters, including, inter alia, as appropriate: |  |
| (a) National circumstances, such as geography, climate, economy, sustainable development and poverty eradication | Information provided in the Second BUR. |
| (b) Best practices and experience related to the preparation of the nationally determined contribution | Establishment of the WG for development of NDC and LCDS and AP that includes representatives of different stakeholders and responsible institutions ensured easier collection of data and information.  Since 2018, the Coordination Body for Gender Equality has representatives in working groups of the inter-ministerial projects supporting improvement of reporting to the UNFCCC in a context of gender equality.  The economic, environmental and social impacts of the mitigation measures were considered in the Strategic Environmental Assessment (SEA) improving their quality and reliability.  The NDC preparation process was not possible without international financial and technical support that contributed to improvement of the national capacities.  However, there is still a need for financial and capacity building and rising awareness support to ensure implementation and revision of the NDC.  Based on Serbia´s LCDS and its Climate Finance Strategy[[7]](#footnote-8), the resources required for achieving the goals set by the LCDS in the least ambitious scenario[[8]](#footnote-9) (i.e., “M2” as defined by the draft Strategy) are estimated at EUR 6.5 billion until 2030 and anywhere between EUR 37.8 and 76.8 billion in the period from 2030 and 2050, of which more than 97% refer to the energy sector. The LCDS provides an estimate of the financing mix and determines that in the period from 2020 until 2030 consumers will bear the largest financial burden (i.e., 63%), 33% will be financed by investors, while the Government is expected to effectively finance 4% of the estimated cost. |
| (c) Other contextual aspirations and priorities acknowledged when joining the Paris Agreement | Serbia faces a particular challenge related to the direct impacts of low carbon development in the coal sector and its workers, and in the coal regions and their communities. It is of the utmost importance to include elements of a just transition in planning towards low carbon development[[9]](#footnote-10). A low carbon energy system requires different labour skills than a fossil fuel based economy. As the development of skills takes time, the early planning for making such skills available is essential.  Serbia suffered damages caused by climate change and extreme weather events (in the period 2000-2015 minimum EUR 1.8 billion, additional to EUR 5 billion in the period 2015-2020).  With significant contribution of the agricultural production to total gross domestic product, the overall national economy of the Republic of Serbia is sensitive to all factors that affect agriculture.[[10]](#footnote-11) Impacts of climate change on crop production and livestock production have impact on food storage and food processing sectors in Serbia.  Effects and impacts of climate change on water sector will be reflected in shortage of water, more periods of intense drought and areas affected by droughts and an increased duration of low-flow conditions in rivers and resulting law level water quality.  The majority of the working population in Serbia are men. Recognizing the issue Coordination Body for Gender Equality was established in 2014 and a National Strategy for Gender Equality for the period 2016-2020 with Action plan was prepared and adopted.  Thus. the situation on the labor market has improved with the recovery from the economic crisis and floods, so activity rates have increased for both women and men (to 60.6% and 75.1% in 2018, respectively), but the gender gap is still present[[11]](#footnote-12).  The combustion of solid and liquid fuels for power generation, domestic heating and in vehicle engines result in the emissions of air pollutants that have harmful effects on human health, in addition to the GHGs emissions. The overall health impact of air pollution for the whole of the urban areas in Serbia (not just the 11 cities studied in detail) was estimated at 6 394 attributable deaths.[[12]](#footnote-13)  **Air quality protection and resilience to climate change – Reduction of short-lived climate pollutants (SLCPs)** |
|  |
| (b) Specific information applicable to Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under Article 4, paragraph 2, of the Paris Agreement, including the Parties that agreed to act jointly and the terms of the agreement, in accordance with Article 4, paragraphs 16–18, of the Paris Agreement; | The Republic of Serbia has signed the Association Agreement with the European Union in 2012, the Stabilization and Association Agreement (SAA) between Serbia and the EU entered into force in September 2013.[[13]](#footnote-14)  Thus, the country has **committed to aligning its legislation on climate change** **to the EU** acquis that will significantly contribute to the GHG emission reduction. |
| (c) How the Party’s preparation of its nationally determined contribution has been informed by the outcomes of the global stocktake, in accordance with Article 4, paragraph 9, of the Paris Agreement | During COP 24, high-level representatives of the Delegation of the Republic of Serbia participated in the **Talanoa Dialogue round-tables**.  In May 2018, in cooperation with the European Commission (EC), an **EU – Serbia Talanoa high-level conference[[14]](#footnote-15)** was organized, supporting the involvement of a broad range of public and private actors (including public and private companies) in development of NDC and combating climate change.  In compliance with modalities of the global stocktake, the reduction commitments of the updated NDC of the Republic of Serbia will be considered. |
| (d) Each Party with a nationally determined contribution under Article 4 of the Paris Agreement that consists of adaptation action and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, paragraph 7, of the Paris Agreement to submit information on: |  |
| 1. How the economic and social consequences of response measures have been considered in developing the nationally determined contribution | The economic, environmental and social impacts of the measures were considered in tandem with the Strategic Environmental Assessment (SEA) process. The impact assessment focused on assessing climate change risk and prioritizing adaptation measures for the following identified three priority sectors: Agriculture, Forestry, Water resources.  Afforestation can be assumed as measure increasing employment of men mainly. Increasing energy costs for households which are expected with increased penetration of renewables in the energy mix, may negatively impact women, as women have a particular role in using energy in the households (lighting, heating, cooking, cleaning, ironing) and households with low income. At the same way, measures related to biomass use as household energy source, namely for cooking and heating (such as Promotion of proper use of wood) may positively affect women. **Water resources**: Adaptation measures in hydrology and water resources will have a positive impact on the objectives of the strategic assessment by almost all parameters. The measure related to the construction of flooding barriers and additional measures in the basin may have a smaller local negative impact on protection of arable land. |
| 1. Specific projects, measures and activities to be implemented to contribute to mitigation co-benefits, including information on adaptation plans that also yield mitigation co-benefits, which may cover, but are not limited to, key sectors, such as energy, resources, water resources, coastal resources, human settlements and urban planning, agriculture and forestry | Beside actions in Adaptation planning framework of the LCDS, that are presented in draft third National Communication, actions will be further elaborated in the National Adaptation Plan (NAP) that is under development. |
| 1. and economic diversification actions, which may cover, but are not limited to, sectors such as manufacturing and industry, energy and mining, transport and communication, construction, tourism, real estate, agriculture and fisheries. | Beside actions in sectors included in the Adaptation planning framework of the LCDS, that are presented in draft third National Communication, economic diversification actions in energy, transport and infrastructure will be further elaborated in the National Adaptation Plan (NAP) that is under development. |

| 5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals | |
| --- | --- |
| (a) Assumptions and methodological approaches used for accounting for anthropogenic greenhouse gas emissions and removals corresponding to the Party’s nationally determined contribution, consistent with decision 1/CP.21, paragraph 31, and accounting guidance adopted by the CMA; | Information are available in the 2BUR and in case of changes, updated information will be presented within the Biennial Transparency Report. |
| (b) Assumptions and methodological approaches used for accounting for the implementation of policies and measures or strategies in the nationally determined contribution; |  |
| Information are available in the 2BUR and in case of changes, updated information will be presented within the Biennial Transparency Report |
| (c) If applicable, information on how the Party will take into account existing methods and guidance under the Convention to account for anthropogenic emissions and removals, in accordance with Article 4, paragraph 14, of the Paris Agreement, as appropriate; | Information are available in the 2BUR and in case of changes, updated information will be presented within the Biennial Transparency |
| (d) IPCC methodologies and metrics used for estimating anthropogenic greenhouse gas emissions and removals; | Information are available in the 2BUR and in case of changes, updated information will be presented within the Biennial Transparency.  Current GHG inventories are compliant with Decision 24/CP.19, including 2006 IPCC Guidelines for National Greenhouse Gas, IPCC 2013 KP Supplement) and the 2013 Supplement to the 2006 IPCC Guidelines for the National Greenhouse Gas Inventories: Wetlands (IPCC 2013 Wetlands Supplement)  The metrics used is the Global Warming Potentials (GWP) of a 100-year time horizon published in the IPCC Fourth Assessment Report (AR4).  These methodologies are subject to change depending on the progress of future international negotiations on estimating and accounting rules. |
| (e) Sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, as appropriate, including, as applicable: |  |
| 1. Approach to addressing emissions and subsequent removals from natural disturbances on managed lands; | The approach to addressing emissions and subsequent removals from natural disturbances on managed lands presented in the 2006 IPCC Guidelines, Volume 4, Chapter 2: Generic Methodologies Applicable to Multiple Land-Use Categories, are used. |
| 1. Approach used to account for emissions and removals from harvested wood products; | The approach used to account for emissions and removals from harvested wood products presented in the 2006 IPCC Guidelines, Volume 4, Chapter 12, Harvested Wood Products, are used. |
| 1. Approach used to address the effects of age-class structure in forests; | Not applicable |
| (f) Other assumptions and methodological approaches used for understanding the nationally determined contribution and, if applicable, estimating corresponding emissions and removals, including: |  |
| 1. How the reference indicators, baseline(s) and/or reference level(s), including, where applicable, sector-, category- or activity-specific reference levels, are constructed, including, for example, key parameters, assumptions, definitions, methodologies, data sources and models used; | The reference indicators, baseline(s) and reference level are constructed based on National GHG Inventory and baseline scenarios taking into account policies and measures adopted by the end of 2015.  Information are available in the 2BUR. |
| 1. For Parties with nationally determined contributions that contain non- greenhouse-gas components, information on assumptions and methodological approaches used in relation to those components, as applicable; | Not applicable |
| 1. For climate forcers included in nationally determined contributions not covered by IPCC guidelines, information on how the climate forcers are estimated; | Not applicable |
| 1. Further technical information, as necessary; | Not applicable |
| (g) The intention to use voluntary cooperation under Article 6 of the Paris Agreement, if applicable. | Participation in global carbon market mechanisms is principally supported by Serbia as under the consideration of the final implementing decision of Art. 6.  Moreover, as the EU candidate country Serbia aligns its legislation with the EU acquis, including the EU Emissions Trading System. |

