REPORT 3

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Review and evaluation of the existing policy and regulatory and institutional framework for adapting to climate change with recommendations for the development and improvement of a specific policy and regulatory framework

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List of abbreviations

GHG	Greenhouse gases
NAP	National adaptation plans
EU	European Union
EC	European Commission
EEA	European Environment Agency
ICPDR	Danube River Basin District Management Plan
HPC	High performance computing
RHMS	Republic Hydrometeorological Service of Serbia
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Programme
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
INC	Initial National Communication of the Republic of Serbia under the UNFCCC
IPCC	Intergovernmental Panel on Climate Change
SNC	Second National Communication of the Republic of Serbia under the UNFCCC
RCM	Regional climate models
RCP	Relative Concentration Pathways
TNC	Third National Communication of the Republic of Serbia under the UNFCCC
WMO	World Meteorological Organization

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1 INTERNATIONAL FRAMEWORK

The United Nations Framework Convention on Climate Change (UNFCCC) introduces the concept and term of adaptation to changed climate conditions, however, its primary goal is to reduce greenhouse gas emissions (GHG). The Kyoto Protocol continues to prioritize mitigation or reduction of GHG emissions. The Paris Agreement introduces adaptation for the first time in a legally binding sense and includes loss and damage as a component of adaptation.

The Paris Agreement establishes a legal basis for the development of national adaptation plans (NAPs) and reporting on priorities, plans, activities and necessary assistance in the field of adaptation, through a public register.

The UNFCCC defines adaptation as an activity carried out to help society and ecosystems cope with climate change.

The Intergovernmental Panel on Climate Change (IPCC[1]) defines adaptation as a response of nature and wildlife and society to current and expected climate change and its effects through adaptation, thus reducing negative impacts and increasing useful opportunities.

Growing awareness of the need to respond to climate change as a condition for economic development and return on investment, as well as the adoption of the Paris Agreement, have led to the improvement of the legislative framework in the field of adaptation to changed climate conditions, which has been confirmed by the first global analysis[2] of laws and policies in the field of adaptation. The results of this analysis show that:

- 91 countries have at least one adopted law that includes adaptation issues;
- 170 countries have included the issue of adaptation into their polices;
- more than 120 countries have at least one framework document that deals with adaptation issues and it is accompanied by other documents that more precisely define the goals that need to be achieved.

The largest number of laws and policies involving adaptation were adopted in the period from 2008 to 2016 (approximately 40% of the 658 laws and policies analysed), mainly after the passing of laws related to the reduction of GHG emissions. Of the total number of laws and policies, the largest number was adopted in 2012/13, when 85 countries adopted 133 laws and policies in the field of adaptation.

[1] UN intergovernmental body tasked with providing scientific information on climate change caused by human activities, their impacts and the risks they pose, as well as potential responses to these challenges

[2] Policy brief, National laws and policies on climate change adaptation: a global review, Grantham Research Institute on Climate Change and the Environment, Center for Climate Change Economics and Policies, December 2019

Global experience in creating policies in the field of climate change adaptation, as well as in other horizontal policies, implies two possible approaches:

1) Preparation of an individual law and/or strategic document that regulates a certain issue/area;
2) Inclusion of issues/areas in sectoral legislation and policies.

Experience shows that the second approach is more practical and provides more efficient implementation of activities. Moreover, experience shows that a large number of policies, plans and activities do not cover climate scenarios, but ground their goals on climate trends (backward changes), which does not ensure a reduction in terms of risks from natural disasters and catastrophes. This is the situation also faced in Serbia, namely a problem that needs to be worked on in terms of raising awareness and strengthening capacities.

Regardless of the approach, it is clear that the adoption of Decision 18/ CMA.1 on Modalities, procedures and guidelines (MPGs) for the transparency framework for action and support requires the existence of national legislation and policies to ensure compliance of obligations established under the Decision, including those relating to adaptation to changed climatic conditions.

In institutional terms, in addition to the United Nations Framework Convention on Climate Change, the Intergovernmental Panel on Climate Change has a significant role to play in creating global policies and goals in the field of climate change.

2 EUROPEAN LEGISLATION AND POLICIES

In 2013, the European Commission (EC) adopted the EU Strategy on adaptation to climate change[3] (hereinafter: EU Strategy), the main goal of which is to increase the resilience of the EU and its Member States to climate change. Within the EU Strategy, Member States are also invited to adopt their comprehensive strategies and provide financial resources for the implementation of identified/ necessary adaptation activities, as well as for strengthening national adaptation capacities. The EU Strategy especially emphasizes the necessity of establishing a system for efficient adaptation at the level of local self-government units through the Covenant of Mayors for Climate and Energy initiative. Over the course of the same year, the EC published Guidelines on developing adaptation strategies[4].

The report on the implementation of the EU Strategy was published by the EC in 2018 and is mainly based on the assessment of individual adaptation strategies and plans for their implementation by EU Member States. The report concludes that the existence of this strategy

[3] The EU Strategy on adaptation to climate change, https://ec.europa.eu/clima/sites/clima/files/docs/eu_strategy_en.pdf
[4] Guidelines on developing adaptation strategies, Accompanying the document: An EU Strategy on adaptation to climate change, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0134&from=EN

has facilitated the integration of climate change adaptation issues into policies and management systems in key sectors.

In principle, the EU insists on establishing an effective system of monitoring, reporting and evaluation, prioritizing monitoring and reporting. This is primarily due to the insufficiently long period of implementation of strategies and specific adaptation activities that derive from them (in order to be able to conduct an evaluation). The focus of this system is on indicators monitored by the European Environment Agency[5] and they mainly indicate changes in climatological parameters, i.e. their deviation from reference values and the impact of climate change on values typical of a sector (e.g. river flow, water temperature, disease introduction, vegetation period, change in yield of agricultural crops, and so-forth), as stated in Report 1.

The European Environment Agency (EEA) is a key institution responsible for collecting and providing necessary data and scientific information relevant to the creation of environmental and climate policies and monitoring their implementation. In order to provide necessary data and information, the EEA cooperates with the European Environment Information and Observation Network (Eionet), within which data is exchanged between EU Member States and Western Balkans countries (as associate members).

The European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation - ETC/CCA[6] which consists of a consortium of 15 state member institutions within the period 2019-2021, holds a significant place in the field of adaptation. From the aspect of information and experience exchange, the Climate-ADAPT platform, established in 2012, **is also significant**.

The existing EU legislative framework, except in the part related to reporting on natural disasters and extreme weather events, does not include the aspect of adaptation. ***New EU legislation, which shall be implemented from 2021 onwards (in accordance with the Paris Agreement), introduces adaptation for the first time.***

Regulation 2018/1999[7] and the draft European Climate Law, published by the European Commission on 3 March 2020, both require the inclusion of an analysis of the impact of climate change on security of energy supply within their Integrated National Energy and Climate Plans (NECPs), primarily in relation to the availability of water for energy production plants and availability of biomass. The biennial reports on the implementation of a NECP should, among other things, contain information on adaptation.

Regulation 2018/1999 also prescribes the obligation of biennial reporting on adaptation plans and strategies, planned and implemented actions, as well as:

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[5] Climate change adaptation indicators, https://www.eea.europa.eu/data-and-maps/indicators/#c0=30&c12-operator=or&b_start=0&c12=climate-change-adaptation

[6] https://www.eionet.europa.eu/etcs/etc-cca

[7] REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1999&from=EN

(a) basic objectives and institutional organization;

(b) climate scenarios, meteorological extremes, impacts of climate change, assessment of effects of climate change and risks and major climate hazards;

(c) adaptation capacities;

(d) adaptation plans and strategies;

(e) monitoring and evaluation systems;

(f) implementation-related progress, including good practices and management changes.

Furthermore, the subject-matter of Regulation 2018/1999 is reporting on financial, technical and capacity building assistance provided to developing countries for the implementation of adaptation and mitigation measures and activities.

For the EU, the overall efficiency of policies and legislation is conditioned by the inclusion of adaptation (and mitigation) in funding/ funds and sectoral policies, in particular in the area of: infrastructure, agriculture, forest and water management, health and disaster risk reduction.

This report primarily analyses the national legislative framework and policies in these sectors, from the aspect of including climate change impacts and adaptation in the process of defining goals and directions of development.

3 NATIONAL FRAMEWORK

Reducing the risk of natural disasters and catastrophes, the occurrence and intensity of which are affected by climate change, and adapting to changed climate conditions largely depend on the inclusion of climate data, information and scenarios in policy planning and legislation, policy itself and implementation of practices.. On the other hand, monitoring a number of indicators in the field of adaptation, both to assess the impact and evaluate the success of measures taken and adaptation activities, requires climate data and information.

Taking into account the organization and already defined responsibilities at the national level, an analysis of legislation and institutions vital for planning and monitoring the implementation of adaptation measures may be initiated by the Republic Hydrometeorological Service of Serbia. Aspects of disaster risk reduction have already been analysed in detail from this aspect in Report 1, so they are an integral part of the sectoral analyses below.

3.1 Climate data collection and climate projection

The Republic Hydrometeorological Service of Serbia (RHMS) is a special organization within the system of public administration of the Republic of Serbia. Responsibilities, liabilities and authorities of RHMS are regulated by the following:

- **Law on Ministries;**
- **Law on Meteorological and Hydrological Activities;**
- **Law on Hail Protection;**
- **Law on Disaster Risk Reduction and Emergency Management** and
- **Law on Waters**

as well as a series of regulations, strategic and planning documents adopted on the basis of the aforementioned.

Within international meteorological and hydrological organizations, RHMS performs the function of national hydrometeorological service and represents the Republic of Serbia in international organizations, as well as at conventions and protocols, in the field of meteorology and hydrology. Furthermore, RHMS hosts the South East European Virtual Climate Change Centre (SEEVCCC) within the system of regional climate centres of the World Meteorological Organization.

In accordance with legal authorities of RHMS, it performs professional tasks of importance for adaptation planning, as follows:

1. planning, establishing, maintaining and developing the state's network of meteorological and hydrological stations;

2. systematic meteorological and hydrological measurements and observations within the auspices of the state's network;

3. planning, establishing, developing and maintaining the functioning of a meteorological and hydrological IT and telecommunication system for collecting, exchanging and distributing data and information concerning the actual and forecast state of the weather, climate and water;

4. establishing, developing and maintaining the functioning of a meteorological and hydrological analytical-prognostic system and hydrometeorological early warning system for preparing and issuing weather, climate, agrometeorological, biometeorological, hydrological and hydrogeological analyses, forecasts and warnings relating to meteorological and hydrological natural disasters and catastrophes;

5. establishing and developing meteorological and hydrological databases, processing, publishing and archiving of data;

6. providing meteorological and hydrological data and information for the needs of competent state authorities, organizations and other legal entities;

9. meteorological and hydrological support for defence and protection against floods, for suppression of hail, ice phenomena and other meteorological and hydrological natural disasters and catastrophes;

10. activities of applying meteorology, climatology and hydrology for the needs of economic and other activities, in particular for the needs of risk assessment, planning and protection from meteorological and hydrological natural disasters and other accidents, preparation of expert opinions in the process of issuing water management conditions, spatial and urban planning and issuance of hydrological and meteorological conditions for the needs of designing and constructing public facilities of general interest determined by law, as well as preparation of special meteorological, climatic and hydrological analyses and information;

11. monitoring and research of the state and changes of weather, climate, water resources and surface and groundwater regimes, solar radiation, energy potential of the sun, wind and water, as well as development and introduction into operational application of numerical models for weather, water and climate change forecasting ; and other tasks.

It is evident that there is no directly defined competence of RHMS in respect of monitoring climate change. However through the monitoring of climatological data and reports such as:

The Annual Bulletin for 2019 (Climate Characteristics in Serbia for 2019)[8], weekly bulletins and so-forth[9], it is possible to monitor deviations of parameters from climatological mean values , thus also the characteristics of climate change.

The existing legislation does not determine competence for the preparation of climate change projections/ climate scenarios, which is a potential area for improvement.

Information on the attainability of data and information available to RHMS was analysed and presented in Report 1.

The Law on Meteorological and Hydrological Activities defines that multidisciplinary research on the impact of climate change on water resources, land desertification, biodiversity, and especially forest ecosystems, population health, energy, traffic, tourism and other activities shall be performed in cooperation with RHMS.

According to the Decree on determining the Program for the implementation of the Spatial Plan of the Republic of Serbia for the period from 2016 to 2020, RHMS is the institution responsible for the implementation of strategic priorities:

- Development of climate monitoring systems and spatial information and databases on local and regional climate change, including information on extreme climatic events and disasters, vulnerabilities of certain areas, and risks of natural disasters related to observed and projected climate change, for the purpose of strategic planning and spatial development planning;

- Strengthening the capacity of operational, research and communication - information functions of the National Centre for Climate Change, which performs the functions of the South East European Virtual Climate Change Centre;

- Establishment of a National Climate Forum for the purpose of educating and informing decision makers and the general public about the causes and consequences of climate change;

while the participant is in the execution of the following strategic priorities:

- Implementation of multidisciplinary research programmes on local climate change and the impact of climate change on agriculture, forestry, water management, energy, biodiversity and ecosystems, infrastructure and public health, as well as development of sectoral plans and programmes for climate change adaptation and mitigation;

- Establishment of a system for collecting information on applied and planned measures of adaptation to changed climatic conditions, as well as other information of importance for combating climate change;

- Study concerning improvements to the system of observing, analysis, forecast, warning and announcement of high waters;

- Development of flood risk management plans;

- Improving the quality of surface and groundwater - Development of a Danube River Basin District Management Plan (ICPDR);

[8] http://www.hidmet.gov.rs/podaci/meteorologija/latin/2019.pdf
[9] http://www.hidmet.gov.rs/latin/meteorologija/klimatologija_produkti.php

- Preparation of a study of the spatial distribution of SHPPs and a detailed revision of the locations envisaged by the Cadastre of Small Hydro Power Plants in order to make a precise list of feasible locations for the construction of SHPPs;

Development and maintenance of the Water Resource Management Information System (WRMIS).

It is not possible to determine the level of achievement of the stated strategic priorities, given that there is no continuous monitoring and reporting on policy implementation. In some cases, the law prescribes reporting on achieving objectives of planning and strategic documents, however, examples of compliance with this provision are not known. Some improvements in terms of monitoring the achievement of policy objectives are provided by the Law on the Planning System ("Official Gazette of the RS", No. 30/2018).

The state meteorological and hydrological observation system consists of state networks of meteorological, hydrological stations and a state network of laboratories. Measured and observed meteorological and hydrological data is stored and archived in digital RHMS databases: meteorological, agrometeorological, hydrological database and database of automatic weather stations.

Archiving and storage of meteorological and hydrological data and information is performed in accordance with the regulations on archival material, the law and regulations adopted on its basis.

The meteorological yearbook contains climatological data as follows: annual values for 40 stations (30 parameters), daily values of measurements and observations for six stations (10 parameters and 8 phenomena), monthly values for 66 stations including dates of extremes for certain quantities (30 parameters) and maps of annual values of the most significant climatological parameters. The Hydrological Yearbook is published in two books: one for surface water and the other for groundwater. The yearbook for surface waters contains daily values, minimum, average and maximum values per month and year, as well as dates of extremes in terms of water level (170 stations), water flow (134 stations), water temperature (52 stations) and data on ice phenomena. The yearbook for underground waters contains data on groundwater levels (313 stations) and temperatures (151 stations) from 32 bodies of water. In this yearbook, in addition to daily values, characteristic monthly and annual values (maximum, minimum and average) are also illustrated.

Digitization and additional control of data for 12 meteorological parameters for the period 1961-2010 was performed within the Carpatclim[10] and Danubeclim[11] projects. A Digital Climate Change Atlas of the Danube Region has also been developed. Grid data of basic meteorological parameters and certain climate indices are freely available on the projects' sites.

Based on the Law on Meteorological and Hydrological Activities:

[10] http://www.carpatclim-eu.org
[11] http://www.carpatclim-eu.org/danubeclim/

- The Rulebook on measures taken to protect the hydrometeorological information system and the manner of giving consent to access that system[12]; and
- The Rulebook on the content, manner of managing and maintaining the fund of official meteorological and hydrological data and information, as well as methods of quality control and verification of data reliability and the manner of their publication[13]

prescribe in more detail the measures taken in order to protect RHMS' hydrometeorological information system and the state fund of meteorological and hydrological data and information.

RHMS is in charge of establishing the operational functioning of the hydrometeorological system dedicated to early warnings and alerting before meteorological, climatic and hydrological disasters and catastrophes, as well as of anti-hail systems across the entire territory of the Republic of Serbia.

The early warning and alert system is an integral part of the national disaster risk reduction and emergency management systems, as well as air, road and river safety systems.

The hydrometeorological system of early warning and alert includes the national meteorological and hydrological observation system, the hydrometeorological telecommunication system and the analytical-forecast system. Information is issued in the period before, during and immediately after the end of a meteorological or hydrological hazard. The manner of preparing, issuing and delivering extraordinary meteorological and hydrological information and warnings is defined by the **Rulebook on the manner of preparing, issuing and delivering extraordinary meteorological and hydrological information and warnings, "Official Gazette of the RS", No. 96/2013**. Information and warnings are published on the RHMS website and submitted to the competent authorities, the media and interested legal and natural persons by e-mail, fax, telephone, SMS and direct exchange (FTP server).

Within the hydrometeorological system of early warning and alert, RHMS has established operating systems of warning and alert Meteoalarm and Hydroalarm as part of the European Union's Severe weather warnings system for Europe and the European Flood Alert System (EFAS).Warnings are issued for extremely high and low temperatures, wind, rain, thunder and snow and ice, as well as for hot and cold waves. As part of the meteorological alarm, an assessment of the danger of forest fires (Fire Weather Index-FWI) is issued, which is based on the assessment of the flammability of forest fuel depending on past and current weather conditions. The hydro alarm treats extraordinary and dangerous phenomena on rivers and includes monitoring of water levels and ice in motion. All these warnings are provided by RHMS and published on its website.

Also, within the Hydrometeorological system for early warning and alert a climate alert system has been established for monitoring and forecasting drought, forest fires, heat waves and other meteorological and climatic extreme conditions, as well as a system for analyzing and mapping the risk of meteorological disasters. Climate analyzes and forecasts are given in a Bulletin for early warning of extreme climate events and anomalies, which is published on the RHMS website[14] and also on the SEEVCCC[15] website for the region of South-east Europe. The early

[12] Rulebook on measures taken in order to protect the hydrometeorological information system and the manner of giving consent to access to that system, "Official Gazette of the RS", No. 20/2013.

[13] Rulebook on the content, manner of managing and maintaining the fund of official meteorological and hydrological data and information, as well as methods of quality control and verification of data reliability and the manner of their publication, "Official Gazette of the RS", No. 20/2013.

[14] http://www.hidmet.gov.rs/podaci/meteorologija/ciril/biltenranenajave.pdf

[15] http://www.seevccc.rs/?p=1564

warning bulletin contains, weekly monitoring, weather forecasts for a week, two, a month, season (temperature, precipitation, drought) and long-term forecasts of potentially dangerous climatic events. The aim of the bulletin is to inform the public (one/ two weeks and one month in advance) about the probability and severity of climate events, in order to ensure the implementation of mitigation plans and avoid consequences arising from dangerous events. **The popularization of this RHMS product could be useful in strengthening the capacities of the general public.**

Within the framework of biometeorological advice and warnings, from the aspect of human health, RHMS issues: The Bulletin on the biometeorological forecast for Serbia, the Bulletin on heat stress index maximum value forecast, the Bulletin on heat wave monitoring and forecasts and the Bulletin on ultraviolet radiation forecasts. The announcement and forecast of a heat wave referred to in the Bulletin on heat wave monitoring and forecasts is also published on the website of the Institute of Public Health of Serbia "Dr. Milan Jovanović Batut". In addition to warnings, the Institute's website also provides Recommendations for the general population on how to act during warm weather and Advice for the protection of children's health during hot waves. Advice to citizens on how to act during extreme weather events can also be found on the website of the Sector for Emergency Situations of the Ministry of the Interior. **Popularization of these RHMS products could also be beneficial.**

In addition to the above-mentioned bulletins, weekly, monthly, seasonal and annual climate-related bulletins are prepared, monthly air temperatures and precipitation amounts are issued for the previous six months and decadal precipitation amounts for the previous four months; seven-day, ten-day, monthly and annual agrometeorological bulletins; drought monitoring and forecastingand humidity conditions assessment for the autumn-winter period and the vegetation period is conducted; daily reports on water level and ice conditions and seven-day hydrological bulletins are developed; and so-forth. All of these products are available on the RHMS website.

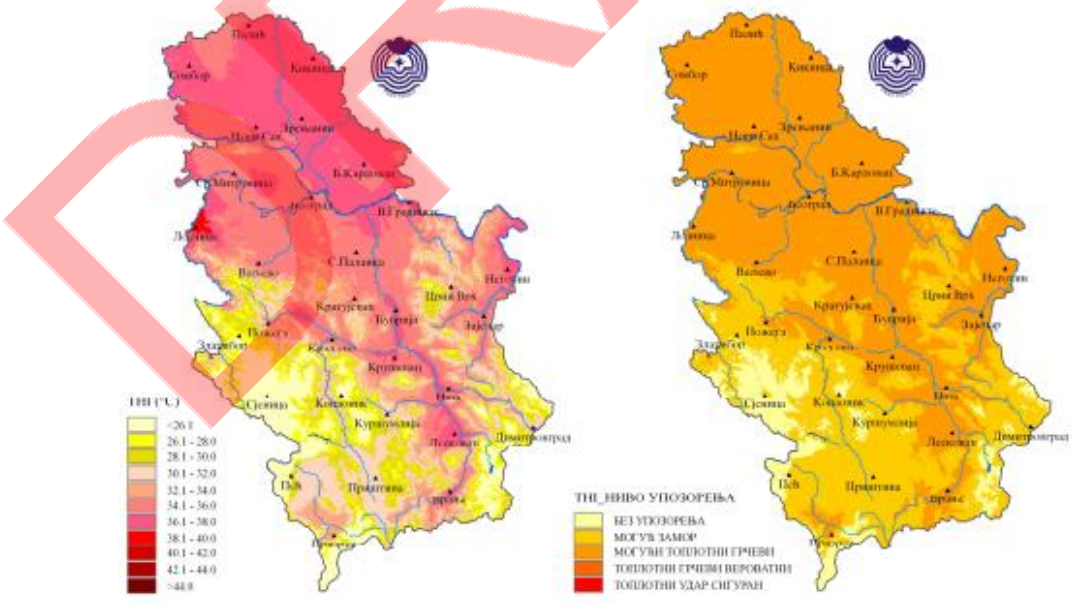

Figure 1. Spatial distribution of the forecast maximum thermal stress index (THI) value for 12 August 2020 (left) and the warning level (right)

According to the **Law on Disaster Risk Reduction and Emergency Management**[16] and the **Instruction on the Methodology of development and content of disaster risk assesment for protection and rescue plan**[17], RHMS coordinated the development and prepared the Risk Assessment of weather disasters of the Republic of Serbia for the needs of the National Disaster Risk Assessment[18]. A risk assessment was developed for four meteorological multihazards: hail, stormy wind and heavy rainfall; large amounts of precipitation; drought and heat waves; snowstorms and drifts, ice and cold waves. The national risk assessment does not include these risks in sectoral risk analyses. In addition, it should be borne in mind that climate scenarios are not included in the risk assessment. **The National Disaster Risk Assessment was adopted in March 2019 and it is updated every three years according to the Law. Priority could be given to working with the competent authorities and providing the necessary climatological data at the level of local self-governments, so that climate change and climate scenarios become an integral part of sectoral assessments within the next National Risk Assessment.**

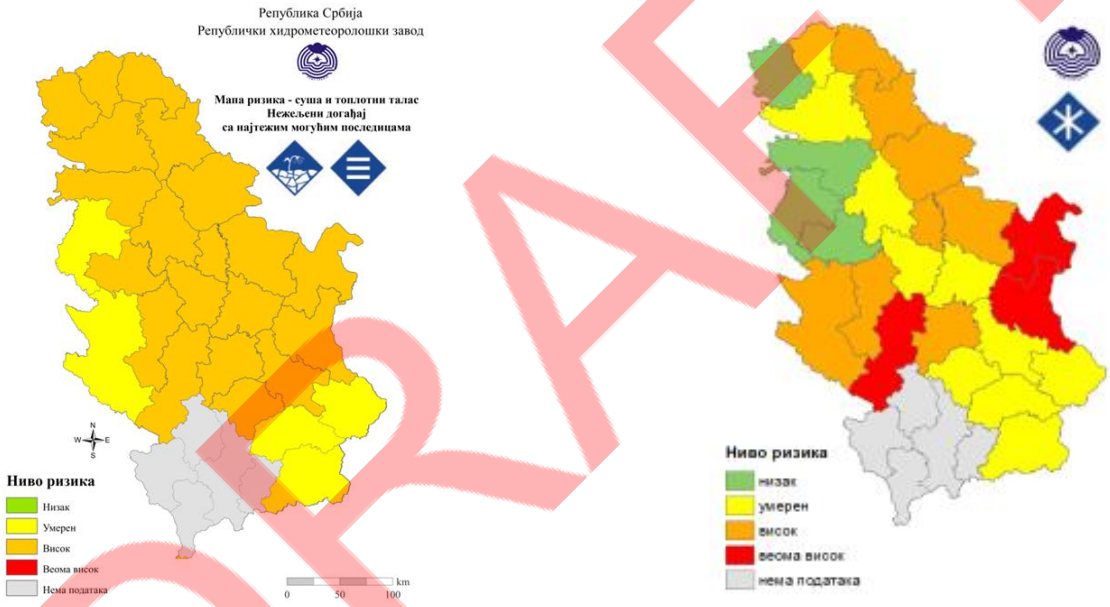

Figure 2. Risk map for drought and heat waves (left) and for blizzards and snow, ice and cold waves (right); an adverse event with the most severe possible consequences

Within the South East European Virtual Climate Change Centre (SEEVCCC), RHMS collects monthly climatological data, from about 450 stations within the region of South-east Europe (directly from national meteorological services on the basis of cooperation agreements, from free databases and from international data exchange under the auspices of the World Meteorological Organization). Based on collected data, monthly and seasonal maps of air temperature and precipitation amounts and their deviations are operatively prepared for the region[19].