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| 6. How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances: | |
| (a) How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances; | Under the UNFCCC, Serbia is a developing country Party, which energy production relay on domestic lignite, that increase of the ambition of more than three times compared to the first NDC.  NDC of the Republic of Serbia is a part of the long-term GHG emission reduction vision in the year 2050 as required by the Paris Agreement long-term goals.  Roadmap for a Just Transition in Serbia is defined and in compliance with modalities of the global stocktake, the reduction commitments of the updated NDC of the Republic of Serbia will be considered.  Serbia suffered damages of minimum EUR 1.8 billion in just five year period (2015-2020). Moreover, Serbia’s GDP potential decrease in case of the global mean temperature increase, relative to the projected GDP without warming is:[[15]](#footnote-16)   |  |  |  | | --- | --- | --- | |  | **GDP decrease (billion USD and %)** | | | **Temperature increase** | **2020 - 2040** | **2020 – 2100** | | 1 °C | 15,465 (1.20%) | 344,364 (4.19%) | | 2 °C | 58,124 (4.53%) | 766,317 (9.32%) | | 3 °C | 59,107 (4.97%) | 890,403 (11.65%) | | 4 °C | 97,536 (6.87%) | 2,002,410 (17.06%) | |
| (b) Fairness considerations, including reflecting on equity; | 1. Refer to 6(a) above ; all scenarios project certain job loss mainly due to the reduction of jobs in the sectors related to fossil fuels and, to a certain extent, in agriculture. Serbia plans to promote skill formation and reallocation of labour in order to contribute to the fairness of the effort to reduce emission across the economy and the society, in particular in regions most affected by the transition of jobs, in close coordination with the social partners. |
| (c) How the Party has addressed Article 4, paragraph 3, of the Paris Agreement; | The presented contribution represents a clear progression beyond the current NDC and reflects the highest possible ambition under consideration of the national circumstances. |
| (d) How the Party has addressed Article 4, paragraph 4, of the Paris Agreement; | Serbia is a developing Party and has hereby enhanced its NDC, which represents an economy wide reduction target. |
| (e) How the Party has addressed Article 4, paragraph 6, of the Paris Agreement. | Not applicable |

|  |  |
| --- | --- |
| 7. How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2: | |
| (a) How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2; | Even though the Republic of Serbia is a non-Annex I Party to the UNFCCC vulnerable to climate change, significant increase of ambition in the updated NDC contributes to achievement of the objective of the Convention, namely stabilization of GHG concentration in the atmosphere. |
| (b) How the nationally determined contribution contributes towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement. | See here 7(a) above  In particular, it should be noted that Serbia is ready for additional/ conditional ambition with financial, technical and capacity building assistance. |

**ANNEXES: Further information necessary for clarity, transparency and understanding (ICTU) of the Nationally Determined Contribution (NDC)**

# Information in Annexes provide information and data that ensures clarity, transparency and understanding of those already provided in previously presented updated NDC. It is not recommended to submit all those to the UNFCCC. However, in order to keep all information publicly available and to continue transparency of the process it is recommended to provide link for founding that information (in MRV system). Thus content of annexes at the end is decision of the MEP. We recommend to keep it detailed.

# Annex 1 - Key sectors and Greenhouse gas Emissions

## **Overview of GHG inventory in the period 1990-2015**

Total emissions of GHG in 2015, (without LULUCF), amounted to 61,233 kt CO2 eq., which represents a 2.3% decrease of emissions compared to the year 2010 and a 13.7% increase compared to 2014. The main driver behind the increased emissions in 2015 was the recovery (+22.2%) of activities in IPCC category 1.A.1.a Production of electricity, after the extensive floods in 2014 which resulted in a shut-down of some electricity producers. Furthermore, significant increase of GHG emissions in 2015 was identified in the IPCC category manufacturing industries and constructions (+16.6%) and IPCC category 2.C Industrial processes (+12.6%) due to revival of steel production in Serbia. Moderate decline of GHG emissions in the period 2010-2015 was also observed in IPCC sectors waste (-0.7%) and agriculture (-0.9%).

Figure 2: Serbia’s total GHG emissions (w/o LULUCF) (1990-2015) (kt CO2eq)



| **IPCC code** | **IPCC sector** | **1990** | **2005** | **2010** | **2015** | **Trend** | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1990 - 2030 | 2010 - 2030 |
| 1.A.1 | Energy industries | 44,146 | 35,557 | 33,050 | 34,700 | -37.9% | -17.0% |
| 1.A.2 | Manufacturing industries and construction | 6,418 | 6,064 | 4,278 | 3,4 52 | -43.1% | -14.7% |
| 1.A.3 | Transport | 4,564 | 6,702 | 6,742 | 5,995 | 62.9% | 10.2% |
| 1.A.4 | Other sectors | 7,048 | 3,030 | 3,477 | 2,711 | -70.4% | -39.9% |
| 1.B | Fugitive emissions | 3,841 | 2,973 | 2,409 | 2,523 | -49.5% | -19.6% |
| 2 | IPPU | 5,455 | 4,729 | 4,660 | 3,883 | -8.4% | 7.2% |
| 3 | Agriculture | 6,186 | 6,238 | 5,305 | 5,259 | -27.4% | -15.3% |
| 5 | Waste | 3,868 | 2,800 | 2,730 | 2,709 | -38.7% | -13.1% |
|  | **TotaL (without LULUCF)** | **81,526** | **68,093** | **62,650** | **61,233** | **-33.3%** | **-13.2%** |
| 4 | LULUCF | -1,432 | -7,090 | -5,627 | -4,533 | 359.2% | 16.9% |
|  | Totals with LULUCF | 80,094 | 61,002 | 57,023 | 56,700 | -40.3% | -16.1% |

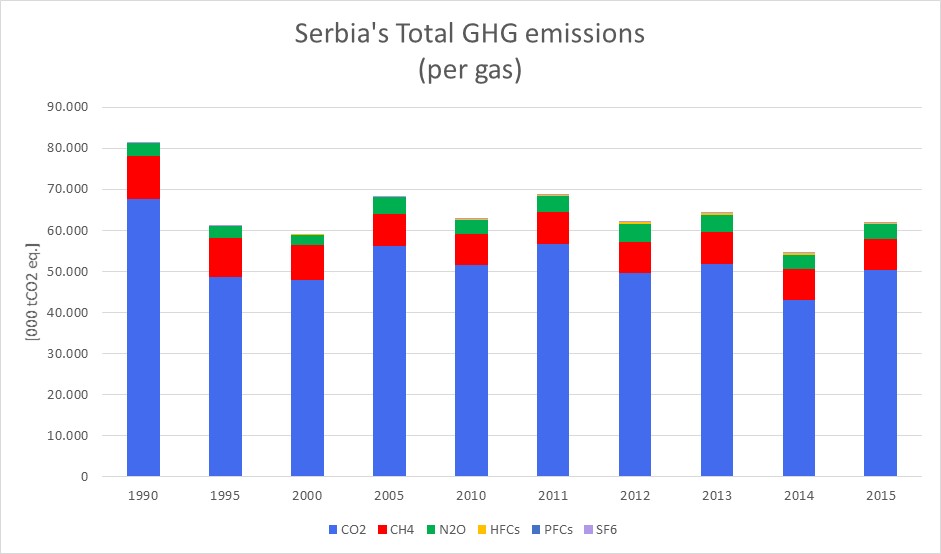
Table 1 Serbia’s total GHG emissions by sector

Figure 2: Serbia’s GHG Emissions – Key sectors in 2010



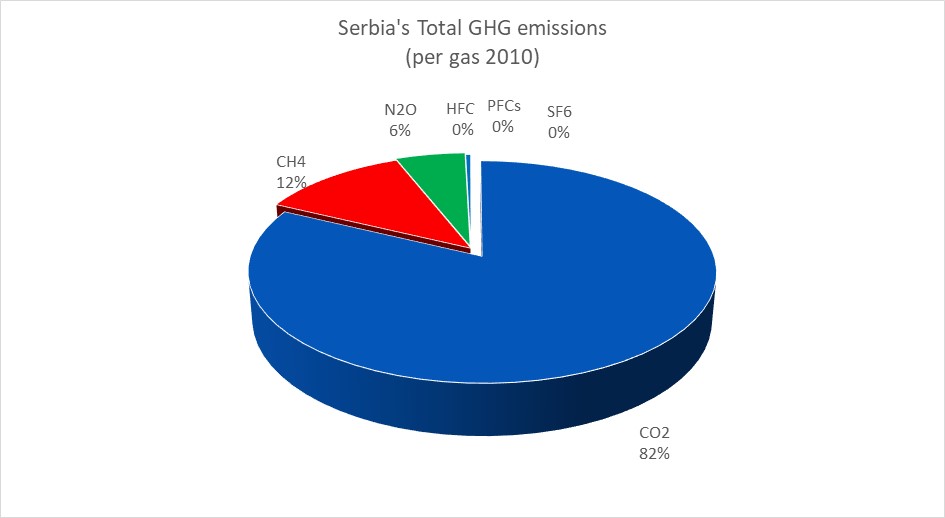
Predominant GHG sector in Serbia is Energy sector. The Energy sector include Fuel combustion (Energy industries, Manufacturing industries, Transport and Other sectors) and Fugitive emissions from fuels and is accounting for 80% of total GHG emissions in Serbia, followed by agriculture (8%), Industrial processes (around 7%) and waste (4%) of the national GHG total. The sector shares in 2010 and 1990 were almost identical which shows that there have not been any structural changes in terms of emission sources in Serbia for the last 25 years.

Figure 4: Serbia´s total GHG emissions (per gas)



In terms of greenhouse gases, CO2 is the predominant gas most significantly driving GHG trends over years. CO2 emissions have declined by 3.7% in 2015 compared to 2010. HFCs emissions increased most (72.4%) in the period 2010 and 2015.

Figure 4: Serbia´s GHG emissions (per gas)



Regarding the share of individual gasses, CO2 was in 2010 representing 82.1% of all emissions, followed by CH4 with 12.0% and N2O with 5.4%. HFC and SF6 together are accounting for 0.4% of total emissions.

# Annex 2 - Adaptation

## STRATEGIC AND LEGISLATIVE FRAMEWORK

The Draft Law on Climate Change[[16]](#footnote-17) has been developed and is expected to be adopted during 2020. The Law provides a **legal framework for the GHG emissions reduction and climate change adaptation** by promoting aligning, adoption and implementation of sectorial policies. This Law foresees the development of the Low Carbon Development Strategy (LCDS) and the **Climate Change Adaptation Programme/National Adaptation Plan (NAP)**, as well as the establishment of a GHG emission monitoring, reporting and verification (MRV) system.

During the process of preparation of Draft LCDS with the action plan[[17]](#footnote-18) the **Adaptation Planning Framework**[[18]](#footnote-19), which provides a **methodology for assessment and planning of adaptation measures** for future polices and projects in sectors with the highest priorities in adaptation, was developed.

The NAP**[[19]](#footnote-20)** is aimed at assessing the impacts of climate change on the society and sectors of the economy, identifying the most vulnerable sectors, propose adaptation measures, and assess their costs and benefits. The overall goal of the Programme is to develop a list of priority adaptation measures and to identify the implementation needs, as well as institutions responsible for the implementation. Once the Programme is developed and adopted, planning and policy-making in vulnerable sectors will be aligned with the climate change adaptation policy.

## **OBSERVED AND PROJECTED CLIMATE CHANGE AND EXTREME WEATHER EVENTS**

The top ten hottest years since meteorological measurements began in Serbia are recorded after 2000. The increasing trend of the mean annual temperature has been observed over the last 7 decades (0.36 °C per decade). Since the 1980’s the warming has accelerated to 0.6°C per decade.[[20]](#footnote-21)

The observed mean annual temperature increase in the period 2008-2017 relative to the reference period 1961-1990 in the largest part of territory of Serbia exceeded 1.5°C, and in the western and eastern parts of the country it even exceeded 2°C. During the same time period, the annual precipitation increased up to 10%, and in the southern part of the country up to 20% relative to the reference period. Observed changes are more pronounced during the summer season which has become warmer by about 2.5°C, while summer precipitation decreased by 10 to 20% in most of the country, and up to 30% in the southern part.Increasing frequency of extreme events has been observed, including among others heat waves, droughts, flooding, intense rainfall, etc.

Projections of regional climate models according to two IPCC scenarios of GHG emissions, the RCP8.5 and RCP4.5[[21]](#footnote-22), foresee further increase of temperature, changes in the precipitation regime, and increase of intensity and frequency of extreme weather events.

According to the scenario RCP4.5, which implies the stabilization of the GHG emissions by 2040, the mean annual temperature in the territory of Serbia will increase relative to the reference period (1986-2005) by about 0.5°C in the near future (2016-2035), by 1.5°C by the middle of the century (2046-2065) and up to 2°C by the end of the century (2081-2100). The change in the mean annual precipitation will not be as pronounced as in the case of temperature change, but will be characterized by interannual precipitation redistribution. It is estimated that by the middle of the century there will be a reduction of mean annual precipitation of up to 5% in most of the country, along with an increase of up to 5% in the north. By the end of the century, a larger part of the territory of Serbia could experience up to 10% more precipitation at the annual level, but at the same time up to 20% less precipitation during summer.

The changes of the mean annual temperatures according to the scenario RCP8.5, which implies continued increase of emissions until the end of the century, would be greater by about 0.5°C relative to RCP4.5 in the first two time periods, while by the end of the century under this scenario they are expected to increase by about 4.3°C relative to the reference period. By the middle of the century mean annual precipitation is expected to increase practically in the whole territory of Serbia up to 10%. By the end of the century, this trend will change, and only the northern part of the country will have an increase of mean annual participation up to 10%, while the rest of the country in most parts will experience a reduction of up to 10% and up to 20% in the southern parts. During the summer season, the deficit of rainfall will be stronger and will range from 10 to 30% across Serbia.

## **SECTORIAL ASSESSMENT OF CLIMATE CHANGE IMPACTS AND PROPOSED ADAPTATION MEASURES**

As presented in the NDC, the sectors that are most vulnerable to climate change in Serbia include: agriculture, water management, forestry, biodiversity and public health.

### AGRICULTURE

It is estimated that drought causes the greatest losses and damages in the Serbian agriculture. During the past 20 years Serbia has recorded 7 dry years (on average, one dry year per 2.8 years), while in the period 1950-2000 there were only 3 dry years (one dry year per 16.7 years). Only one drought, in 2012, resulted in estimated damages and losses in the Serbian agriculture of USD 2 billions. The Draft National Adaptation Plan estimated the losses and damages resulting from drought in the Serbian agriculture in the period 1994-2014 at minimum USD 4.6 billions.[[22]](#footnote-23)

The Strategy of Agriculture and Rural Development for the period 2014-2024[[23]](#footnote-24) recognizes that the response to climate change impacts in this sector so far has been inadequate and that system-wide solutions are needed, particularly related to use of new technologies. That is why the adaptation and mitigating climate change impacts are defined as one of the strategic objectives of the Serbian agricultural policy.

Priority adaptation measures in the sector of agriculture (Annex III) proposed through the relevant sectorial strategies and planning documents are:

1. Constructing new irrigation systems and more efficient use of the existing ones.
2. Use of small, multi-purpose water accumulations.
3. Adjustment of the technologies of agricultural plant and animal production.
4. Improvement of the use of meteorological and climatological information for planning in agriculture.

### WATER MANAGEMENT

The greatest share of the available surface water is that of transit waters (92%) flowing into Serbia as big rivers, while only 8% originates on the territory of the country. In the north, the greatest part of water resources belong to transit waters, while in the south surface waters are mostly domicile waters that depend on local the climate conditions, more specifically on the difference between total precipitation and evapotranspiration. Due to the temperature increase in recent decades, Serbia has experienced increased evapotranspiration, which ranges from a couple of percentages to as much as 10% for the period 2008-2017 relative to the reference period 1961-1990. The positive trend of evapotranspiration, along with interannual redistribution of precipitation has resulted in reduced the water content in soil (up to 2m depth) in practically the whole territory of Serbia. The biggest reduction of the soil water content, exceeding 10%, has been recorded during summer and autumn months, which in turn can affect water supply, agricultural and energy production. Measurements have indicated a trend of reducing river flows in central and southern Serbia, amounting to -2 to -3% per decade. Negative trends of river flows have been observed on the Sava and the Danube (about -1% per decade) rivers. At the same time, due to more frequent and intensive rainfall there are increasing risks from floods and flash floods.[[24]](#footnote-25)

The anticipated changes in the precipitation regime, the redistribution of precipitation within a year, longer dry periods, increased intensity of precipitation and less snowfall will affect the future availability of surface and ground water in the country. Projections indicate19 further reduction of flows on all rivers in Serbia, amounting to -8% by the mid-century and up to -17% by the end of the century, compared to the reference period 1971-2000. The biggest reduction in river flows is expected in central and eastern Serbia, and the least on the Sava and the Danube rivers.

Alongside, the groundwater recharge is expected to reduce across the whole territory of Serbia on the average by -10% by the mid-century and by up to -50% by the end of the century, compared to the reference period 1951-2010. This reduction will more strongly affect groundwater in the east and southeast of the country.

The increase of air temperature will also affect the increase of water temperatures, which could have negative effects on the quality of water, the ecosystems and energy production.

Water management in Serbia is organised in three strategic areas: water use, protection against harmful effects of water, and protection of water quality. The Water Management Strategy for the territory of the Republic of Serbia until 2034 recommends many measures for improvement of the strategic areas, many of which may be considered as adaptation measures since the water resources strongly depend on climate conditions. Priority adaptation measures adopted from the Strategy (Annex 3) are:

1. Increasing efficiency of water supply systems
2. Improving protection of water springs and preservation of water quality
3. Development of flood risk management plans
4. Improving protection against floods and flash floods
5. Improving protection against inland flooding
6. Improving the water management in drought conditions and water shortage

### FORESTRY

The forests in Serbia cover about 2,360,000 ha, most of which are state owned (51.4%). The major types of forests are beech (27.6%), oak (24.6%), with only about 6% of coniferous trees. The Forestry Development Strategy of the Republic of Serbia[[25]](#footnote-26) estimated that the state of forests is unsatisfactory in terms of their health, age structure, production funds and forest cover.

The most significant climate change impacts on forests in Serbia include the more frequent occurrence of droughts, forest fires, pests and diseases. The English oak has been identified as the most vulnerable tree species as it is dependant on the groundwater level, which is being reduced in recent decades. On the other hand, black and white pine and downy oak are coping well with the arid conditions and will be least affected by the more frequent droughts in the future. Extreme droughts, fires, strong winds, frost, and pests (gypsy moth, *Lymantria dispar* L.) and diseases have caused the largest damages in Serbian forests in the past two decades.

Due to the poor status of forests and their huge significance for both climate change mitigation and adaptation, it is necessary to systemically improve the forestry sector. Priority adaptation measures (Annex III)

proposed through the relevant strategic and planning documents include:

1. Reforestation using climate adaptable tree species
2. Adopting the close-to-nature forest management and the climate-smart forestry principles and approaches
3. Conversion of coppice into high forests
4. Reducing the negative risk factors of biotic and abiotic origin

### BIODIVERSITY

Climate change in Serbia could result in phenological, morphological, physiological changes and changes in the behaviour of species, changes in conditions or loss of existing natural habitats, changes in number and distribution of species, increasing the number of pests and diseases, or genetic changes. The most vulnerable habitats are high mountains, pastures, forests, riverbanks, wetlands and steppe habitats.

Although biodiversity in Serbia is threatened by climate change, research in this field is not at a significant level. The Biodiversity Strategy of the Republic of Serbia with the accompanying Action Plan for the period 2011-2018[[26]](#footnote-27) envisaged several measures related to the climate change adaptation, which have hardly been achieved at all. The Draft Nature Protection Programme of the Republic of Serbia for the period 2020-2022[[27]](#footnote-28) stipulates that the main problems in the field of biodiversity adaptation to climate change are insufficient interaction among researchers, decision-makers and other stakeholders, lack of systematic monitoring of climate change impacts on biodiversity, insufficient number of models for projections and assessment of climate change impacts on biodiversity, as well as low public awareness on this issue. Within the specific strategic objective of biodiversity protection, there is a defined measure on ***monitoring the impacts of climate change on biodiversity and impacts of biodiversity on mitigating the effects of climate change***. It implies the development of the vulnerability assessment methodology and indicators, determining the number of species, habitats and ecosystems that are subject to monitoring climate change impacts, developing specific measures to protect the species and habitats sensitive to climate change, monitoring the level of endangerment of biodiversity from natural disasters, and raising public awareness about the climate change impacts on biodiversity through campaigns, media, and scientific publications. In addition, in order to strengthen research capacities, it is necessary to work on ***improving the cooperation among scientists and researches and capacities of researchers***. One of the first comprehensive steps would be to ***develop a national assessment of biodiversity vulnerability to climate change*** in Serbia. All strategic measures relevant to reducing vulnerability and biodiversity losses and maintaining biological diversity at genetic, species, and ecosystem levels can be understood as adaptation measures, as they increase the adaptive capacity.

### PUBLIC HEALTH

Climate change can have a direct or indirect impact on public health. Direct impact implies injuries, diseases, and fatalities resulting from climate change and extreme weather events (floods, heat waves, storms, etc.). The indirect impact includes the consequences for public health that are associated with the more frequent occurrence of vector-borne diseases, reduced air and water quality, as well as reduced availability of food and water. The categories of population that are particularly vulnerable to the health impacts of climate change are the elderly, particularly those in single member households, the chronically ill, the poor, children, farmers and outdoors workers. It is estimated that in Serbia about 35% of the total population is vulnerable.[[28]](#footnote-29)

Climate change is included in the Public Health Strategy of the Republic of Serbia 2018-2026[[29]](#footnote-30) through the specific objective to improve the environment, adaptation measures and response to climate change – ***development of action plans for response to climate change in urban areas***. Although not specifically stated, all strategic measures related to improving the quality of air, water and soil, to improving monitoring of infectious diseases, those aimed at improving the position of vulnerable population groups (prevention of chronic diseases, poverty reduction, improving access to health care services), and measures aimed at strengthening the capacities of health care institutions and services, could be indirectly understood as climate change adaptation measures.