[16] "Official Gazette of the RS", No. 87/2018
[17] "Official Gazette of the RS", No. 80/2019
[18] Disaster Risk Assessment, ://prezentacije.mup.gov.rs/sektorzazastituispasavanje/HTML/zakonska%20regulativa.html
[19] http://www.seevccc.rs/?p=6

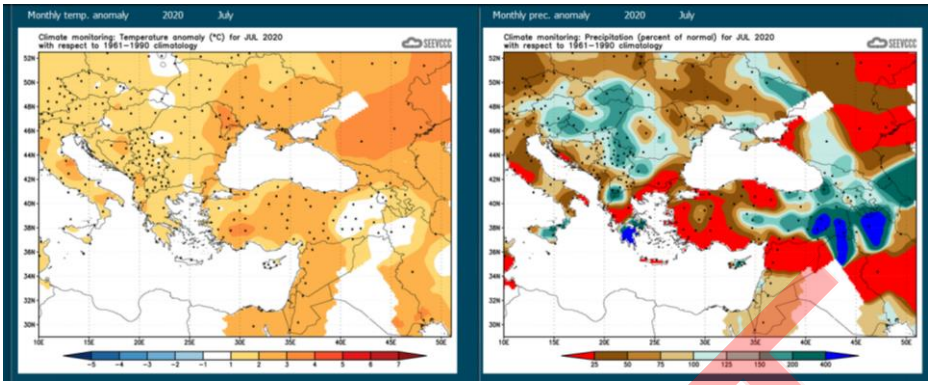

Figure 3. Anomalies of air temperature and precipitation for July 2020 for the region of South-east Europe

RHMS/SEEVCCC also develop seasonal weather forecasts for the summer and winter seasons. In addition to monitoring long-term forecasts provided by world meteorological centres, RHMS/SEEVCCC also prepare their long-term forecasts (seven months in advance each month) for the region of South-east Europe.

In cooperation with the Institute of Meteorology, Faculty of Physics, University of Belgrade, RHMS/SEEVCCC developed high-resolution regional climate projections (8 km) for the period 1971-2100, according to the RCP8.5[20,21] greenhouse gas emission scenario. Based on the observed data and these projections, an analysis of 27 indices of climate extremes for the territory of the Republic of Serbia was developed.[22] Direct outputs from the model are available on request free of charge, while additional data processing and analysis is charged as a professional service.

The documents issued by RHMS to stakeholders according to the Law on Waters and the Law on Planning and Construction are as follows:

- expert opinions in the process of obtaining water conditions;

- hydrometeorological conditions in the process of preparing planning documentation.

RHMS submits data to public enterprises (EPS and PWC "Srbijavode"), transport enterprises, road maintenance companies, insurance companies and utility companies and other undertakings in accordance with special contracts. In emergency situations, data is exchanged with institutions that deal with emergency management, environmental protection, agriculture, forestry and water management, health care, energy, traffic, ionizing radiation protection and nuclear safety, as well as with the media and other interested institutions and legal entities. Other potential users of data are charged in accordance with the Law on Meteorological and Hydrological Activities on the basis of the Decree on determining the fee for the provision of

[20] Djurdjevic V, Krzic A, 2013: Analysis of the downscaled ERA40 reanalysis performed with the NMMB model. http://www.seevccc.rs/ORIENTGATE/Dwnsc-ERA40-NMMB.pdf

[21] Djurdjevic V, Krzic A, 2014: Analysis of the downscaled CMCC-CM projections performed with the NMMB model. http://www.seevccc.rs/ORIENTGATE/Dwnsc_CMCC-CM_NMMB.pdf

[22] Davidović U, Kržič A, Simić G, Milić-Petrović B, 2014: Analysis of extreme climate indices for the territory of the Republic of Serbia. http://www.seevccc.rs/docs/Analiza_klimatskih_indeksa_RS_2014.pdf

services in the field of meteorological and hydrological activities[23]. The collected funds are not available to RHMS (Law on Budget System, "Official Gazette of RS", No. 72/2019) and are not used for the purpose of improving measurements, data quality or strengthening the capacity of employees.

Simultaneously, it should be borne in mind that the European Commission launched an initiative in 2008 with the aim of publishing ground-based and satellite observations at the global level. This initiative resulted in COPERNICUS - the European Union's Earth Observation Programme[24], which includes data from six thematic areas: atmosphere, sea, land, climate change, security and emergencies, which are all publicly available.

The assessment of climate change and consequently the impact of a sector from changed climatic conditions requires a vast series of meteorological parameters, so it is necessary to maintain a network of measuring points (Report 1 shows that this is not the case). Additionally, when replacing auto manual stations, the requirement that both stations operate in parallel for at least two years (precipitation amounts take five years) does not apply in order to maintain the homogeneity of periodic data series[25].

In addition to measuring points managed by RHMS, there are also measuring points set up by public enterprises, private companies, scientific institutions, and local self-governments. Some institutions, in cooperation with RHMS, procured and installed stations in accordance with the Rulebook on conditions for establishing additional networks of meteorological and hydrological stations[26]. Data from these stations are included in RHMS' databases and are used for further analyses. Data from stations that were not set up in cooperation with RHMS are not integrated into RHMS databases (unreliability and incompatibility of data). On the other hand, the RHMS consultation service for setting up stations is charged.

3.2 Recommendations

The existing laws and by-laws prevent free access to data collected and processed by RHMS in easily accessible digital formats.

This is one of the key obstacles that needs to be solved that does not require significant normative requirements but only political readiness to amend the Law on Meteorological and Hydrological Activities and the Decree on determining the fee for the provision of services in the field of meteorological and hydrological activities.

In addition, the existing National Risk Assessment does not include climate change in sectoral risk assessments. Accordingly, the Instruction on the Methodology of development and content of a disaster risk assessment and a protection and rescue plan[27] does not require the inclusion of climate change in risk assessments. Thus, the impact of climate change, i.e. the inclusion of climate scenarios in risk assessments, was also absent in the risk assessments for local self-

[23] Decree on determining the fee for the provision of services in the field of meteorological and hydrological activities, "Official Gazette of the RS", No. 37/2013.
[24] https://www.copernicus.eu
[25] https://library.wmo.int/doc_num.php?explnum_id=3179
[26] Rulebook on conditions for establishing additional networks of meteorological and hydrological stations, "Official Gazette of the RS", No. 30/2014. 30/2014.
[27] Instruction on the Methodology of development and content of a disaster risk assessment and a protection and rescue plan "Official Gazette of the RS", No. 80/2019.

government units. It is recommended that the Instruction be improved, namely that the forthcoming revision of the National Risk Assessment, which should be prepared in 2022 according to the Law, should envisage the inclusion of climate change impacts (trends and projections) in sectoral risk assessments.

According to the Law on Reconstruction after Natural and Other Disasters[28], local self-government units are obliged to assess damage from natural and other disasters, in accordance with the act regulating the unique methodology for assessing damage from natural and other disasters, which is passed by the Government. The 1987 Guide on Unique Methodology for Assessing Damage from Natural Disasters is still in force. A new instruction is currently being drafted, but it is necessary to prepare and train local self-governments for its implementation.

In this manner, data on damages and losses would beobtained, thus providing multiple benefits in the field of adaptation to changed climatic conditions. First and foremost, they indicate the correctness of investing in adaptive measures and they represent a significant basis for obtaining funds, in particular from the Green Climate Fund, but also other funds that finance adaptation activities.

In addition, it is important to work with the competent authorities and provide the necessary climatological data at the level of local self-governments, so that climate change and climate scenarios become an integral part of sectoral assessments within the next National Risk Assessment (the version still in force was adopted over the course of March 2019, whereby the next shall be updated in three years).

Potentially, improving legislation by defining a responsible institution for developing climate scenarios and popularizing existing RHMS products, especially in the area of early warning, could contribute to raising knowledge and awareness concerning the problem of climate change impacts and the need to adapt to changed climate conditions.

4 WATER MANAGEMENT AND WATER RESOURCES

4.1 Legislative Framework

The **Constitution of the Republic of Serbia**[29] guarantees the right of every citizen to a healthy environment and water as its vital element. The legislative framework for the regulation of water within the territory of the Republic of Serbia includes numerous laws and by-laws in this area, as well as strategic and planning documents that define long-term goals and directions of sustainable water management.

The Law on Waters[30] regulates the legal status of waters, integrated water management, management of water facilities and riverine and lacustrine terrain, sources and manner of financing water activities, supervision over the implementation of this law, as well as other issues of importance for water management.

The provisions of this Law apply to all surface and groundwater within the territory of the Republic of Serbia, including thermal and mineral waters, except for groundwater from which useful mineral raw materials and geothermal energy can be obtained. The provisions of this law also refer to watercourses that form or cross the state border of the Republic of Serbia and

[28] Law on Reconstruction after Natural and Other Disasters, "Official Gazette of the RS", No. 112/2015.

[29] "Official Gazette of the RS", No 98/2006

[30] "Official Gazette of the RS", No. 30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 - other law

groundwater belonging to them, as well as to river sediments that do not contain other useful mineral raw materials.

As a significant natural resource, waters are the property of the Republic of Serbia, which is responsible for their integrated management. Integral management is a set of measures and activities aimed at maintaining and improving the water regime, providing the necessary quantities of water of required quality for various purposes, protecting water from pollution and ensuring protection from the harmful effects of water.

Within the territory of the Republic of Serbia, five river basin districts have been defined, which represent the basic units for water management, as follows:

1. Sava river basin district,
2. Danube river basin district,
3. Morava river basin district,
4. Ibar and Lepenac river basin district,
5. Beli Drim river basin district.

The Law on Waters also regulates the area of financing activities of general interest related to water management. Financing of these activities is executed from:

- The budget of the Republic of Serbia,
- the budget of the autonomous province,
- water tariffs,
- concession fees and
- other sources of financing (investors' own funds, prevention funds allocated from insurance premiums, credits, public loans, donations, and so-forth).

The following is financed from the budget:

1. Watercourse management and protection against the harmful effects of water,
2. water management and usage activities,
3. activities in terms of protecting water from pollution,
4. activities related to drainage and irrigation systems,
5. activities related to regional and multi-purpose hydro systems,
6. other tasks of general interest.

The condition for full implementation of the Law on Waters is the adoption of accompanying by-laws with respect to relevant EU directives, as well as by-laws in the field of environmental protection, which include protection of water as an important element of the environment. This primarily refers to acts which determine methodologies, criteria and other necessary elements for the implementation of integrated water management within the territory of the Republic of Serbia. Currently, there are 37 by-laws that regulate in more detail issues relating to water protection, regulation of watercourses, protection from harmful effects of water, use of water for various purposes, methods of financing, and so-forth.

The following are among the existing by-laws in this area that are important for including aspects of climate change and adaptation:

Decree on the establishment of the Water Management Programme for 2020[31], the Ordinance on determining the operational flood defence plan for 2020[32] and the Decree on determining the general flood defence plan[33].

The Law on Waters, as the basic legal act for water management, does not deal with the impact of climate change and the needs of adaptation to changed climatic conditions, which is stated in the Second Report of the Republic of Serbia under the United Nations Framework Convention on Climate Change (p. 88) and consequently does not define specific measures regarding adaptation to climate change.

Integral water management, within the meaning of this Law, represents a set of measures and activities aimed at maintaining and improving the water regime, providing the necessary quantities of water of required quality for various purposes, protecting water from pollution and ensuring protection from harmful effects of water, all of which is within the competence of the Republic of Serbia (Article 24 of the Law on Waters). Furthermore, the Law defines a Preliminary Flood Risk Assessment, namely its compulsory elements (including a description of past floods and an assessment of potential harmful consequences of future floods), leaving the Minister the authority to determine the methodology for developing a preliminary flood risk assessment. Otherwise, the Law defines floods as temporary water coverage of land that is not otherwise covered by water (Article 3, paragraph 44a) and distinguishes between floods caused by external waters (caused by water spills from riverbeds) and floods caused by internal waters (from excess atmospheric and groundwater).

Vulnerability maps and flood risk maps are defined in Article 48, on the basis of which a Flood Risk Management Plan is adopted, while the methodology for developing maps is defined by the Rulebook on determining the methodology for developing vulnerability maps and flood risk maps. The law does not contain any reference to climate change in this section, nor does it explicitly mention climate change as one of the factors taken into account when drafting these documents. This is also a matter that could possibly be improved in the Law, above all through the improvement of by-laws, namely methodologies in a manner that would include climate change and in particular climate scenarios.

The moment of declaring a state of emergency caused by a natural disaster (among others: floods, torrents, storms, heavy rains, atmospheric discharges, and so-forth) is governed by Article 30 of the Law on Emergency Situations, as well as by Article 38 of the Law on Disaster Risk Reduction and Emergency Management:

An emergency situation is declared when the risks and threats or consequences of a catastrophe on the population, material and cultural goods or the environment are of such scope and intensity that their occurrence or consequences cannot be prevented or eliminated by regular action of competent authorities and services, which is why special measures and additional efforts and means must be invested to mitigate and eliminate them through an enhanced mode of operation. An emergency situation is declared immediately upon learning of the imminent danger of its occurrence. An emergency situation may be declared even after its occurrence, if the immediate danger of an emergency situation could not have been foreseen or if due to other circumstances it could not be declared immediately after learning of the immediate danger of its occurrence.

[31] "Official Gazette of the RS", No 13/20
[32] "Official Gazette of the RS", No. 91/20
[33] "Official Gazette of the RS", No. 18/19

Moreover, the Law on Waters defines the types of water facilities for water usage (Article 18), whereby paragraph 3 provides for their purpose:

- the supply of drinking water and sanitary-hygienic needs - water intakes (wells, catchments, interventions on watercourses, channels, lakes and dams with reservoirs), drinking water treatment plants, main pipelines and tanks with devices belonging to them;

- irrigation: interventions on watercourses, channels, lakes, groundwater and dams with reservoirs, main channels and secondary networks and facilities and devices belonging to them;

- fish farming - ponds;

- navigation - facilities that ensure the safety of navigation on waterways along irrigation and drainage channels and ship locks on them;

- the production of hydroelectric energy and other purposes - dams with reservoirs, supply and drainage channels and devices belonging to them. The use of water for this purpose represents special usage of water, whereby the right to it is acquired through the issuance of a water permit and if special water usage is executed on the basis of concession and in accordance with a contract governing concession.

Water consent and permit requirements (Attachment 1) also do not include aspects governing the impact of climate change.

The Law on Waters regulates all manners of water use, including water supply, irrigation, use of water for sports and recreation, navigation, fish farming, and so-forth, and defines measures to protect water from pollution, as well as bans and obligations established for polluters (Articles 97-104), however, it does not deal with the aforementioned in terms of climate change.

Moreover, having in mind the complexity of water management, in addition to the Law on Waters, as a basic legal act in the field of water, other laws have been adopted that regulate many issues related to this area, among which the most important are as follows:

- **The Law on Environmental Protection**[34], **Law on Environmental Impact Assessment**[35], **Law on Integrated Prevention and Control of Environmental Pollution**[36] and **Law on Strategic Environmental Assessment**[37], which together regulate the environmental protection system, covering water as its essential element.
- **Law on Nature Protection**[38], which regulates protection and preservation of nature, as well as biological, geological and landscape diversity as part of the environment.
- **Law on Mining and Geological Research**[39], which, among other things, regulates the manner of classifying resources and reserves of mineral raw materials, groundwater and geothermal resources.

[34] "Official Gazette of the RS", No. 135/2004, 36/2009, 36/2009 - other law, 72/2009 - other law, 43/2011 - Decision of the Constitutional Court, 14/2016, 76/2018, 95/2018 - other law and 95/2018 - other law
[35] "Official Gazette of the RS", No. 135/2004 and 36/2009
[36] "Official Gazette of the RS", No. 135/2004 and 25/2015
[37] "Official Gazette of the RS", No. 135/2004 and 88/2010
[38] "Official Gazette of the RS", No. 36/2009, 88/2010, 91/2010 - corr., 14/2016 and 95/2018 - other law
[39] "Official Gazette of the RS", No. 101/2015 and 95/2018 - other law

- **Law on Communal Activities**[40], which determines communal activities and regulates the general conditions and manner of performing these activities, which are, among others: drinking water supply and purification and drainage of atmospheric and waste-water.
- **Law on Public Property**[41], which deals with forms and holders of property rights, including water resources and water facilities.
- **Law on Navigation and Ports on Inland Waters**[42], which regulates the conditions and manner for safe navigation on inland waters of the Republic of Serbia, waterways and navigation, vessels and their waterworthiness, crew-related issues, search and rescue, ports and harbours, supervision and other issues relating to inland navigation.
- **Law on Local Self-Government**[43]**,** which regulates local self-government units, criteria for their establishment, competencies (which include arranging and ensuring the performance and development of communal activities, as well as taking care of environmental protection, protection from natural and other disasters), bodies, supervision over their acts and work, protection of local self-government and other issues.
- **Law on Financing of Local Self-Government**[44] regulates the provision of funds to local self-government units for performing source-related and entrusted tasks.
- **Law on Establishing the Competences of the Autonomous Province of Vojvodina**[45], which determines the competencies of the Autonomous Province of Vojvodina and regulates other issues of importance for the position of AP Vojvodina. AP Vojvodina, within its territory, through its institutions, in the field of water management, is entrusted with the following tasks: adopts, implements and supervises regular and extraordinary measures of defence against external and internal waters, manages water resources and artificial and natural watercourses, adopts a basis for water management, establishes a public enterprise dedicated to water management, and performs inspection supervision in the field of water management.
- **Law on Emergency Situations**[46], which regulates the operation, proclamation and management of emergency situations, the system for protecting and rescuing people, material and cultural goods and the environment from natural disasters (including, inter alia: floods, torrents, storms, heavy rains, atmospheric discharges, hail, accumulation of ice on a watercourse), competencies, rights and duties of other entities in connection with emergency situations and other issues of importance for the organization and functioning of the protection and rescue system. In terms of this Law, the Republic Water Directorate/ Ministry of Agriculture, Forestry and Water Management are one of the subjects of the protection and rescue system (Article 4, paragraph 1) and as such have a role in the wider

[40] "Official Gazette of the RS", No. 88/2011, 104/2016 and 95/2018
[41] "Official Gazette of the RS", No. 72/2011, 88/2013, 105/2014, 104/2016 - other law, 108/2016, 113/2017 and 95/2018
[42] "Official Gazette of the RS", No. 73/2010, 121/2012, 18/2015, 96/2015 - other law, 92/2016, 104/2016 - other law, 113/2017 - other law, 41/2018
[43] "Official Gazette of the RS", No. 129/2007, 83/2014 - other law, 101/2016 - other law and 47/2018
[44] "Official Gazette of the RS", No. 62/2006, 47/2011, 93/2012, 99/2013 - adjusted RSD amounts, 125/2014 - adjusted RSD amounts, 95/2015 - adjusted RSD amounts, 83/2016, 91/2016 - adjusted RSD amounts, 104/2016 - dr. law, 96/2017 - adjusted RSD amounts, 89/2018 - adjusted RSD amounts, 95/2018 - other law and 86/2019 - adjusted RSD amounts.
[45] "Official Gazette of the RS", No. 99/2009 and 67/2012 - Decision of the Constitutional Court
[46] "Official Gazette of the RS", No. 111/2009, 92/2011 and 93/2012

system established by the Law (e.g., among others, participation in the work of crisis units and flood damage assessment commissions).

- **Law on Disaster Risk Reduction and Emergency Management**[47], which regulates, inter alia, disaster risk reduction, as well as emergency management, where disaster risk reduction involves, among other things, monitoring climate change and community adaptation to expected consequences.
- **Law on the Capital City**[48], which regulates the position, responsibilities and jurisdiction of the City of Belgrade. The City of Belgrade, within its territory, among other competencies, determines parts of the coast and water area where hydrotechnical facilities can be built, where floating facilities and moorings, namely vessel ship lay up sites, may be set, the conditions and manner of their installation, and also provides oversight in the field of water management and over the use of sites for setting floating facilities and moorings.
- **Law on Planning and Construction**[49], which regulates the conditions and manner of spatial planning, arrangement and use of construction land and construction of facilities, supervision over the application of provisions of this law and inspection, as well as other issues of importance for spatial planning, arrangement and use of construction land and facilities construction (including water facilities).
- **Law on Public Enterprises**[50], which regulates the legal status of public enterprises and other forms of organization performing activities of general interest (utilities and water management).
- **Law on Public Health**[51], which regulates the areas of public health, competencies, planning, implementation of activities related to the preservation and improvement of public health, where the implementation of public health in the field of environment and public health includes: monitoring and analysis of the state of the environment, including analysis of water (surface and groundwater, water used for drinking and recreation) and waste-water, as well as monitoring and control of the quality and health safety of drinking water and assessment of the impact of its pollution on public health.
- **Law on Public-Private Partnership and Concessions**[52], which regulates all issues of significance for public-private partnerships, with or without elements of concession, or concessions, where a public-private partnership represents long-term cooperation between public and private partners with the aim of ensuring financing, construction, reconstruction, management or maintenance of infrastructure and other facilities of public importance and providing services of public importance.
- Other laws that also deal with water or that have an impact on water management are as follows: **Forest Law**[53]**, Law on Agricultural Land**[54]**, Law on Energy**[55]**, and so-forth.**

[47] "Official Gazette of the RS", No 87/2018
[48] "Official Gazette of the RS", No. 129/2007, 83/2014 - other law, 101/2016 - other law and 37/2019
[49] "Official Gazette of the RS", No. 72/2009, 81/2009 - corr., 64/2010 - Decision of the Constitutional Court, 24/2011, 121/2012, 42/2013 - Decision of the Constitutional Court, 50/2013 – Decision of the Constitutional Court, 98/2013 - Decision of the Constitutional Court, 132/2014, 145/2014, 83/2018, 31/2019, 37/2019 - other law and 9/2020
[50] "Official Gazette of the RS", No. 15/2016 and 88/2019
[51] "Official Gazette of the RS", No. 15/2016
[52] "Official Gazette of the RS", No. 88/2011, 15/2016 and 104/2016
[53] "Official Gazette of the RS", No. 30/2010, 93/2012, 89/2015 and 95/2018 - other law
[54] "Official Gazette of the RS", No. 30/2010, 93/2012, 89/2015 and 95/2018 - other law
[55] "Official Gazette of the RS", No. 145/2014 and 95/2018 - other law

In principle, none of the laws includes aspects of climate change and adaptation in the segment relating to water management.

4.2 Strategic and planning documents

The Law on Waters defines the planning documents that are the basis for water management within the territory of the Republic of Serbia, and they are as follows:

1. Water Management Strategy of the territory of the Republic of Serbia, as a planning document which determines long-term directions of water management. The strategy is adopted by the Government, at the proposal of the Ministry of Agriculture, and is drafted for a ten-year period. Its implementation is also monitored by the Ministry. The content of the Strategy is defined by the Law and necessarily consists of the following: 1) Assessments of the current state of water management, 2) goals and guidelines for water management, 3) measures for achieving the established goals of water management and 4) a water management development projection.
2. The water management plan is adopted in accordance with the Danube River Basin Strategy, as well as strategies for river basin districts. The management plan for the Danube River is adopted by the Government at the proposal of the Ministry, while plans for river basin districts are adopted by public water management enterprises. The content of the Water Management Plan is defined in Article 33 of the Law on Waters, and it covers the following:
    1. general description of the characteristics of an area, which includes the development of maps indicating the position and boundaries of surface water bodies, mapping of eco-regions and types of surface water bodies and production of maps indicating the position and boundaries of groundwater bodies;
    2. a review of significant human impact on the state of surface and groundwater, including assessment of pollution from concentrated and bulk pollutants, as well as a review of land use, assessment of pressures on the quantitative status of water and the reach of the aforementioned;
    3. identification and mapping of endangered areas;
    4. a map of the monitoring network and a cartographic presentation of the observation results that includes the ecological and chemical status of surface waters and the chemical and quantitative status of groundwater and protected areas, as well as possible deviations from the established deadlines for implementing the water management plan;
    5. a list of environmental objectives in terms of surface and groundwater and protected areas, including cases where an extension of the deadline for achieving objectives and less stringent protection objectives for certain water bodies apply;
    6. water balance;
    7. identification of water bodies used or envisaged to be used for drinking water supply where the average water intake is higher than 10 m3/per day or water bodies used or envisaged to be used for supply of drinking water for more than 50 inhabitants;
    8. identification of agglomerations larger than 2000 ES;
    9. a summary of the register of protected areas, including a map indicating the position of protected areas and the regulations according to which those areas have been declared protected;
    10. a review of the adopted programme of activities and measures and the manner in which the determined goals shall be achieved in the fields of protection against harmful effects of water, water protection (including measures to stop trends of constant and significant deterioration of the state of groundwater and its reversal, protection measures aimed at applying a lower degree of purification in the production of drinking water, prohibiting the introduction and control of pollution emissions, bans, cases for which direct

discharge of pollution into groundwater is allowed, prevention and reduction of the impact of accidental pollution, and so-forth) and regulation and use of water (ensuring supply of drinking water and other needs, protection of sources intended for human consumption in the future, control over water coverage and accumulation, including bans on water use, economic prices of used water, etc.);

11. additional measures for achieving established environmental goals;
12. a more detailed list of water management programmes and plans for individual sub-basins, water-related issues or types of water, including their content;
13. an overview of the economic analysis of water usage and protection and safe-guarding against water, conducted with the application of the principles of "the user pays" and "the polluter pays";
14. a presentation of priorities, dynamics and ways of providing funds for the implementation of planned works and measures, including the possibility of funds not being provided for certain envisaged measures;
15. an overview of the undertaken measures in terms of public information, their results and changes in the plan that resulted from them;
16. a list of competent institutions in the field of water management, with the area they cover, responsibilities, status;
17. procedures for obtaining basic documentation and information, in particular details of adopted control measures for concentrated sources of pollution and ensuring that hydromorphological conditions of water bodies are in line with the required ecological status or good ecological potential of artificial and significantly modified water bodies, as well as details of monitoring data;
18. a review of obligations under international agreements related to water management and the manner of their implementation;
19. principles of establishing a water information system to ensure water management in a river basin district or sub-basin.