Nevertheless, it is necessary to conduct a detailed vulnerability assessment on the territory of Serbia, to plan adaptation measures, to set priorities and to mainstream them in the strategic documents of the public health sector. Problems that might arise in this process are primarily the lack of relevant systematised data needed for assessment of climate change effects on health, and insufficient funding and capacities. Therefore, as a first step it is necessary to ***improve scientific research, cooperation and capacities in the field*** and to ***establish a monitoring system on infectious diseases and vectors (i.e. mosquitos) introduced as a consequence of climate change***.

## **DISASTER RISK REDUCTION**

Serbia’s First NDC quotes that the damages caused by climate change and extreme weather events for the period 2000-2015 are estimated at minimum EUR 5 billion. Of this amount, more than 70% are damages caused by droughts and high temperatures. Individual events with highest damages are the drought of 2012 (EUR 2 billion) and the floods of 2014 (EUR 1.7 billion).

The **National Programme and the National Strategy for Protection and Rescue in Emergency Situation**[[30]](#footnote-31) were the basis for the adoption of the Action Plan for implementation of the National Disaster Risk Management Programme for the period 2017-2020. Its general goal is for the Republic of Serbia to build a disasters risk management system, to establish a system of inter-institutional cooperation, and to become more resilient to natural disasters and other hazards and to be capable to recover in a timely manner.

On the basis of the **National Strategy for Protection and Rescue in Emergency Situation**[[31]](#footnote-32) the **Law on Disaster Risk Reduction and Emergency Management**[[32]](#footnote-33) was adopted. This Law introduced the obligation to develop **Disaster Risk Assessments and Plans for Protection and Rescue** at national level, at the level of units of local self-governments, companies, public health, social and educational institutions, and legal entities. The methodology is also prescribed to conduct vulnerability assessments in case of natural disasters and other accidents and protection and rescue plans in emergencies.

The **Emergency Management Sector** of the Ministry of Internal Affairs conducted the **Disaster Risks Assessment** for the Republic of Serbia[[33]](#footnote-34), which was adopted in March 2019. It is also responsible for collection and publishing data on loss and damage.

### FINANCIAL ASSESSMENT OF LOSS AND DAMAGE

The **assessment of loss and damage caused by natural disasters** in the Republic of Serbia is done using the **Guidance on a unique methodology for assessing the damage from natural disasters**[[34]](#footnote-35) adopted in 1987. Since the methodology is outdated and not very detailed, in practice the financial assessment is done only for adverse events with large consequences on infrastructure and housing, such as floods and earthquakes.

Financial assessment of loss and damage of natural disasters in the period 2015-2020 in Serbia was done using publicly available data from different sources. In the Table 2 presented are minimum estimated loss and damage for the natural disasters and extreme weather events recorded in Serbia in 2015-2020 period. This analysis finds that Serbia suffered damage of minimum 1.8 billion EUR in this five-year long period.

Table 2 Minimum estimated loss and damage for the natural disasters and extreme weather events recorded in Serbia in 2015-2020

| **Event** | **Period** | **Details** | **Minimum estimate of loss and damage (EUR)** | **Data source** |
| --- | --- | --- | --- | --- |
| Flooding | January-March 2015 | Several municipalities of central, southern and western Serbia were affected | 7,730 | Public Investment Management Office and DesInventar |
| Flooding | March 2016 | 16 municipalities of central and western Serbia were affected | 1,648,665 | Public Investment Management Office and DesInventar |
| Flooding | May-June 2017 | 12 municipalities of central and western Serbia were affected | 280,538 | Public Investment Management Office and DesInventar |
| Flooding | March-April 2018 | 19 municipalities of central, eastern and western Serbia were affected | 2,511,880 | Public Investment Management Office and DesInventar |
| Flooding | May-August 2018 | 23 municipalities of central, eastern and western Serbia were affected | 313,288,986 | Public Investment Management Office and DesInventar |
| Flooding | June 2019 | 22 municipalities of central, eastern and western Serbia were affected | 3,661,793 | Public Investment Management Office and DesInventar |
| Flooding | June-July 2020 |  | 4,383,303 | Public Investment Management Office and DesInventar |
| Forest fire | 2015 | 1,033 ha of forest were affected and 5,059 m3 of trees were damaged | 128,619 | Statistical Office of the Republic of Serbia, Forestry in the Republic of Serbia 2015 |
| Forest fire | 2016 | 317 ha of forest were affected and 37,114 m3 of trees were damaged | 943,576 | Statistical Office of the Republic of Serbia, Forestry 2016 |
| Forest fire | 2017 | 1,258 ha of forest were affected and 11,415 m3 of trees were damaged | 290,212 | Statistical Office of the Republic of Serbia, Forestry 2017 |
| Forest fire | 2018 | 690 ha of forest were affected and 707 m3 of trees were damaged | 17,975 | Statistical Office of the Republic of Serbia, Forestry 2018 |
| Forest fire | 2019 | 4,068 ha of forest were affected and 2,397 m3 of trees were damaged | 60,941 | Statistical Office of the Republic of Serbia, Forestry 2019 |
| Extreme weather events in forests (wind, rain, hail, snow, ice) | 2015 | 14,154 ha of forest were affected and 116,431 m3 of trees were damaged | 2,960,110 | Statistical Office of the Republic of Serbia, Forestry in the Republic of Serbia 2015 |
| Extreme weather events in forests (wind, rain, hail, snow, ice) | 2016 | 2,637 ha of forest were affected and 86,826 m3 drveća | 2,207,441 | Statistical Office of the Republic of Serbia, Forestry 2016 |
| Extreme weather events in forests (wind, rain, hail, snow, ice) | 2017 | 10,084 ha of forest were affected and 44,074 m3 of trees were damaged | 1,120,525 | Statistical Office of the Republic of Serbia, Forestry 2017 |
| Extreme weather events in forests (wind, rain, hail, snow, ice) | 2018 | 2,022 ha of forest were affected and 74,495 m3 of trees were damaged | 1,893,941 | Statistical Office of the Republic of Serbia, Forestry 2018 |
| Extreme weather events in forests (wind, rain, hail, snow, ice) | 2019 | 1,999 ha of forest were affected and 58,028 m3 of trees were damaged | 1,475,288 | Statistical Office of the Republic of Serbia, Forestry 2019 |
| Drought | 2015 | Estimated yield losses of wheat, alfalfa and clover | 120,000,000 | 3rd National Communication of the Republic of Serbia - Report on agriculture vulnerability assessment, Stricevic et al., 2020 |
| Drought | 2017 |  | 1,300,000,000 | Maslac, 2018[[35]](#footnote-36) |
| Hailstorm | 2015-2020 | 67 recorded events over 5 years, from May to August | 35,200,000 | DesInventar |
| Windstorm | 2015-2020 | 23 recorded events over 5 years | 7,814,200 | DesInventar |
| Snowstorm | 2015-2020 | 13 recorded events over 5 years, from January to May | 881,245 | DesInventar |
| **TOTAL** |  |  | **1,800,776,968** |  |

The **Study on the** **Socio-economic Aspects of Climate Change in the Republic of Serbia** (2020)[[36]](#footnote-37) estimated is potential change of the country’s GDP if the global mean annual temperature increases by 1°C, 2°C, 3°C, or 4°C by the end of the century.

### LAND DEGRADATION

Preserving and improving the quality of land is an important component of sustainable development, while at the same time it contributes to adaptation and mitigating the climate change impacts. The United Nations Convention to Combat Desertification (UNCCD) has adopted, as one of its goals for sustainable development, to combat against desertification, to restore degraded land and to achieve a land degradation neutrality (LDN) in the world by 2030 (Goal 15.3).

In order to determine the initial degree of degraded land, assess land degradation trends, define measures that need to be taken to achieve LDN, as well as to monitor the effect of these measures, three indicators were set by the UNCCD: land cover, land productivity and carbon stocks.

According to the **Report on the applied methodology and identification of objectives for establishing neutrality of land degradation in the Republic of Serbia**[[37]](#footnote-38) (2019) in the Republic of Serbia degraded land accounts for 6.47% of the total territory of the country (5,725.2 km2), 20.54% of the total territory (18,755.5 km2) is in the category of stable condition, while 72.86% is in the category of improved condition (64,472.7 km2). Based on the analysis of the recommended indicators, a number of measures have been defined, in order to achieve land degradation neutrality in the Republic of Serbia by 2030. The following measures are defined as priorities in this process:

1. Introducing measures addressed to achieve LDN in strategic, legal and planning document.
2. Improvement, restoration and remediation of degraded areas by applying the principles of sustainable land management.
3. Establishment and development of land monitoring in accordance with national environmental protection indicators (land use change, land productivity, land erosion).
4. Establishment of detailed databases for the territory of the Republic of Serbia for the application of LDN methodology.
5. Raising public awareness and the role of education in combating land degradation and drought.

## **IMPLEMENTATION OF ADAPTATION MEASURES**

The establishment of the national strategic and legislative framework in the field of climate change in the Republic of Serbia is underway. While the Draft Law on Climate Change and the Draft Low Carbon Development Strategy with Action plan pending for the adoption, the next important step concerning the climate change adaptation is the development and adoption of the NAP

The needs for the assessment across the sectors are not uniform. In sectors that directly depend on weather conditions, such as agriculture, forestry and water management, the impacts of climate change in Serbia are known, clearly visible and sufficiently scientifically researched. In the adopted strategies of these sectors, some of the proposed measures also refer to climate change adaptation, although it is often not explicitly indicated.

On the other hand, in sectors such as biodiversity, public health, infrastructure and transport, the impact of climate change has been noticed, but not significantly and systematically researched, and in indicators and systems for monitoring the impact and consequences of climate change are generally not developed.

The implementation of the adaptation measures presented in this document should be followed within sectors by monitoring the fulfilment of the objectives of the relevant strategic and planning documents.

# Annex 3 - Mitigation and adaptation measures

## **NDC Implementation Plan**

The NDC Implementation Plan provides information on specific projects, measures, and activities to be implemented. A detailed description of actions that will lead to achievement of the targets presented in the NDC is provided in the LCDS and 2BUR as well as in Third National communication, mostly when it comes to adaptation.