The Water Management Plan is adopted for a six year period. After the expiration of six years from the date of adoption of the Water Management Plan, it shall be updated.

3. The Annual Water Management Program must be in accordance with the Water Management Strategy and Plan and adopted by the Government, i.e. the Autonomous Province. It is a planning document which determines water facilities, type and scope of works, i.e. works financed in the period for which the program is adopted, the amount of funds for the execution of works, the amount of participation and other issues related to the construction, reconstruction, rehabilitation and maintenance of water facilities and to other affairs of general interest.
4. Plans regulating the protection against the harmful effects of water, namely: flood risk management plan, general and operational plan for flood defense, as well as plans governing water protection (water pollution protection plan and monitoring program).

Also, the Water Law defines the mutual harmonization of these and other strategic and planning documents adopted at the national level in the field of spatial development, sustainable development, sustainable use of natural resources and goods, environmental protection, which also include the water issue. Mutual compliance is mandatory and refers to the following strategic and planning documents:

- **The Water Management Strategy of the territory of the Republic of Serbia in the period until 2034**[56] (WMS) defines a long-term policy for the implementation of water sector reforms in accordance with the social and economic capacities of the state, compliant to the European Union standards.
- **Spatial plan of the Republic of Serbia from 2010 to 2020**,[57] which determines the long-term basis of organization, regulation, use and protection of space of the Republic of Serbia in order to harmonize economic and social development with the natural, environmental and cultural potentials and limitations on its territory.
- **National Strategy for Sustainable Development of the Republic of Serbia**,[58] [59]with the objective to balance three key factors, i.e. three pillars of sustainable development: sustainable economic growth and economic and technological progress, sustainable social development, based on social balance and environmental protection accompanied with reasonable use of natural resources, embracing them in one whole supported by an adequate institutional framework.
- **Strategy for Agriculture and Rural Development of the Republic of Serbia for the period 2014–2024**,[60] as a fundamental and long-term strategic document defining objectives, priorities and frameworks for political and institutional reforms in the field of agriculture and rural development.
- **National Program for Environmental Protection**,[61] [62]which enables raising the quality of the environment and improving the quality of life of the citizens in the Republic of Serbia, and is in the function of facilitating the accession of the Republic of Serbia to the European Union.
- **National Strategy for Sustainable Use of Natural Resources and Goods**,[63] which frames the strategic planning for sustainable use of natural resources and goods together with the Spatial Plan of the Republic of Serbia.
- **The Basis of Water Management of the Republic of Serbia**,[64] whose goal is to maintain and develop the water regime that provides the most favorable and expedient technical, economic and environmental solutions for unified water management, protection against harmful effects of water, water protection and water use.

The Water Management Strategy of the territory of the Republic of Serbia for the period until 2034 (WMS) as an umbrella strategic document in this area does not deal directly with climate change, i.e. their possible impact on water. In only a few places in the document is climate change recognized as a factor of importance for the field of water, especially in the future. For example, WMS notes climate change as a factor influencing water management planning (p. 130):

"Climate change is a significant element to be taken into consideration in long-term planning in the field of water use. The average trend of average annual temperature in Serbia is about 0.6 °C/100 years. The average trend of total annual precipitation for Serbia, based on a sixty-year

[56] Official Gazette of the RS, no. 03/2017
[57] Law on the Spatial Plan of the Republic of Serbia from 2010 to 2020 (Official Gazette of RS, no. 88/2010)
[58] Official Gazette of the RS, no. 57/2008
[59] The National Strategy for Sustainable Development of the Republic of Serbia refers to the period 2008-2017
[60] Official Gazette of the RS, no. 85/2014
[61] Decision on establishing the National Environmental Protection Program (Official Gazette of the RS, no. 12/2010)
[62] The National Environmental Protection Program covers the period 2010-2019
Official Gazette of the RS, no. 33/2012
[63] Official Gazette of RS, no. 33/2012
[64] Regulation on Determining the Basis of Water Management of the Republic of Serbia (Official Gazette of the RS, no. 11/2002)

observation period, is around zero, but it varies by territory - in the (south) western part of the country it is positive, and in the east it is negative. Hydrological trends are in a certain correlation with the observed climate trends, having in mind the fact that the flow in rivers does not depend only on climate changes, but also on other factors, primarily on anthropogenic factors. The average trend of a drop in average annual flows in central Serbia is about 30%/100 years, but it varies by territory. The smallest changes are expected in the southwestern part of Serbia, and the biggest negative changes are expected in the eastern part."
Also, the WMS (p. 179) states that: "As a consequence of possible changes in temperature and precipitation regimes, more dry periods can be expected in the future. In order to neutralize or reduce the adverse effects of drought, which are the most pronounced and harmful in agriculture, water management in dry periods must be carried out based on relevant field and study research. "
In this regard, the following operational goals and measures are envisaged:
Operational goal 1: Water management in conditions of drought and water scarcity

Measures to reach the goal:

- conduct continuous research on changes in the cycle of precipitation and evapotranspiration and their impact on runoff and water resources;
- define ecological needs for water by watercourses and needs for water of other users (water supply, energy, irrigation), where the environment is an equal user;
- make drought management plans for water areas, with defined conditions for declaring drought or water scarcity and with detailed measures for adapting water management in these conditions, and their summary will need to be entered in the water management plan in the water area;
- develop a characterization of waters in drought conditions for each water area and, using historical data and forecasts for climate change, develop a program of measures for prevention and mitigation of the consequences of drought;
- organize and monitor consultations with stakeholders and coordinate the selection and implementation of appropriate measures (preventive, for water retention in the basin, operational, in terms of protection and controlled use of water resources in drought, or organizational, related to protocols for coordinated work of the sector water and other bodies related to the use of water resources);
- development of measurement and forecasting systems based on observation of parameters on the network of meteorological and hydrological stations, satellite images and botanical prospecting in the field, and assessing the impact of water scarcity on population, economy and environment from comparing conditions in wet and dry conditions.

Although the WMS in creating the water policy recognizes drought as a factor that may have an increasing importance in the future and at the same time states that drought carries the greatest damage to agriculture, the measures envisaged under this goal have an integral character, i.e. they are aimed at providing sufficient quantities of water for all purposes, not only for the purpose agriculture.

In some detail, the WMS touches on the possible effects of climate change (p. 195) and states that "In the last ten years, in cooperation with the Faculty of Physics and the Climate Change Center at the Institute of Meteorology, numerous RCM models have been made, with forecasts of future climate under different scenarios. In the same period, numerous studies and analyzes of the observed values of average air temperatures, precipitation and flows in rivers in Serbia were conducted at the Institute for Water Management "Jaroslav Černi" and significant correlations between them were determined. The period from 1949 to 2006 was analyzed, which

can be considered representative for defining trends, due to its length (58 years). There are data from a number of climatic (selected 26 temperature and 34 precipitation) and hydrological (18, using a larger number for certain checks) stations for this period. More detailed annual and monthly analyzes of the parameters were conducted, and the obtained results for different time periods were additionally verified."

There is an increase in average annual temperatures of about 0.6 °C/100 years, with a higher trend in the northern and mountainous parts of the country. The results of the temperature forecast show an increase in temperature between 0.5 °C and 2 °C in the next fifty years, while further predictions are more uncertain, due to a possible change in a number of parameters. The average trend of total annual precipitation for Serbia obtained based on the observed data, is slightly negative, but the distribution of the trend is geographically different. There was an increase in the trend in the (southwestern) part of the country, and a decrease in the eastern, while in most parts of Serbia it is in the range of + 10%/100 years. Some of the newer regional climate models speak of a surplus of precipitation in the summer and early autumn period in the near future, which is in line with current trends, as well as a significant reduction in precipitation in the distant future. RCM models also indicate for Serbia a certain total average reduction of precipitation on an annual level, in the range from 0% to 25%/100 years. Here, the data presented earlier in the document are elaborated (p. 130), that is, the way in which they were reached is described.
Also, (p. 199): "Hydrological trends are in a certain balance with the observed climate trends, bearing in mind the fact that the flow in rivers depends not only on climate change, but also on other factors, primarily anthropogenic. The average trend of the decrease in average annual flows in central Serbia is about 30%/100 years, but it varies by territory. The smallest changes are recorded in the southwestern part of Serbia, and the biggest negative changes are recorded in the eastern part. It should be taken into consideration that a larger increase in temperature could result in a greater negative impact on flows in watercourses in the territory of the Republic of Serbia. In addition to the above changes in the regime of temperature and precipitation on an annual and seasonal level, it is very likely that significant changes can be expected in terms of intensity and frequency of climatic extremes such as droughts, heavy rains and others. It is very certain that Serbia will face a growing number of dry periods in the future, which does not exclude the possibility of more frequent occurrence of high waters."

Although it's the only document that gives importance to climate change, the WMS does not create goals or plan activities taking into account the results of these analyzes. The potential inclusion of climate change issues would contribute to the improvement of WMS, but also to securing water availability.

It is also significant that the Ministry of Agriculture, Forestry and Water Management, in cooperation with the Food and Agriculture Organization of the United Nations (FAO) and the European Bank for Reconstruction and Development (EBRD) began drafting a National Irrigation Development Strategy and a five-year Action Plan in May 2020. The Irrigation Development Strategy (IDS) will be developed for a ten-year period, and the Action Plan will be made for a five year period. The strategy will take into account both the observed and the expected climate change.

Within this activity, irrigation priorities for the period 2022–2032 and appropriate technical solutions for irrigation will be identified. Priority criteria will also be developed within the project.

The project will also include an economic and financial analysis of potential investments and an identification of possible mobilization of funds for combating climate change and development to improve the protection of planned infrastructure from climate change and climate resilience of the irrigation infrastructure. An appropriate action plan for protection against and adaptation to climate change will be prepared for each potential investment. This will ensure the construction and/or reconstruction of irrigation infrastructure taking into account the impacts of climate change, including construction standards and the application of adequate materials and technical solutions.

Based on the Terms of Reference, that is, the planned activities within the project, it would be said that the Irrigation Development Strategy will be the first national document that will include climate scenarios and define goals and opportunities based on them. That is why it is important to establish a connection between the two projects.

4.3 Sources and methods of financing

Financing of water management, i.e., creation of policy in the field of water is done practically exclusively from public sources, i.e., through budget allocations by various state bodies. In addition, various levels of government are involved in the financing, from:

- national (Ministry of Agriculture, Forestry and Water Management: Water Directorate - Water Budget Fund, Agricultural Land Administration, Directorate for Agrarian Payments),
- AP Vojvodina (Secretariat for Agriculture, Forestry and Water Management),
- local governments.

The total funds allocated for the implementation of various activities, i.e. water policy measures in the budget for 2020 amount to RSD 10.847 billion or about EUR 92.2 million (Table 1). The Water Budget Fund was established by Article 185 of the Water Law, for recording special budget funds intended for financing activities of general interest, and its management is entrusted to the Ministry of Agriculture. It is financed: 1) from appropriations in the budget of the Republic of Serbia for the current year, 2) from water fees, except for water pollution fees and 3) from revenues from the management of free funds of the Republic Fund

Table 1 Total budget support in the field of water management, 2020

State body	**Budget allocations in RSD**
1	2
Republic Water Directorate	1,769,320,000
Water Budget Fund	3,870,362,000
Autonomous Province of Vojvodina	4,711,330,137
Agricultural Land Administration	66,786,476
Directorate for Agrarian Payments*	140,000,000
Local governments	289,457,882
Total	10,847,256,495

Note: Allocations of local governments have been estimated based on the execution of the 2018 budget.

* Detailed data on the type of measures paid through the Directorate for Agrarian Payments are not available, but it is mostly non-refundable funds to farmers for the purchase of irrigation equipment. (Source: *Author's calculation*)

The largest part of the budget goes to public companies for regular maintenance or management. However, within the category of measures called "Infrastructure allocations", we can identify a set of measures that by their nature are intended to mitigate and/or eliminate the consequences of climate change such as: Flood prevention and procurement of mobile dams (39,554,000), Construction of irrigation systems - Phase I (546,658,000), Electrification of irrigation systems (145,500,000) that can contribute to the adaptation and reduction of GHG emissions, but only under the condition the new standards which take into account climate scenarios are applied in the construction of irrigation systems. It is not possible to determine whether such standards are applied, as no data are available, but taking into consideration the previous experience and practice, this is not the case.
The so-called "General Services" include Emergency Flood Damage Remediation (113,400,000), Grants for the early reporting system (1,000,000) and Natural Disaster Risk Management (15,000,000) that can be significant mechanisms for collecting data on damages and losses (Table 2).

Table 2 Overview of budget allocations in the field of water management, 2020

Type of measure	**Name and description of the measure**	**Budget allocations in RSD**
1	2	3
(a) General services		
	Water Management[65]	57,868,000
	Emergency flood damage remediation	113,400,000
	Grants for the early reporting system	1,000,000
	Natural Disaster Risk Management	15,000,000
	Protection of water from pollution (Budget Fund)	56,400,000
	Protection of water against pollution (AP Vojvodina)	109,715,961
	Planning and international cooperation	246,361,000
(b) Maintenance		
	Water maintenance and use[66] (Budget Fund)	270,592,000
	Water maintenance and use (AP Vojvodina)	480,481,183
	Maintenance of river watercourses and protection against the harmful effects of water	2,796,600,000
	Water protection, use and maintenance	3,700,000,000
	Regulation of canal networks (AP Vojvodina)	268,714,993
	Regulation of canal networks (Local self-governments)	277,889,758

[65] Material management costs, above all, salaries of employees.
[66] Costs of maintenance and use of water facilities

(c) Donor-funded projects		
	GEF Water management Drina/Western Balkan project	230,000,000
	Environmental protection EU IPA 2017 project	363,375,000
	EU twining support IPA 2016 project[67]	27,182,000
(d) Inspection costs		
	Water inspection costs	48,137,000
(e) Infrastructure allocations		
	Construction of a dam with a reservoir (Valjevo and Arilje)	500,409,000
	Electrification of irrigation systems	145,500,000
	Construction of irrigation systems - Phase I	546,658,000
	Construction of a special purpose ship (Icebreaker)	221,200,000
	Water supply and development of water infrastructure in border areas (EU project)	105,000,000
	Flood prevention and procurement of mobile dams	39,554,000
	Revitalization of the navigation infrastructure of the Begej canal	7,864,000
	Grants to farmers and SMEs for irrigation investments (Directorate for Agricultural Land)	66,786,476
	Grants to farmers and SMEs for irrigation investments (Local governments)	11,568,124
	Grants to farmers and SMEs for irrigation investments (Directorate for Agrarian Payments)	140,000,000
Total		10,847,256,495

Source: Author's calculation

A significant item within the budget is the allocations for the purpose of supporting farmers (and small and medium enterprises in agriculture) for the purchase of the irrigation equipment. This measure is financed from as many as three sources: the budget of the Ministry of Agriculture, AP Vojvodina and the budget of some local governments. The measure otherwise operates on the principle of co-financing the purchase of equipment for farmers by the budget, in the amount that usually represents 50% of the purchase value of equipment. The so-called "Eligible costs" under this measure **means all equipment on the farm needed for irrigation, regardless of the source of the water used for irrigation**. In that sense, this measure is compatible with the measures of the so-called second pillar of the EU Common Agricultural Policy, and it is also in the current IPARD program of the Republic of Serbia as an eligible investment. In the current year, the total funds allocated for this purpose amount to RSD 218.3 million.

[67] Support to policy planning in water management sector, EU funded twining project (Germany, Austria and Netherlands)

There are no criteria for awarding subsidies, nor their limitation to certain areas, technologies and practices depending on the impact of climate change on water resources, which represents the potential to reduce risk and include adaptation to changed climate conditions.

4.4 Institutional Organization

In addition to the **Republic Directorate for Water**, the Ministry of Agriculture, Forestry and Water Management that, in compliance with the Law on Ministries[68] performs state administration and professional tasks related to:

- water management policy,
- multipurpose water use,
- water supply, excluding water distribution,
- water protection,
- implementation of water protection measures and planned rationalization of water consumption,
- regulation of water regimes,
- monitoring and maintaining the water regime that forms and crosses the border of the Republic of Serbia,
- inspection supervision in the field of water management; performs other tasks in this area,
- other tasks determined by law.

Other actors in the sector of importance are public water management companies that perform activities of general interest related to water management: JVP "Srbijavode", JVP "Vode Vojvodine" and JVP "Beogradvode".

The Ministry of Environmental Protection is, among other things, responsible for the transboundary air and water pollution, protection of water from pollution in order to prevent deterioration of surface and groundwater quality. This illustrates that such a legal solution leads to a certain overlap of competencies between the MAFWM and the MEP, which should be removed by further amendments to the law, i.e. precisely delineate the competencies of these two ministries.

In addition to the ministries dealing with state administration affairs at the level of the Republic, the bodies of the Autonomous Province, the city of Belgrade and local self-government units also deal with water management affairs, each within its competences.

The Autonomous Province and the City of Belgrade, through their administrative (Provincial Secretariat for Agriculture, Water Management and Forestry, Provincial Secretariat for Urbanism and Environmental Protection, Provincial Secretariat for Energy, Construction and Transport in Vojvodina and Secretariat for Economy, Secretariat for Environmental Protection and Secretariat for Communal and Housing Affairs, in Belgrade) and other institutions carry out water management within their administrative boundaries, including the adoption of planning documents (water management plans, flood risk management plans) and administrative acts.

[68] Official Gazette of the RS, nos. 44/2014, 14/2015, 54/2015, 96/2015 - another law and 62/2017

According to the Water Law, the local self-government is responsible for water management of the 2nd order, issuing water acts for facilities of local importance, as well as acts for discharging wastewater into the public sewerage.[69] Among its most important activities is the performance and development of communal activities (purification and distribution of drinking water, collection and purification of wastewater, etc.), which is regulated by a special law. At the local level, administrative and other tasks related to water are performed within various organizational bodies (secretariats, directorates, institutes and other forms).[70]

The capacities of state bodies of different levels of government in the Republic of Serbia are not adequate to the needs in the field of water management, which is stated in the Water Management Strategy (p.104): "Based on the analysis of the available capacities involved in water management in the Republic of Serbia, and obligations in the process of joining the EU, it can be concluded that, primarily in administrative bodies at all levels, the number and structure of employees do not allow the efficient execution of all statutory tasks."
Furthermore, the Water Management Strategy states that the capacity of the **Republic Water Directorate** is inadequate and that for these reasons it must rely on the results of research and analysis conducted by scientific and professional organizations. Also, the same document states that the **Provincial Secretariat for Agriculture, Forestry and Water Management** compensates for the lack of its own capacities by hiring JVP "Vode Vojvodine" to perform part of the expert work in the field of water. Finally, it is stated that at the level of **local self-governments**, activities in the field of water are performed within various organizational units (secretariats, directorates, institutes, etc.) with "often insufficient professional capacity".

The capacities of companies for the operational execution of activities within the water activity (water management and other companies) can be considered satisfactory in terms of the number of employees, but their staff structure is not always satisfactory. However, the assessment is that their staff structure and equipment with the necessary mechanization are not always adequate.

From the above, it is obvious that the capacity of the competent state bodies for water management is limited, and in its own opinion, inadequate. With this in mind, it is logical to conclude that the capacity to deal with climate change, its impact on the country's waters, as well as the planning and implementation of measures aimed at mitigating and/or eliminating the negative effects of climate change is limited and inadequate to an even greater extent.

The place and role of local self-governments in matters related to water management are regulated by the Water Law. Although there is already an appropriate legal basis for this, most local governments in the country do not carry out a number of water management activities. An even smaller number of activities have a "climate aspect", i.e. taking into account current (and emerging) climate change when creating and implementing policy measures financed by budget funds.

[69] Water conditions are attached
[70] Water Management Strategy of the territory of the Republic of Serbia for the period until 2034, p. 102

Additionally, the Report on Significant Water Management Issues in the Republic of Serbia states problems related to financing the water activities, to capacities in institutions responsible for water management, data collection, etc., and as a special problem the missing data on quality monitoring of surface and groundwater.[71]

From the aspect of monitoring, the **Republic Hydrometeorological Service and Serbian Environmental Protection Agency** also have an important place. The location of measuring points, as well as the number and frequency of measuring the parameters are not appropriate on all watercourses, and observations on small and medium watercourses are insufficiently represented, which is reflected in the reliability of surface and groundwater quality assessment and surface and groundwater status. Also, there is no monitoring of groundwater in deep wells, which must be overcome in the coming period.
River sediment monitoring was an integral part of the surface water monitoring program carried out by RHS, but since 2008 this activity is not conducted. Once a year, the Serbian Environmental Protection Agency monitors sediment quality on selected river profiles and in reservoirs within its competencies.
Given the level of information and data, the Water Information System[72] is an important segment in the process of monitoring and improving the water regime, planning the development of water infrastructure and operational management of water and water systems. It is kept in the Ministry, for the entire Republic of Serbia, and in public water management companies for the territory of their competence. The data of the Water Information System are public and available for inspection to interested users, free of charge. Public water management companies also receive data and information relevant to the functioning and development of the water sector from public companies and other legal entities whose activities are related to water management. In addition to water, the Serbian Environmental Protection Agency also maintains the National Environmental Information System (SNEIS), which includes water. The relevant data in these systems must be mutually consistent.[73].

4.5 Recommendations

As two umbrella sectoral documents, one in terms of establishing a legal basis and the other in terms of defining a strategic framework for creating and implementing the policies in the field of water management, it is necessary to amend the Water Law and the Water Management Strategy to strengthen their linkages to climate change and expected implications it brings.

It is important to note here that the existing legal framework already provides an opportunity (or rather, does not prevent) for various state bodies of all levels of government (national, provincial and local) to finance, create and implement water sector measures that have a stronger, or even only, the climate component.

Amendments to the Water Law and the Water Management Strategy would give importance to this segment of water policy (for a start) and thus create a direct legal basis for:

[71] http://www.rdvode.gov.rs/doc/dokumenta/javne-rasprave/Izvestaj-o-znacajnim-pitanima_nacrt_final_191029.pdf

[72] Established by the Water Law, Article 148
[73] Water Management Strategy of the territory of the Republic of Serbia for the period until 2034, p. 115

- higher budget allocations and
- introduction of measures aimed at mitigating and/or eliminating the negative effects of climate change in the water sector.

It is necessary to ensure adequate inclusion of observed and expected climate changes in the Water Law, i.e. to envisage 1) measures directly related to observed and expected climate changes and 2) to incorporate the climate aspect into the process of creating, implementing and monitoring the existing measures, which would condition the existence of measures by their climatic component. This is especially important for the process of planning and construction and/or reconstruction of water infrastructure, which must take the observed and expected climate changes as a starting point for the planning. Also, the water management process itself must be based on climate change, among other important starting factors. In the part of the Law dealing with protection against harmful effects of water, it is necessary to incorporate the climate component (observed and expected) to the adequate extent, since these events may be caused by climate change in the future.

Consequently, and based on the principle of mutual harmonization, the annual work plan and program, as well as local plans and programs should be harmonized with the amended and newly developed legal and strategic framework in the water sector, which would ensure the implementation of measures with a stronger climate component at both provincial and local level.

In practice, it would be most effective to incorporate climate change issues (observed and expected) into:

- Regulation on the methodology for making a preliminary flood risk assessment;
- Regulation on the establishment of the methodology for preparation of flood hazard and flood risk maps;
- Water conditions for obtaining water consent and permit;
- Criteria for awarding subsidies.

From the analysis of human capacities of national, provincial and local bodies engaged in the field of water, as well as of related public companies, the overall lack of adequate human resources is obvious. This shortcoming is stated in the relevant documents and refers, above all, to the execution of activities directly related to water management. Having in mind that the staff capacity is inadequate for the basic activity of these bodies and public companies, it is logical to conclude that the capacity of staff at jobs that involve knowledge in the field they do not deal directly with is even smaller. The development of staff capacities in the direction of perceiving current climate change, the implications for the water sector as well as possible measures that can be taken in order to mitigate and/or eliminate the negative impact of climate change on the water sector is a logical step.

5 AGRICULTURE

5.1 Legal Framework

The basis for incorporating climate change issues into agricultural legislation can be achieved:

1) by legislation governing the subsidies in agriculture and rural development, and
2) by laws and regulations governing the management of agricultural resources (agricultural land, waters and forests) and agricultural practices (plant protection, organic production).