## **Mitigation related projects, measures and actions required for achievement of Serbian NDC**

***Explanation of the table content***

Preparatory (start-off): All relevant preparatory costs for institutional enforcement and administrative preparation and management of the measure

Additional investment costs: Costs additional than those for the Business as Usual (BaU)

Investors: For the purpose of cost estimates, costs have been allocated to the one who makes the investment, irrespective of its capacity to pass the costs of the investment down the value chain to consumers and irrespective of any public subsidies or incentives it received. Investors have been considered to represent companies, public or private and farmers; consumers represent households and state represents state investments from state budget.

| **Mitigation action 1** | **Implementation of the emissions trading system (and implementation of equivalent measures)** |
| --- | --- |
| Description | * ETS works on the 'cap and trade' principle. * Implementation of the MRV aspects of EU-ETS in Serbia is expected to take place by 2025, in line with the planned EU accession year after which the full implementation of the EU ETS can commence. * The gradual introduction of CO2 tax (as equivalent measure) in the ETS sector in the period before entering the EU (2022-2025), is important. |
| Indicators | Reduction of GHG emission by 15% |
| Type of instrument | Financial, regulatory |
| Status | Planned |
| Sector(s) affected | Energy, Industrial processes and product use (IPPU) |
| Gases affected | CO2, N2O |
| Start year of implementation | 2025 |
| Implementing entity(ies) | * Ministry of Environmental Protection * Ministry of Finance * **Implementation partners:** Environmental Protection Agency, Civil Aviation Directorate, Accreditation Body of the Republic of Serbia, Ministry of Mining and Energy |
| Costs | Investment Costs: 279,3 Mio. EURO  Add. budget revenues: 3910,3 Mio. EURO  EU and other funds: 1,6 Mio. EURO |
| Non-GHG mitigation co-benefits | * Improve air quality * Improve resource efficiency |
| Information on interactions of mitigation actions | Support to realization of the Mitigation action 2 and Mitigation action 3) |
| GHG emission reductions (in 2030 (single year) compared to WOM | 6,942 ktCO2 (combined mitigation impact with Mitigation action 3) |
| Target year or period | 2030 |
| Other year | Achievement will be yearly monitored, and corrective measures made in 2030, if necessary |

| **Mitigation action 2** | **Introduction of CO2 tax** |
| --- | --- |
| Description | The introduction of CO2 tax for plants above a certain size in:   * power and heat generation * energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminum, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals * production of nitric, adipic and glyoxylic acids and glyoxal, aluminum   CO2 tax shall start gradually increase from 2022. |
| Indicators | Reduction of GHG emission by 15% |
| Type of instrument | Financial, regulatory |
| Status | Planned |
| Sector(s) affected | Energy, Industrial processes and product use (IPPU) |
| Gases affected | CO2, N2O |
| Start year of implementation | 2022 |
| Implementing entity(ies) | * Ministry of Environmental Protection, Ministry of Finance * Environmental Protection Agency, Civil Aviation Directorate, Accreditation Body of the Republic of Serbia, Ministry of Mining and Energy |
| Costs | Preparatory (start-off): 1.6 Mio. EURO  Additional investment costs for investors: 279.3 Mio. EURO |
| Non-GHG mitigation co-benefits | * Improve air quality * Improve resource efficiency * Reduce negative impacts on health |
| Information on interactions of mitigation actions | Support to realization of the Mitigation action 3 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 161 kt CO2 equ |
| Target year or period | 2030 |
| Other year | Achievement will be yearly monitored, and corrective measures made in 2025, if necessary |

| **Mitigation action 3** | **Increasing the RES use in energy production** |
| --- | --- |
| Description | In order to increase share of RES in energy system, that is mostly based on the coal the Government will continue to incentives use of RES for energy and heat production. The feed in tariff system currently in place in Serbia needs to be updated. |
| Indicators | Reduction of GHG emissions by 17% |
| Type of instrument | Incentive, Financial, Regulatory |
| Status | On-going |
| Sector(s) affected | Energy |
| Gases affected | CO2, CH4, N2O |
| Start year of implementation | From 2009 |
| Implementing entity or entities | Ministry of Mining and Energy, Ministry of Environmental Protection |
| Costs | Preparatory (start-off): 2Mio EUR  The additional investment costs for investors: 635Mio EUR. |
| Non-GHG mitigation co-benefits | Improve air quality  Reduce impacts on health  Increase number of green jobs |
| Information on interactions of mitigation actions | Support to realization of the Mitigation action 1 |
| GHG emission reductions (in 2030 (single year) compared to WOM | Included in Mitigation measure 1 |
| Target year or period | 2030 |
| Other year | Achievement will be yearly monitored, and corrective measures made in 2025, as necessary |

| **Mitigation action 4** | **Improving energy efficiency and increasing use of CHP and RES in district heating systems** |
| --- | --- |
| Description | Different analysis as well as Energy development Strategy underline a large potential for CHP in district heating systems and in industry. There is potential for increase of share of electricity production from CHP in gross electricity production to 5.5 % in 2030 (4.0 % in 2015). In order to achieve that potential incentives shall be introduced. |
| Indicators | Reduction of GHG emissions by 17% |
| Type of instrument | Incentive, Financial, Regulatory |
| Status | Planned |
| Sector(s) affected | Energy |
| Gases affected | CO2 |
| Start year of implementation | 2020 |
| Implementing entity or entities | Ministry of Mining and Energy, Municipalities, Local Communities |
| Costs | Preparatory costs (start-off): 1.5 Mio. EUR  The additional investment costs for investors: 115.2 Mio EUR, |
| Non-GHG mitigation co-benefits | Improve Air quality, health benefits |
| Information on interactions of mitigation actions | Realization of the Mitigation action 1 is going to support achievement of goals of this action |
| GHG emission reductions in 2030 (single year) compared to WOM | Included in Mitigation measure 1 |
| Target year or period | 2030 |
| Other year | Achievement will be yearly monitored, and corrective measures made in 2025, as necessary |

| **Mitigation action 5** | **Increasing use of RES and energy efficiency in the industry** |
| --- | --- |
| Description | The industrial sector will have to promote and implement energy efficiency projects and employ Best Available Technology (BAT) to retain its competitive advantage. Also, use of RES has significant role in that regard and it shall be at the level of 282 ktoe in 2030 (126 ktoe in 2015). Subsidies shall be introduced to support such improvements. |
| Indicators | Reduce GHG emissions by 9.7% |
| Type of instrument | Regulatory, Incentive, Financial |
| Status | Planned |
| Sector(s) affected | Manufacturing industry |
| Gases affected | CO2, CH4, N2O |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Mining and Energy  Ministry of Economy,  Chamber of Commerce and Industry of Serbia |
| Costs | Preparatory costs (start-off): 2.5 Mio. EURO  The additional investment costs for investors: 694.2 Mio EUR |
| Non-GHG mitigation co-benefits | Improve of air quality  Attract use of cleaner technologies  Improve work conditions  Reduce utility bills |
| Information on interactions of mitigation actions | This measure is part of the other regulatory measures such as penetration best available technology (BAT) to retain its competitive advantage and indirectly benefit from carbon taxation introduced through Mitigation action 1 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 715 ktCO2 in 2030 |
| Target year or period | 2030 |
| Other year | Achievement will be yearly monitored and corrective measures made in 2025, as necessary |

| **Mitigation action 6** | **Improving thermal integrity of households** |
| --- | --- |
| Description | There is an estimate that 85% of current buildings do not fulfil minimum energy efficiency requirements. Increase of EE in households shall contribute to achievement of energy consumption, excluding electricity, of 81 kWh/m2 (in 2015 it was 90 kWh/m2) per m2 of housing stock in 2030, In order to reduce the GHG emissions but also to directly contribute to improvement of a quality of life of Serbian inhabitants, financial support shall be ensured through Energy Energy Efficiency fund. |
| Indicators | Reduce GHG emissions by 9.7% |
| Type of instrument | Regulatory, Incentive, Financial, informational-educational; Organizational-governance-institutional |
| Status | Planned |
| Sector(s) affected | Residential sector |
| Gases affected | CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Construction, Transport and Infrastructure, Ministry of Mining and Energy, Chamber of Commerce and Industry of Serbia |
| Costs | Preparatory (start-off): 3 Mio EUR, of which 2 Mio. EUR for establishing independent advice network for citizens.  The additional investment costs for consumers: 1,730.1 Mio EUR |
| Non-GHG mitigation co-benefits | Improve air quality  Reduce utility bills |
| Information on interactions of mitigation actions | Implementation of this measure is incremental for the reduction of costs associated with Mitigation action 6 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 220 kt CO2 |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 7** | **Energy efficiency, improvement of heating and cooling infrastructure and promotion of use of RES in households** |
| --- | --- |
| Description | A large share of single-family houses predominantly use old inefficient boilers on coal and wood biomass. Combustion causes high specific CO2 emissions. Coal and biomass use in inefficient boilers emits PM 2.5, which has adverse effects on health. More efficient boilers reduce fuel use, while decreasing emissions. It is assessed that up to 41,000 boilers and heat pumps could be supported with subsidies in the 2022-2030 period. This will result by decrease of average CO2 emissions per amount of fuel used in households, excluding electricity, to 11.3 tCO2/TJ |
| Indicators | Reduce GHG emissions by 9.7% |
| Type of instrument | Regulatory, Incentive, Financial, informational-educational |
| Status | Planned and partially adopted |
| Sector(s) affected | Residential sector |
| Gases affected | CO2, N2O |
| Start year of implementation | 2022 |
| Implementing entity or entities | Ministry of Mining and Energy, Ministry of Economy, Ministry of Construction, Transport and Infrastructure,  Chamber of Commerce and Industry of Serbia, Ministry of Environmental Protection |
| Costs | Preparatory (start-off): 2 Mio EUR  The additional investment costs for consumers: 81.4 Mio EUR. |
| Non-GHG mitigation co-benefits | Improve life conditions  Reduce health pressures  Reduce utility bills |
| Information on interactions of mitigation actions | Interaction with Improving thermal integrity of households will lead to significant and reasonable investment and action of the GHG emission reduction - Mitigation action 5 |
| GHG emission reductions (in 2030 (single year) compared to WOM | Included in Mitigation action 5 |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 8** | **Improving energy efficiency and use of RES in the Tertiary sector** |
| --- | --- |
| Description | Measure shall contribute to reduction of energy consumption (including electricity) and replacement of fuels with zero or lower emitting fuels for heating purposes. Reduction of consumption of solid fuels shall be for 63 ktoe in 2030/ |
| Indicators | Reduce GHG emissions by 9.7% |
| Type of instrument | Regulatory, Incentive, Financial |
| Status | Planned |
| Sector(s) affected | Tertiary sector (the tertiary sector includes buildings in the public and private service (IPCC sector 1.A.4.a) and in the agriculture sectors (IPCC sector 1.A.4.c.i)) |
| Gases affected | CO2, N2O |
| Start year of implementation | 2021 |
| Implementing entity or entities | Administration for Joint Services of the Republic Bodies, Ministry of Mining and Energy, Ministry of Construction, Transport and Infrastructure, Ministry of Finance, Local communities and other Institutional and Commercial entities |
| Costs | Preparatory costs (start-off): 2 Mio EUR  The additional investment costs (mainly for the state): 94.4 Mio EUR. |
| Non-GHG mitigation co-benefits | Improve quality of services  Reduce utility bills  “Greening” of the local economy  Improve work conditions |
| Information on interactions of mitigation actions | Strong interaction with improving of the thermal integrity of tertiary buildings (Mitigation action 8) in order to achieve significant GHG emission reduction and sustainable investment |
| GHG emission reductions (in 2030 (single year) compared to WOM | 365 kt CO2 eq |
| Target year or period | 2030 |
| Other year | - |