At the same time, it should be borne in mind that the existence of provisions relevant to climate change in agricultural legislation is accidental, i.e. the result of the inclusion of environmental aspects and/or standard objectives of agricultural improvement.

1) The legal framework governing subsidies

The Law on Incentives in Agriculture and Rural Development defines the support measures in agriculture and rural development, the beneficiaries of incentives and the conditions they need to meet. This Law (Article 10) stipulates that each incentive beneficiary must: respect the prescribed standards of environmental quality, protection of human health, animal health and plant protection, animal welfare and protection of agricultural land. The law remains vague in terms of the penalties provided for non-compliance with these provisions, but it has served as the legal basis for the enactment of bylaws (rulebooks) prescribing detailed rules and conditions for specific types of incentives[74].
However, Article 46 of this Law, as well as other regulations, regulate these issues, and Article 46 itself provided that the agricultural inspector may initiate an initiative with the Administration for running a farm in a passive status.

However, the Law on Incentives in Agriculture and Rural Development (CAP) does not provide, as mentioned earlier, for a cross-compliance mechanism based on the EU CAP practice, which would oblige users of direct incentives to comply with the standards related to Statutory Management Requirements - SMR and maintenance of land in good agricultural and environmental conditions (Good Agricultural and Environmental Condition of land - GAEC). Certain dynamics in terms of the introduction of conditions - maintenance of land in good agricultural and environmental condition is defined by the Action Plan for harmonization of regulations with EU regulations. It is certainly necessary to determine whether something more could be done in this sense.

However, in this regard, we should mention two rulebooks that specify the conditions for the right to subsidies, and are related to compliance with environmental standards:

- **Rulebook on environmental conditions that must be fulfilled by the users of IPARD incentives** - This rulebook was adopted on the basis of the Law on Environmental Protection and provides that the beneficiary is entitled to the receiving the IPARD incentives payment if, among other conditions, they fulfil conditions such as: the project is in accordance with the **regulation on environmental impact assessment** (which opens another area in which the issue of climate change and adaptation would be incorporated through the inclusion in the impact assessment), wastewater is treated in a way that does not affect the quality of the recipient, pollutants are released into the air in accordance with the regulation in the field of air and ozone layer protection, hazardous and non-hazardous waste is managed in accordance with the regulation on waste management and the user implements nature protection measures in protected areas and in the ecological network and carries out the works and activities in accordance with a regulation governing nature protection.

- **Rulebook on the conditions to be met by animal waste facilities and plants for animal waste processing and treatment.** This rulebook was adopted on the basis of the

[74] Sanctions for these provisions are provided by other laws. Law on Environmental Protection, Law on Veterinary Medicine, Law on Food Safety, Law on Agricultural Land and others.

Law on Livestock and regulates the technical standards to be met by manure collection facilities in terms of types and capacities, depending on the number and type of livestock.

2) Legal framework governing the management of agricultural resources and agricultural practices

The legal framework governing the management of agricultural resources and other issues relevant to climate change is complex, incomplete and/or insufficiently integrated. The reasons for this can be found in the slow process of delineation of competencies and responsibilities of all actors and insufficient capacities of institutions for creating and coherent policy management.

One of the most important laws in this area is the **Law on Agricultural Land**, which stipulates the obligation of owners or users of agricultural land to use it in accordance with the rules of the Code of Good Agricultural Practice (which is not prescribed), as well as activities and procedures related to land reclamation. The law obliges the users of agricultural land to take measures in order to protect the land from the harmful effects of erosion and torrents in the erosion area: a temporary or permanent prohibition on plowing meadows and pastures and other areas; introduction of crop rotation; cultivation of perennial plants; raising and cultivating field protection belts or planting perennial woody plants; ban on grazing livestock for a certain period of time or limiting the number of heads that can be released on certain areas; ban on cutting forests and forest plantations above endangered plots and the like. In addition, the Law on Land Protection prescribes measures to protect land from unplanned and/or uncontrolled change of purpose, conversion of forest land into agricultural, inappropriate land cultivation, exceeding the optimal number of livestock in accordance with natural soil characteristics, erosion, unplanned and uncontrolled deforestation etc. It would be useful to include aspects of climate change in the identification of land susceptible to erosion and torrents.

In the part related to forestry and forest, the law prescribes the prohibition, i.e. restriction of activities in order to prevent, among other things, (1) conversion of forest into agricultural land, (2) soil erosion, (3) unplanned and uncontrolled deforestation, and (4)) planting trees that do that are not suitable for the habitat (Article 18). Although item (4) is declarative in nature, it still recognizes the importance of adaptation to climate change.

Means for protection and improvement of soil quality are used, among other things, for soil monitoring, rehabilitation, remediation and reclamation of land (important for forests from the aspect of afforestation), as well as for the application of soil protection measures against erosion.

Articles 28 and 29 provide for the establishment of a state and local land monitoring network. At the proposal of the relevant ministry the Government of the RS adopts the "Land Monitoring Program at the level of the state network" (state monitoring), for a period of two years, which is financed from the RS budget. The competent authority of the Autonomous Province and local self-government units adopt the "Land Monitoring Program at the level of the local network", which must be harmonized with the "Land Monitoring Program at the level of the state network", with the consent of the Ministry. Funds for the implementation of the "Land Monitoring Program at the level of the local network" are provided from the budget of the Autonomous Province and the budget of the local self-government unit. The Government of the Republic of Serbia has adopted the "Decree on systematic monitoring of the condition and quality of land", which prescribes in detail the content of the Monitoring Program. Thus, the

maintenance of the database on the condition and quality of land is distributed at different levels (national, provincial and local self-government).

In accordance with the objectives of the Water Management Strategy related to the reduction of pollution inputs from bulk sources of pollution, including agricultural land, as well as the need to define sensitive areas for nutrients, the Water Law and the Rulebook on Designation of Land Reclamation Areas and their Borders were adopted following the Nitrates Directive. The law stipulates that the Government, in addition to determining the criteria for identifying vulnerable areas and defining vulnerable areas and their borders, should also determine action programs for certain vulnerable areas with mandatory measures. The Rulebook defines 13 reclamation areas where the hydro-melioration systems for drainage and irrigation regulate the water regime and where it is necessary to provide adequate protection measures in accordance with the principles of good agricultural practice. **It would be useful to review the identified areas, in a way that includes the expected climate change, in accordance with the available data**.

In order to prevent the spread of harmful organisms and for their control, the Law on Plant Health stipulates that activities of public interest in the field of plant health are assigned to agricultural expert services, as well as to scientific research organizations and higher education institutions, which should conduct special monitoring of harmful organisms, report to the competent body on the occurrence of harmful organisms from the list prescribed by law, on new or sudden mass occurrence of harmful organisms and should conduct education on harmful organisms as well as phyto-sanitary measures and forecasting and reporting activities. The portal of the Forecasting and Reporting Service of Plant Protection updates daily data on threats to plant health with recommendations for producers, at the regional level (http://pissrbija.com/default.aspx).

On the other hand, the Department of Phytosanitary Inspection (Internal phytosanitary inspection Division) of the Plant Protection Directorate of the MAFWM is responsible for systematic monitoring of plants for the presence of harmful organisms that are considered particularly dangerous for plants, in accordance with the **Rulebook on Lists of harmful organisms and the Lists of plants, plant products and regulated objects. There is space for the inclusion of climate projections through this Rulebook**.

The legislation in the competence of other ministries, which regulates a number of issues related to the sustainable use of agricultural resources and climate change in agriculture should be added to the above:

- Law on Nature Protection;
- Law on Disaster Risk Reduction and Emergency Management;
- Law on Reconstruction after Natural and Other Disasters;
- Law on Meteorological and Hydrological Activity;
- Law on Hail Protection.

5.2 Strategic and Planning Documents

Long-term development goals for the agricultural sector and rural areas of the Republic of Serbia are defined by the National Agriculture and Rural Development Strategy (NARDS)[75] of the Republic of. Serbia for the period 2014-2024. The Strategic Framework for Sector Development until 2024 has incorporated the basic principles of the EU Common Agricultural Policy (CAP) for the period 2014-2020, but thus not aspects of adaptation to changed climatic conditions because it is not an integral part of the CAP.

In NARDS, sustainable use of agricultural resources is recognized as one of the five most important internal challenges, and climate change as one of the four most significant external challenges for achieving development goals. Bearing in mind that agriculture is at the same time a significant cause of pollution and climate change, the NARDS pays special attention to sustainable resource management and environmental protection, which are one of the five set strategic goals.[76]

Emphasizing the necessity of reaction to climate change and protection of agricultural land from permanent change of purpose, as well as the need to "reduce greenhouse gas emissions, protect biodiversity and typical rural landscapes, rational use of water resources, forests and other natural potentials of rural areas" NARDS foresees for one of the 14 strategic policy priorities to be: *Adaptation and mitigation of the effects of climate change* (Priority Area 6). The envisaged operational objectives under this priority are:

> "6.1. monitoring of climate change, creation of adaptation measures and adequate measures aimed at reducing greenhouse gas emissions from the agriculture;
> 6.2. improvement and adaptation of the production technology;
> 6.3. technical improvements of land, facilities and equipment;
> 6.4. raising awareness of climate change, its consequences and the need to address them".[77]

MAFWM implements measures that can be reviewed in the stated goals of adaptation and mitigation of climate change, but which belong to other strategic priorities.

To monitor the implementation of strategic goals related to climate change, NARDS defines special indicators, as shown in Table 3.

Table 1. Indicators for monitoring the execution of strategic goals

Indicator	Source	Unit	Value in 2013	Goals set for 2023

[75] In addition to the strategy of agriculture and rural development, we should also mention the Water Management Strategy of the territory of the Republic of Serbia until 2034 and the Forestry Development Strategy of the Republic of Serbia which set frameworks for policies in these sectors (which are the subject of separate sector reports).

[76] The strategic development goals envisaged by the SARD are: 1) production growth and income stability of producers; 2) growth of competitiveness with adjustment to the requirements of the domestic and foreign markets and technical-technological improvement of the agricultural sector; 3) sustainable resource management and environmental protection; 4) improving the quality of life in rural areas and reducing poverty; and 5) effective management of public policies and improvement of the institutional framework.

[77] Strategy for Agriculture and Rural Development of the Republic of Serbia for the period 2014-2024

Area of irrigated and drained agricultural land	MAFWM	000 ha	40	Area of irrigated and drained agricultural land grow to 250,000 ha by 2023
Areas under anti-hail nets, shading nets and the anti-frost system	MAFWM	000 ha	1500	Areas under anti-hail nets, shading nets and the anti-frost system increase by 4 times
Identification of areas sensitive to nitrates from agriculture	MAFWM	Y/N	No	Identification of areas sensitive to nitrates from agriculture by the middle of the period
Investments for environmental protection	SORS			Introduction of agri-environmental measures by 2018

Source: National Agriculture and Rural Development Strategy of the Republic of Serbia for the period 2014-2024

Although foreseen, permanent monitoring of the execution of strategic goals is not carried out, so there are no official progress reports for each of the listed indicators. However, since the support system for agriculture and rural development in Serbia, as will be seen below, has in recent years included incentives for irrigation, for the procurement of crop protection networks, for investments in equipment, machinery and facilities for indoor production and similarly, it is certain that there has been progress in achieving the set indicators. In addition, as planned, the Republic Water Directorate has adopted the Rulebook on Identifying Land Reclamation Areas and their Boundaries,[78] which defines vulnerable areas (which were determined to cover about 49% of the total area of Serbia).

In accordance with the provisions of the **Law on Agriculture and Rural Development**,[79] the operationalization of long-term strategic goals set in the NARDS is more closely defined by medium-term programming documents, namely: **National Agriculture Program, National Rural Development Program and IPARD II program**. These programs contain descriptions of support measures to the sector that will be applied in the planned period, as well as basic activities in the direction of adjusting the national agricultural policy to appropriate support schemes modelled on the CAP.

National program for agriculture for the period 2018-2020 (NAP)[80] is based on the goals set by the NARDS and the National Program for the Adoption of the Acquis (NPAA). This program is focused on measures and activities in the field of the first pillar of the EU CAP, i.e. measures to support the link for direct payments to producers and market regulation measures.

However, the NAP pays little attention to "greening" the first pillar of the policy in order to protect the environment and combat climate change, following the example of the EU practice. NAP does not contain a plan of activities for the introduction of elements of multiple conditionality of payment (Cross-compliance) by respecting environmental standards, on which

[78] Official Gazette of RS, no. 90/2018
[79] Official Gazette of RS, nos. 41/2009, 10/2013 - another law and 101/2016
[80] Official Gazette of RS, no. 120/2017

the farmers' right to receive subsidies in the EU[81] is based, so the introduction of the "green payment system" is not foreseen. The introduction of multiple harmonization is planned by the Action Plan for harmonization of regulations, but in the period after 2020. Since 2015, the EU CAP has included "green direct payment" as a policy instrument, which is granted to farmers to implement the three mandatory practices, namely: crop diversification, areas with an ecological focus and permanent grasslands. These measures are partly related to climate change, mainly with mitigation measures, while their impact on adaptation is indirect.[82] Here is important that according to the proposal of the new CAP 2021-2027, greening is abolished as a scheme, as well as that the official position of the MAFWM is that the green payment will be introduced in accordance with the Action Plan, at the time of EU accession.