|  |  |
| --- | --- |
| **Mitigation action 9** | **Improving thermal integrity in the Tertiary sector** |
| Description | Improving thermal integrity (insolation) of the tertiary sector buildings, reduces heating and cooling needs, contributing significantly to energy efficiency gains. Measure assumes 5.8 Mio m2 of tertiary sector public buildings deeply renovated. Consequently, energy costs as well as investment costs in heating and cooling infrastructure are reduced. |
| Indicators | Reduce GHG emissions by 9.7% |
| Type of instrument | Regulatory, Incentive, Financial |
| Status | Planned |
| Sector(s) affected | Other sector – Tertiary Sector |
| Gases affected | CO2, N2O |
| Start year of implementation | 2022 |
| Implementing entity or entities | Administration of Joint Services of the Republic Bodies, Ministry of Mining and Energy, Ministry of Construction, Transport and Infrastructure, Ministry of Finance, Local communities and other Institutional and commercial entities |
| Costs | Preparatory (start-off): 1 Mio EUR  The additional investment costs (mainly for the state): 168.7 Mio EUR |
| Non-GHG mitigation co-benefits | Improve quality of life  Reduce utility bills  “Greening” of the local economy |
| Information on interactions of mitigation actions | Interaction with measure Improving Energy efficiency and use of RES in the Tertiary sector (Mitigation action 7) |
| GHG emission reductions (in 2030 (single year) compared to WOM | Included in measure Improving Energy efficiency and use of RES in the Tertiary sector (Mitigation action 7) |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 10** | **Renewal of the passenger fleet and promotion of sustainable passenger transport** |
| --- | --- |
| Description | This measure includes three areas of actions: Efficiency improvement of vehicle stock and usage of vehicles, Promotion of public transport and non-motorized transport and Promotion of usage of alternative fuels and biofuels aiming to: foster the penetration of low-CO2 passenger cars through relevant adjustment of legal framework and increased incentives, to increase the use of public transportation. This will contribute to limitation to the GHG emissions growth by 2030 and preparation of a legal framework to allow and support the 2nd generation of biofuels to penetrate into Serbia’s transport fuel market |
| Indicators | Limit GHG emissions growth in transportation sector by 10% |
| Type of instrument | Regulatory, Organizational-Governance-Institutional, Incentive |
| Status | Planned |
| Sector(s) affected | Road Transport |
| Gases affected | CO2, , N2O |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Environmental Protection, Ministry of Finance; Ministry of Construction, Transport and Infrastructure; Ministry of Mining and Energy; Ministry of Economy, Chamber of Commerce and Industry of Serbia |
| Costs | Additional investment costs for consumers: 2262.9 Mio EUR. |
| Non-GHG mitigation co-benefits | Improve air quality  Reduce impacts on health  Additional reduction in PM2,5 |
| Information on interactions of mitigation actions | Action shall be realized in combination with Mitigation action 10 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 752 kt CO2 eq. |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 11** | **Renewal of the freight fleet and promotion of sustainable freight transport** |
| --- | --- |
| Description | Freight transport is necessary for economic growth and normally witnessing higher growth rates than GDP. As such, in a context where Serbia’s GDP will continue to grow and freight more than the GDP, it is important to find modalities to limit from this source, without necessarily limiting freight and growth. Therefore, in order to support promotion of sustainable freight transport it is important to implement modulation of yearly infrastructure charges for HDVs according to CO2 emission performance standards and implement road charging for freight vehicles based on EURO emission standard. The goal is to share freight transport on railways and waterways in total freight transport of 45%. For these fees needs to be ensured. |
| Indicators | Limit GHG emissions growth in transportation sector by 10% |
| Type of instrument | Regulatory, Organizational-Governance-Institutional |
| Status | Planned |
| Sector(s) affected | Road Transport |
| Gases affected | CO2, N2O |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Construction, Transport and Infrastructure |
| Costs | Additional investment costs for investors: 388 Mio. EUR, |
| Non-GHG mitigation co-benefits | Improve air quality  Reduce impacts on health |
| Information on interactions of mitigation actions | Action shall be realized in combination with Mitigation action 9 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 156 kt CO2 eq |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 12** | **Implementation of the F-gas regulation and MACs directive** |
| --- | --- |
| Description | • Service and maintenance bans: Limits on the use of higher GWP gases, such as R404A and R507A, in existing refrigeration equipment with a charge size of 40 tonnes of CO2 equivalent or more will be considered from 2020. If charge size is lower than 40 tonnes of CO2 equivalent R404A is allowed to be used.  • For Equipment with a charge size of 40 tonnes of CO2 equivalent a regenerated R404A can be used by 2030. Equipment retrofit is allowed for switching to R448A, R449A and R452A in accordance with restrictions as contained in f-gas regulation  Furthermore F-gas emissions from mobile air conditioning (MACs) in EU are regulated through Directive 2006/40/EC on mobile air conditioners. It is being enforced over three phases, starting in 2008. Second stage was that air conditioning systems in new vehicle types had to be filled with gases with a GWP lower than 150. From 2017 onwards, this applies to all new air-conditioned vehicles put on the EU market. Despite the fact that MACs Directive has not been yet transposed into Serbian legal system, it is being in practice implemented by EU automotive industry operating in Serbia in order to ensure conformity of its products with EU standards |
| Indicators | Limit GHG emissions growth from industrial processes and product use by 7% by 2030 compared to 2010 |
| Type of instrument | Regulatory, informational-educational |
| Status | Planned |
| Sector(s) affected | IPPU |
| Gases affected | HFC, SF6 |
| Start year of implementation | 2020 (F gas regulation), 2021 (MAC Directive) |
| Implementing entity or entities | Ministry for Environment Protection, Ministry of Economy, Chamber of Commerce and Industry of Serbia |
| Costs | The investment costs: 4,6 Mio. EURO; EU and other funds: 0,5 Mio. EURO |
| Non-GHG mitigation co-benefits | Increased air quality |
| Information on interactions of mitigation actions | - |
| GHG emission reductions (in 2030 (single year) compared to WOM | 114 kt CO2 eq |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 13** | **Awareness raising on benefits of Winter cover crops** |
| --- | --- |
| Description | Awareness raising through the Agriculture Advisory Services. Measure assumes planting of winter cover crops on the area of 1.919 kha. |
| Indicators | Reduce GHG emissions in agriculture by 15% |
| Type of instrument | Incentive; Informational-Educational |
| Status | Planned |
| Sector(s) affected | Agriculture |
| Gases affected | N2O, CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Agriculture, Forestry and Water Management, Agricultural Advisory Service, Farmers |
| Costs | The additional investment costs for investors associated with this measure are 76.2 Mio. EURO |
| Non-GHG mitigation co-benefits | Reduce soil erosion  Increase soil fertility  Increase soil and water quality  Reduce pressure on biodiversity. |
| Information on interactions of mitigation actions | - |
| GHG emission reductions (in 2030 (single year) compared to WOM | 579.05 kt CO2 eq of which 410.70 kt CO2 are related to sequestration/ |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 14** | **Potentials in increase of legume share in fodder area** |
| --- | --- |
| Description | Financial stimulations for increase of legume share for 33,000 ha compared to 2017, combined with awareness raising through the Agriculture Advisory Services. Additional legumes shall be made on temporary grassland increase. |
| Indicators | Reduce GHG emissions in agriculture by 15% |
| Type of instrument | Incentive, Informational-Educational |
| Status | Planned |
| Sector(s) affected | Agriculture |
| Gases affected | N2O, CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry of Agriculture, Forestry and Water Management, Agricultural Advisory Service, Directorate for Agrarian Payments, Directorate for agricultural land, Chamber of Commerce, Farmers, |
| Costs | The additional investment costs: 3.55 Mio. EURO |
| Non-GHG mitigation co-benefits | Increase bio-fixation  Reduce costs for farmers  Soil erosion control and improved landscape water absorption  Retention and reduced runoff  Improved water quality  Increased biodiversity in soils and agri-landscapes  Improved food security |
| Information on interactions of mitigation actions | Can be combined with the agroforestry NbS |
| GHG emission reductions (in 2030 (single year) compared to WOM | 14.6 kt CO2eq |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 15** | **Breeding for higher milk yields** |  |
| --- | --- | --- |
| Description | A genetic selection for cows with higher milk yields may reduce overall emissions if the cow herd is reduced due to limited market outlets. An increase in milk yields per cow will also increase emissions per cow but this may be overcompensated by reduced cow numbers, basically because the maintenance requirements of the cow herd are reduced. A precondition for this approach is that health problems may be avoided therefore, the breeding targets will combine productivity and robustness indicators. The necessity to improve milk yield and increase efficiency and competitiveness of the Serbian dairy producers is recognized in the Serbian Strategy for Agriculture and Rural Development as well as in the IPARD and National Programme for Agriculture 2018-2020. |  |
| Indicators | Reduce GHG emissions in agriculture by 15% (including mitigation action 14) | Reduce GHG emissions in agriculture by 15% |
| Type of instrument | Incentive; Informational-Educational; organizational-governance-institutional |  |
| Status | Planned | Planned |
| Sector(s) affected | Agriculture | Agriculture |
| Gases affected | CH4 |  |
| Start year of implementation | 2022 | 2021 |
| Implementing entity or entities | Ministry of Agriculture, Forestry and Water Management, Directorate for Agrarian payments, Veterinary Directorate, Chamber of Commerce of Republic of Serbia, Research institutions |  |
| Costs | The additional investment costs: 1,5 Mio. EURO |  |
| Non-GHG mitigation co-benefits | Reduces Short-Lived Climate-forcing Pollutants (SLCPs)  Soil erosion control and improved landscape water absorption, retention and reduced runoff;  Improved water quality  Increased biodiversity in soils and agri-landscapes  Improved food security |  |
| Information on interactions of mitigation actions | Can be combined with the agroforestry NbS |  |
| GHG emission reductions (in 2030 (single year) compared to WOM | The emission savings of breeding measures are considered in the total savings, but CAPRI model used for assessment of emission reductions in agriculture sector cannot assign them to the single breeding measures |  |
| Target year or period | 2025 | 2030 |
| Other year | - | - |

| **Mitigation action 16** | **Afforestation** |
| --- | --- |
| Description | This measure prescribes the afforestation (secondary forest or plantation forest) of 5,000 ha every year up to 2030 (and should be continued up to 2050). This requires the additional afforestation of 2,952 ha, compared to the current average level of 2,048 ha. |
| Indicators | Increase the carbon sink in the Serbian forest by 17% |
| Type of instrument | Regulatory, Incentive |
| Status | Planned |
| Sector(s) affected | Land use Land use Change and Forestry (LULUCF) |
| Gases affected | CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry for Agriculture, Forestry and Water Management, Research institutions, Directorate for Agrarian payments, Organizations responsible for the forest management, Private forest owners |
| Costs | The additional investment costs: 35 Mio EUR (1200 € per hectar) |
| Non-GHG mitigation co-benefits | Reduce soil erosion  Increase biodiversity,  Conserve rainwater  Increase employment  Increase biomass resources for fossil fuel substitution  Increase the amount of natural material (wood for construction and insulation) |
| Information on interactions of mitigation actions | Action is combined with Mitigation action 14.  Reduce soil erosion  Increase biomass resources for fossil fuel substitution  Increase the amount of natural material (wood for construction and insulation) |
| GHG emission reductions (in 2030 (single year) compared to WOM | 259.1 kt CO2 |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 17** | **Close to nature forest management** |
| --- | --- |
| Description | Introduction of close-to-nature forest management could lead to an increase in soil organic carbon and biomass (aboveground + below-ground) through different measures, such as as species selection, rotation length and management regime (incl. sustainable harvesting levels, planned thinning and low-impact logging); conversion of suitable coppice forests; harvesting of over-mature beech stands; increased mixture of tree species suitable for Climate Change - increased productivity;  The actions comprise the preparation of all management guidelines for all management types, the establishment of demonstration and experimental plots in all management types and systematic training activities to smooth implementation of the close to nature and smart forest management |
| Indicators | Increase the carbon sink in the Serbian forest by 17% |
| Type of instrument | Informational-Educational |
| Status | Planned |
| Sector(s) affected | Land use Land use Change and Forestry (LULUCF) |
| Gases affected | CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry responsible for forestry, chamber of forest engineers |
| Costs | Based on the LCDS document the estimated cost is 1,300,000 Euro |
| Non-GHG mitigation co-benefits | Positive effects on soil erosion control and infrastructure  Enhanced air quality  Positive effects on water balance and quality by tree admixture  Increased biodiversity  Positive effects on the protection of the soil organic layer |
| Information on interactions of mitigation actions | Increasing of biomass resources for fossil fuel substitute; Increasing of the amount of natural material (wood for construction and insulation); reduction of disaster risk by creating vital and resilient forest ecosystems; increasing of biodiversity by increasing tree species admixture; increasing of stabile and vital green infrastructure around cities; water balance stability |
| GHG emission reductions (in 2030 (single year) compared to WOM | 1008,33 kt Co2 eq. until 2030 |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 18** | **Conversion of coppice to high forest** |
| --- | --- |
| Description | This measure prescribes the annual conversion of 7,000 ha of coppice forest to high forests, in particular oak and beech coppice forests for conversion into high forest. At the present, the government is financing amelioration of forests, which also includes direct conversion of coppice forests. Direct conversion of coppice forests is a process consisting of clear cut of certain areas and then afforestation. This measure is available for the both State and private forests. |
| Indicators | Increase the carbon sink by 17% |
| Type of instrument | Regulatory, Incentives, Educational-Informational |
| Status | Planned |
| Sector(s) affected | Land use Land use Change and Forestry (LULUCF) |
| Gases affected | CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry for Agriculture, Forestry and Water Management, Research institutions, Organizations responsible for the forest management, Private forest owners |
| Costs | The additional investment costs: 33.5 Mio EUR |
| Non-GHG mitigation co-benefits | Increase biodiversity  Conserve rainwater  Increase employment |
| Information on interactions of mitigation actions | Action is combined with Mitigation action 13 |
| GHG emission reductions (in 2030 (single year) compared to WOM | 458.4 kt CO2 |
| Target year or period | 2030 |
| Other year | - |

| **Mitigation action 19** | **Definition of guidelines for the reduction of abiotic and biotic factors** |
| --- | --- |
| Description | **Forest management:** Improved land use planning; improved infrastructure for accessing remote areas; preparation of prevention management guidelines; establishment of an adequate mechanism for the monitoring of wild fires; education and training on the practical implementation of fire prevention management guidelines for foresters and fire-brigades  **Integrated pest management:** Monitoring of pests; preparation of pest management plans; prevention and use of pest control methods |
| Indicators | Increase the carbon sink by 17% |
| Type of instrument | Planning, education |
| Status | Planned |
| Sector(s) affected | Land use Land use Change and Forestry (LULUCF) |
| Gases affected | CO2 |
| Start year of implementation | 2021 |
| Implementing entity or entities | Ministry responsible for forestry, chamber of forest engineers |
| Costs | Costs: 0.025 mio Euros/yr (source of finance is same for fire management and8u integrated pest management, defined in quantity of 0.5 mio Euros/year for both measures, and evenly distributed for definition of guidelines for implementation of both measures)  Revenues: from higher value of timber that is not damaged |
| Non-GHG mitigation co-benefits | Protection of forest woodlands and other vegetation, as well as human lives and game and decreasing of the economic damage  Preserving of biodiversity |
| Information on interactions of mitigation actions | Tending of the biomass resources for fossil fuel substitution  Decreased erosion risks  Decreased soil and habitat damage |
| GHG emission reductions (in 2030 (single year) compared to WOM | No quantified assessment available yet |
| Target year or period |  |
| Other year |  |

| **Mitigation action 20** | **Waste sector** |
| --- | --- |
| Description | No specific measures included in this action plan.  Included elsewhere (IE). All measures related to waste sector are covered through Waste sector directive specific implementation plans (DSIP)   * Support schemes for production of RES II biofuels (from wastes, residues, non-food cellulosic material, and ligno-cellulosic material) does not exist, thus there is almost no production. Therefore, it is necessary to prepare Directive specific implementation plan for transposition and implementation of Fuel Quality Directive and implement updated RES directive in order to allow 2nd generation of biofuels to penetrate into Serbia’s transport fuel market and set up of support schemes for production of biofuels (from wastes, residues, non-food cellulosic material, and ligno-cellulosic material).  (See Mitigation Action 3, 4, 7 and 8) |
| Indicators | Reduce GHG emissions in agriculture by 13% |
| Type of instrument | Incentive; Informational-Educational; organizational-governance-institutional |
| Status | Planned |
| Sector(s) affected | Waste |
| Gases affected | CH4 |
| Start year of implementation | 2020 |
| Implementing entity or entities | Ministry of Agriculture, Forestry and Water Management, Directorate for Agrarian payments, Veterinary Directorate, Chamber of Commerce of Republic of Serbia, Research institutions |
| Costs | - |
| Non-GHG mitigation co-benefits | Reduces Short-Lived Climate-forcing Pollutants (SLCPs) |
| Information on interactions of mitigation actions | Mitigation Action 3, Mitigation Action 4, Mitigation Action 7 and Mitigation Action 8 |
| GHG emission reductions (in 2030 (single year) compared to WOM | - |
| Target year or period | 2030 |
| Other year | - |

## **Adaptation related projects, measures and actions required for achievement of Serbian NDC**

| **SECTOR** | **Priority adaptation measure** | **Description** | **Sector(s) involved or affected** | **Responsible institution** | **Indicator** | **Potrebna finansijska sredstva do 2030.** | **Potential sources of funding** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| AGRICULTURE | Constructing new irrigation systems and more efficient use of the existing ones | Constructing new irrigation systems and increasing the irrigated area from currently 40.000-70.000 ha to 220.000 ha until 2030 (new 150.000-180.000 ha under the irrigation systems). | Agriculture  Water Management | Ministry of Agriculture, Forestry and Water Management | Volume of water used for irrigation per year (m3/year)  (Statistical Office of the Republic of Serbia) | More than 100.000.000 EUR  (440.000.000 EUR proportionally from the Water Management Strategy) | Budget (IPARD)  International funds (Adaptation Fund, GCF, GEF, Abu Dhabi Fund for Development) |
| Use of small, multi-purpose water accumulations | Constructing and use of small water accumulations (small lakes, ponds, reservoirs) for irrigation and water supply during drought, erosion management, flood protection and agro-ecosystems management. | Agriculture  Water Management Biodiversity | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate  Public Water Management Companies | Number of issued permissions for constructing lakes or accumulations (Local self-government, Republic Water Directorate) | From 10.000.000 EUR to 100.000.000 EUR | Budget (IPARD)  International funds (Adaptation Fund, GCF, GEF) |
| Adjustment of the technologies of agricultural plant and animal production | Development of recommendations for species and varieties selection, agro-technical measures (including sustainable land use and rational fertilizer management) and zoo-technical conditions. Provide financial support for farmers to implement the recommended measures. | Agriculture  Environmental Protection  Mitigation Co-benefits | Ministry of Agriculture, Forestry and Water Management | Number of agricultural households with granted state subventions for implementation of the recommended measures  (Agricultural Advisory Service) | From 1.000.000 EUR to 10.000.000 EUR | Budget (IPARD)  International funds (Adaptation Fund, GCF, GEF)  Private funding |
| Improvement of the use of meteorological and climatological information for planning in agriculture | Improvement of the agrometeorological monitoring systems. Improvement and promotion of agrometeorological short-term and long-term forecasts products. | Agriculture | Ministry of Agriculture, Forestry and Water Management  Republic Hydro-meteorological Service of Serbia | Number of agrometeorological forecasts users (Agricultural Advisory Service, Republic Hydrometeorological Service of Serbia) | From 1.000.000 EUR to 10.000.000 EUR | Budget (IPARD)  International funds (Adaptation Fund, GCF, GEF)  International projects |
| WATER MANAGEMENT | Increasing efficiency of water supply systems | Decrease of water losses in water supply systems to 25% until year 2034 through regular maintenance, rehabilitation of existing systems, detection of water leaks and losses. | Water Management | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate | Water losses in water supply systems (%)  (Statistical Office of the Republic of Serbia) | More than 100.000.000 EUR  (150.000.000 EUR proportionally from the Water Management Strategy) | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improving protection of water springs and preservation of water quality | Establish monitoring of relevant parameters for surface and ground water quality, determine sanitary protection zones at water springs, implement protective measures, and control pollution inputs | Water Management Agriculture  Environmental Protection  Public Health | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate | Number of water springs with determined sanitary protection zones and established monitoring (Republic Water Directorate) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Development of flood risk management plans | Development of hazard maps, flood risk maps, and flood risk management plans on a national and watercourses level. | Water Management Agriculture  Forestry  Biodiversity  Environmental Protection  Public Health  Infrastructure  Transportation  Industry and Economy  Energy | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate | Number of adopted flood risk maps and flood risk management plans  (Public Water Management Companies, Republic Water Directorate) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improving protection against floods and flash floods | Building small barriers for flash floods and implementing additional anti-erosion measures on river basins | Water Management Agriculture  Forestry  Biodiversity  Environmental Protection  Public Health  Infrastructure  Transportation  Industry and Economy  Energy | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate,  Republic Hydrometeorological Service of Serbia | Number of river basins with new barriers and/or implemented anti-erosion measures (Republic Water Directorate) | More than 100.000.000 EUR  (120.000.000 EUR proportionally from the Water Management Strategy) | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improving the water management in drought conditions and water shortage | Development of drought management plans and recommendations for prevention and mitigation of drought effects | Water Management Agriculture  Forestry  Biodiversity  Environmental Protection  Public Health  Transportation  Energy | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate,  Republic Hydrometeorological Service of Serbia | Number of river basins with adopted drought management plans (Local self-government, Republic Water Directorate) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improving protection against inland flooding | Constructing the water objects and hydro-meliorative drainage systems.  Development of drainage network on new 100.000 ha of endanger areas until year 2034 | Agriculture  Water Management | Ministry of Agriculture, Forestry and Water Management, Republic Water Directorate  Public Water Management Companies | Area under drainage systems (ha)  (Statistical Office of the Republic of Serbia) | More than 100.000.000 EUR  (about 150.000.000 EUR proportionally from the Water Management Strategy) | Budget  International funds (Adaptation Fund, GCF, GEF) |
| FORESTRY | Reforestation using climate adaptable tree species | Mapping and reforestation of 5.000 ha per year using climate adaptable tree species, until year 2030 | Forestry  Environmental Protection  Biodiversity  Mitigation Co-benefits | Ministry of Agriculture, Forestry and Water Management, Directorate of Forests | Area under new forests with climate adaptable tree species (ha)  (Directorate of Forests, Statistical Office of the Republic of Serbia) | From 10.000.000 EUR to 100.000.000 EUR  (35.000.000 EUR Proposed Strategy of Low-Carbon Development) | Budget  International funds (Adaptation Fund, GCF, GEF)  Private funding  Innovative climate funding (Carbon market, green credit lines) |
| Adopting close-to-nature forest management and climate-smart forestry principles and approaches | Promotion of tree species that are habitat appropriate, promotion of mixed forests, preservation and increase of genetic variations of tree species and promotion of natural forest regeneration | Forestry  Biodiversity  Mitigation Co-benefits | Ministry of Agriculture, Forestry and Water Management, Directorate of Forests | Number of forest management plans with included principles of close-to-nature and climate-smart forestry (Javna preduzeća za gazdovanje šumama, Directorate of Forests) | From 1.000.000 EUR to 10.000.000 EUR  (1.300.000 EUR Proposed Strategy of Low-Carbon Development) | Budget  International funds (Adaptation Fund, GCF, GEF)  Innovative climate funding (Carbon market, green credit lines) |
| Conversion of coppice into high forests | Conversion of 7.000 ha of coppice to high forests per year until 2030, using natural seeds of prominent coppice trees and planting at appropriate selected locations | Forestry  Biodiversity  Mitigation Co-benefits | Ministry of Agriculture, Forestry and Water Management, Directorate of Forests | Area under coppice forest converted to high forests (ha) (Directorate of Forests) | From 1.000.000 EUR to 10.000.000 EUR  (33.500.000 EUR Proposed Strategy of Low-Carbon Development) | Budget  International funds (Adaptation Fund, GCF, GEF)  Private funding  Innovative climate funding (Carbon market, green credit lines) |
| Reducing the negative risk factors of biotic and abiotic origin | Improvement of monitoring and forest fires early warning system, assessment of vulnerability from forest fires and development of recommendations for prevention and recovery from forest fires, insects and pests. | Forestry  Biodiversity  Mitigation Co-benefits | Ministry of Agriculture, Forestry and Water Management, Directorate of Forests | Forest area under forest fires, droughts, pests and diseases (ha)  (Preduzeća za gazdovanje šumama, Statistical Office of the Republic of Serbia) | From 1.000.000 EUR to 10.000.000 EUR  (500.000 EUR Proposed Strategy of Low-Carbon Development for developing recommendations only, without implementation) | Budget  International funds (Adaptation Fund, GCF, GEF)  Innovative climate funding (Carbon market, green credit lines) |
| BIODIVERSITY | Development of national assessment of biodiversity vulnerability to climate change | Development of a comprehensive analysis of climate change impact to biodiversity, vulnerability assessment and possibilities of adaptation and mitigation of impacts on the territory of Serbia | Environmental Protection  Biodiversity | Ministry of Environmental Protection,  Agency for Environmental Protection | Developed national assessment of biodiversity vulnerability to climate change  (Ministry of Environmental Protection) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Monitoring the impact of climate change to biodiversity and impact of biodiversity to mitigating climate change effects | Defining a number of species, habitats and ecosystems and developing methodologies and indicators for monitoring climate change impacts to biodiversity. Developing specific measure to protect species and habitats that are vulnerable to climate change. Monitoring the level of endangerment of biodiversity from extreme weather events. | Environmental Protection  Biodiversity | Ministry of Environmental Protection,  Agency for Environmental Protection | Number of indicators, species, habitats and ecosystems with established monitoring of climate change impacts (Agency for Environmental Protection) | From 1.000.000 EUR to 10.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Capacity building and improving the cooperation among scientists and researchers | Improving cooperation among scientists and researchers from different research fields in order to investigate climate change impacts to biodiversity in Serbia. | Environmental Protection  Biodiversity | Ministry of Environmental Protection,  Agency for Environmental Protection  Scientific and Research Institutes | Number of published scientific papers with a subject of climate change impacts to biodiversity (Ministry of Environmental Protection) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF)  International projects |
| PUBLIC HEALTH | Development of action plans for respond to climate change in urban areas | Development of action plans with recommended measures to respond to climate change in urban areas | Public Health  Environmental Protection | Ministry of Health  Institute of Public Health of Serbia | Number of developed action plans for urban areas (Ministry of Health) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Establish monitoring of diseases introduced as a consequence of climate change and vectors that transmit them | Establish monitoring of diseases introduced as a consequence of climate change (West Nile, Chikungunya, etc.), as well as vectors (insects such as mosquitos) that transmit them | Public Health | Ministry of Health  Institute of Public Health of Serbia | Number of patients with diagnosed diseases that are introduced due to climate change and that have established monitoring system (Institute of Public Health of Serbia) | From 1.000.000 EUR to 10.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improvement of scientific research on direct and indirect climate change impacts to human health in Serbia | Improving cooperation among scientists and researchers from different research fields in order to investigate climate change impacts to human health in Serbia. | Public Health | Ministarstvo zdravlja  Institut za javno zdravlje Srbije  Naučno-istraživačke ustanove | Number of published scientific papers and funded research projects with a subject of climate change impact to human health  (Ministry of Health) | From 100.000 EUR to 1.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF)  International projects |
| Disaster risk reduction | Developing an efficient and comprehensive system for risk reduction and assessment and monitoring losses and damages due to natural hazards that are caused by climate change | Development of detailed methodology for assessment of damages and losses due to natural hazards that are caused by climate change in all sectors. Establishing monitoring system for losses and damages in all relevant sectors. Improvement of using DesInventar. | All sectors | Ministry of Internal Affairs | Developed methodology for assessment of losses and damages and established monitoring system (Ministry of Internal Affairs) | From 1.000.000 EUR to 10.000.000 EUR | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Improvement of monitoring, forecast and early warning hydro-meteorological systems | Improvement of meteorological and hydrological observation and monitoring systems. Improvement of operational meteorological and hydrological forecasts quality. Establishing an effective system of dissemination and information use in all relevant sectors | All sectors | Ministry of Internal Affairs  Republic Hydrometeorological Service of Serbia | Number of users of forecast and early warning system (Hydrometeorological Service of Serbia) | From 10.000.000 EUR to 100.000.000 EUR  (10.000.000 EUR for pilot region) | Budget  International funds (Adaptation Fund, GCF, GEF) |
| Integration climate change projections into national and other risk assessments | Update national and local risk assessments by including quantified impacts of climate change on frequency and intensity of natural hazards in the future. | All sectors | Ministry of Internal Affairs | Number of issued approvals for risk assessments with incorporated climate change projections (Ministry of Internal Affairs) | From 100.000 EUR to 1.000.000 EUR | Budget |

List of abbreviations

|  |  |
| --- | --- |
| AR | IPCC Assessment Report |
| BAT | Best Available Technology |
| BUR | Biennial Update Report |
| BTR | Biennial Transparency Report |
| CMA | Conference of the Parties serving as the meeting of the Parties to the Paris Agreement |
| DRR | Disaster Risk Reduction |
| EC | European Commission |
| ETS | Emissions Trading System |
| EU | European Union |
| EUR | Euro |
| GDP | Gross Domestic Product |
| GHG | Greenhouse Gas |
| GWP | Global Warming Potentials |
| ICTU | Information for clarity, transparency and understanding |
| INDC | Internationally Nationally Determined Contribution |
| IPA | Instrument for Pre-accession Assistance |
| IPCC | Intergovernmental Panel on Climate Change |
| IPPU | Industrial processes and product use |
| L&D | Loss and Damages |
| LCC | Law on Climate Change |
| LCDS | Low Carbon Development Strategy ~~with Action plan~~ |
| LULUCF | Land Use, Land Use Change and Forestry |
| MAFWM | Ministry of Agriculture, Forestry and Water Management |
| MEP | Ministry of Environmental Protection |
| MME | Ministry of Mining and Energy |
| MMR | Monitoring Mechanism Regulation |
| MRV | Monitoring, Reporting and Verification |
| NAP | National Adaptation Plan |
| NDC | Nationally Determined Contribution |
| NECP | National Energy and Climate Plan |
| NC | National Communication |
| NGO | Non-Governmental Organizations |
| PA | Paris Agreement |
| PAM | Policies and Measures |
| RES | Renewable Energy Sources |
| RCP | Representative Concentration Pathway |
| SEA | Environmental Impact Assessment |
| SEPA | Serbian Environmental Protection Agency |
| SORS | Statistical Office of the Republic of Serbia |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | US-Dollar |
| WOM | Without measures |
| GHG | greenhouse gases |
| CO2 | carbon dioxide |
| CH4 | Methane |
| N2O | nitrous oxide |
| PFCs | perfluorocarbons |
| HFCs | hydrofluorocarbons |
| SF6 | sulphur hexafluoride |
| NF3 | nitrogen trifluoride |
| SO2 | sulphur dioxide |
| NO2 | nitrogen dioxide |
| PM10 | particulate matter with coarse particles with a diameter of 10 micrometers (μm) or less |
| PM2,5 | particulate matter with finest particles with a diameter of 2.5 micrometers (μm) or less |
| O3 | Ozone |
| ODS | ozone depleting substances |
| Mio | Million |
| kt | kiloton = gigagram |
| Gg | Gigagram = kiloton |
| TJ | Terrajoule |
| ktoe | Tonnes oil equivalent |
| Gg CO2eq | Gigagram carbon dioxide equivalent |
| kt CO2eq | kiloton carbon dioxide equivalent |
|  |  |

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