National Rural Development Program for the period 2018-2020[83] is also based on the objectives defined in the NARDS, with a more precise framework for rural development policy and support measures modelled on the second pillar of the CAP. The NRDP strategic logic matrix also covers issues related to climate change, as given in Table 2.

The NRDP envisages support measures for agricultural producers that contribute to adaptation to climate change, both at the level of farms and at the level of the entire sector:

- In order to increase competitiveness, it is planned to encourage investments in the physical assets of farms in order to better equip them technically and technologically and thus, among other things, increase their resilience to the challenges posed by climate change. In addition to investments in physical assets, incentives for risk management in agricultural production (subsidies for insurance premiums) are also provided for farmers (Table 5).
- In order to achieve the goal related to sustainable resource management and environmental protection, a number of measures and activities are envisaged with the aim of ensuring sustainable management of agricultural land, water and forests, as well as incentives for knowledge transfer on climate change (Table 4).

Table 4 Strategic matrix of NRDP goals related to climatic and agroecological conditions and measures selected for their execution

Goals defined in the Strategy	**Sub-goals**	**Measures selected for the**

[81] Cross-compliance is a mechanism by which direct payments to producers are conditional on compliance with standards related to the environment, climate change, human, plant and animal health, including the maintenance of land in good production and environmental condition. The GAEC itself was not directly related to climate change in the period 2014-2020, but the requirements it prescribes related to agricultural practices are directly related to the increased carbon sequestration and maintenance of carbon stocks in the soil. GAEC measures include (EC Regulation 73/2009, Annex III,): Prevention of soil erosion; Maintenance of soil organic matter level and soil structure; Biodiversity and preservation of the minimum level of maintenance: preservation of the appearance of the landscape and prohibition of cutting trees and hedges during the bird breeding and rearing season; Water protection and management: Establishment of buffer strips along water courses, permits for the use of irrigation water and protection of groundwater against pollution. Multiple compliance rules apply to about 70% of all farmers supported by the CPL, and about 83% of all payments are spent on them. These figures do not include small farmers, as they are not subject to administrative penalties if they do not comply with multi-compliance obligations.

[82] The literature states that these measures can increase the resilience of farmers and contribute to reducing the vulnerability of farmers to extreme weather and climate events. For these payments, the EU has planned 30% of the total budget for direct payments, and as green direct payment is mandatory, its advantage is the introduction of practices that are beneficial for the environment and climate change in a large part of the used agricultural area.

[83] Official Gazette of the RS, no. 60/18

		execution of strategic goals
Agricultural holding level		
Growth of competitiveness with adjustment to the requirements of domestic and foreign markets and technical-technological improvement of the sector	1) improvement of technical-technological equipment of agricultural farms; 2) sustainable management of resources, and environmental protection, as well as improving the energy efficiency in agricultural production; 1) harmonization with EU rules, its standards, policies and practices.	Incentives for investments in physical assets of agricultural holdings
	2) Ensuring a continuous production process and production stability; 3) risk reduction and efficient compensation of losses in production caused by risk factors; 4) increasing the certainty of achieving a positive financial result and yield for agricultural producers, regardless of weather conditions; 5) improvement of the insurance system, adjusted to the needs of the agricultural sector.	Incentives for risk management in agricultural production
Sectoral level		
Sustainable resource management and environment protection	1) Sustainable management of land as a natural resource and a good of general importance; 2) protection of land from the negative effects of inappropriate agricultural production and inappropriate production practices; 3) rational management of water resources and its impacts on agricultural land; 4) protection of land from negative effects of water and wind; 5) improved application of good agricultural practice (agro - meliorative measures).	Incentives for sustainable use of agricultural land
	1) Protection and stability of forest ecosystems;	Incentives for sustainable use of forest resources

	2) rehabilitation of the general condition of degraded forest ecosystems; 3) ensuring optimal coverage; 4) preservation of durability and increase of yield; 5) preservation and increase of the total value of forests; 6) development and strengthening of public forest functions; 7) increasing the degree of forest areas	
Effective management of public policies and improvement of the institutional framework for agricultural and rural development	8) sustainable development, protection of resources, improvement of biodiversity, reduction of population migration and more efficient response to climate change in the agricultural sector	Incentives to improve knowledge creation and transfer system

Source: NRDP

Climate change and greenhouse gas emissions, as well as their impact on agriculture, are specifically highlighted in the IPARD II program, which lists the following possible impacts of climate change on agriculture based on climate change scenarios: reduction of main crop yields; the emergence of invasive species of plants, insects and animals; threats to dairy farms (heat stress in animals, which may result in reduced milk and meat production); increased risk of "traditional diseases" (E-coli, salmonella, mad cow disease, foot-and-mouth disease, bluetongue, etc.), but also increased risk of "new" diseases (African horse sickness virus, etc.). However, in accordance with EU procedures and rules, activities related to the reduction of these impacts and risks are not funded.

With regard to the forestry sector, IPARD II refers to studies on the impact of climate change that have identified potential risks such as: "1) shifting of some types of forests in relation to their latitude and altitude; 2) changes of real distribution of different types of forests and their relation to each other and changes in the composition of particular plant communities; 3) forest communities will be more exposed to various adverse impacts".
Based on the above and the priorities identified in the NARDS, the IPARD II program provided for the following measures to support farmers in Serbia:

- "Investments in physical assets of agricultural holdings;
- Investments in physical assets related to the processing and marketing of agricultural and fishery products, and
- Agroecological-climatic measures and measures of organic production".

The program goal (expressed as a combination of different indicators at the level of each of the above measures) is defined as: "Number of beneficiaries investing in promoting resource efficiency and supporting the shift towards a low carbon and climate resilient economy in agriculture, food and forestry sectors: 276".

These measures will have an impact on strengthening the adaptive capacities of agricultural holdings, insofar as they will enable the procurement of equipment, machinery and construction

of facilities in accordance with the most modern standards of crop protection, animal welfare and resource efficiency.

The implementation of the IPARD II program in Serbia began in 2017, when the first calls for projects for the measure Investments in physical assets of agricultural holdings were announced. It is important to emphasize that agro-ecological-climatic measures and measures of organic production have not been accredited yet, i.e. EU funds for these purposes are still not available to producers in Serbia. It is planned that these measures will be accredited in the next programming period.

Development goals in the agricultural sector and rural development at the sub-national level are set by the Development Program of the Autonomous Province of Vojvodina (APV) for the period 2014-2020, and strategic documents of local self-government units (LGUs).
The development program of AP Vojvodina for the period 2014-2020[84] did not include climate change in agriculture as a special topic.

The action plan for the priorities from the development program of AP Vojvodina for the period 2018-2020[85] did not envisage climate change as a priority.[86] However, the priority "Development of infrastructure and of conditions for decent living and work", it foresees within the measure "Improvement and management of the environment" organizing the education of "children and students on energy efficiency", and the implementation of a cross-border cooperation project for disaster risk reduction. However, as in the case of all other planning documents, climate change or impacts on the sector do not define or influence the determination of development goals and directions.

The annual programs of support measures for the implementation of agricultural and rural development policies adopted by the provincial and local authorities are approved by the MAFWM. These programs are related to the goals set in the national programs for agriculture and rural development, and depending on the needs of local communities, they include activities related to the impact of climate change on agriculture and rural households.

5.3 Sources and Models of Financing

A description of agricultural policy measures that contribute to the execution of strategic goals related to climate change, which are financed by the MAFWM, IPARD II program and from the local self-government budget are presented in Table 5.

When it comes to incentives intended for agricultural producers, they include incentives for investments (compensation of part of the value of the invested funds) in machinery, equipment and facilities for plant and livestock production, as well as incentives related to reducing the risk of climate change (insurance premium compensation).[87]

[84] http://programrazvoja.vojvodina.gov.rs/wp-content/uploads/2016/03/Program_razvoja_AP_Vojvodine_2014_2020_3891.pdf
[85] http://programrazvoja.vojvodina.gov.rs/wp-content/uploads/2016/02/Akcioni-plan-2018_komplet.pdf
[86] The development priorities are: Development of human resources, Development of infrastructure and conditions for decent living and work, Sustainable economic growth, Development of institutional infrastructure
[87] In addition, other incentives are available under agri-environmental measures, such as incentives for organic production and genetic resources. These incentives (genetic resources and organic farming) are not directly related to adaptation to climate change, but constitute a set of agri-environmental measures that contribute to reducing greenhouse effects and preserving biodiversity.

Table 5. Support measures to agricultural producers from the national budget, of impact on the effects of climate change

Incentive type	**description**	**Amount of incentive**[88]
1. Incentives to improve competitiveness		
1.1 Investments in physical assets of agricultural holdings *(MAFWM, IPARD, LGU)*	Incentives for the purchase of new machines and equipment for the improvement of primary agricultural production of plants[89] - Incentives for investments in the purchase of new machines and equipment for primary production of plant crops in a protected area; - Incentives for investments in the purchase of machinery and equipment for primary production of fruits and grapes, vegetables, flowers, aromatic and medicinal plants (anti-hail nets; frost protection textile covering crops; covering for protection against high temperatures - shading nets, irrigation systems for frost protection) - Incentives for investments in the purchase of machinery and equipment for land cultivation, protection of plants from diseases and hail, weeds and pests; - Incentives for investments in the purchase of new machines and equipment for plant irrigation; - Incentives for the construction and equipping of facilities for the improvement of primary agricultural production[90]	Compensation of 50% of the value of the investment, i.e. 65% of the value of the investment for areas with difficult working conditions in agriculture (POURP)

[88] The amount of incentives financed by local government budgets may vary

[89] Rules on incentives for investments in physical assets on farms for the purchase of new machinery and equipment and high-quality breeding animals for improving primary agricultural production; Official Gazette of RS, nos. 48/2018, 29/2019 and 78/2020

[90]

	- Incentives for the construction of a manure storage facilities; procurement of new equipment for handling, disposal, separation and distribution of manure;	
1.3 Risk management[91] (MAFWM, LGU)	- Compensation for insurance premium for crops, fruits, plantations, nurseries and animals.	Compensation of 40% of paid insurance premium; 45% for POURP; 70% in the area of particular administrative districts.

Source: Author's systematization

Subsidies for the strengthening of the overall resilience of the sector and which are the responsibility of the administrations and funds within the MAFWM should also be noted.

These subsidies are paid on the basis of special annual programs of the Agricultural Land Administration and funds from the Budget Fund for Forests of the Republic of Serbia,[92] and the amount of incentives for these purposes is generally regulated by prescribing maximum amounts, depending on the type of eligible costs.

Table 2. General support measures for the climate change adaptation sector

Type of incentive	**Description**
Sustainable use of agricultural land	Support for the protection and use of agricultural land [93] - Fertility control of arable agricultural land - Improvement of chemical and biological properties of arable agricultural land - Support for agricultural land development - Agricultural land allocation - Reclamation of meadows and pastures
Sustainable use of forest resources[94]	- Forest conservation; Tree planting; Forest management
Support for building rural infrastructure	- Rehabilitation, revitalization, reconstruction, modernization and construction of irrigation systems - Construction and reconstruction of forest roads
Incentives for improving the system of knowledge creation and transfer	

[91] Regulation on conditions, manner and form of request for exercising the right to incentives for insurance premium for crops, fruits, perennial crops, nurseries and animals; Official Gazette of RS, nos. 61/2017 and 44/2018 - another law

[92] Annual decrees on determining the program of works on protection, arrangement and use of agricultural land and annual decrees on determining the annual program of using the funds of the budget fund for forests of the Republic of Serbia

[93] https://upz.minpolj.gov.rs/sadrzaj/download/konkursi/Uredba-o-utvrdjivanju-programa-izvodjenja-radova-2020.pdf

[94] https://upz.minpolj.gov.rs/sadrzaj/download/konkursi/Uredba-o-utvrdjivanju-programa-izvodjenja-radova-2020.pdf

Incentives for improving the system of knowledge creation and transfer	Incentives for the development of technical-technological, applied, development and innovative projects in agriculture and rural development. The incentives include: - incentives for the implementation of technical-technological, applied, development and innovative projects in agriculture and rural development; - incentives related to the development of forecasting and reporting activities in the field of plant protection. Study and research papers, programs and projects in the field of protection and use of agricultural land of importance for the Republic of Serbia
Support for providing advice and information	Support of the Agricultural Advisory and Expert Services of Serbia (AAES) in order to improve advisory activities in the field of agriculture[95]

Source: Authors' systematization

Some of the support measures described in Table 6 are not exclusively and/or directly aimed at addressing climate change issues (such as support for knowledge transfer and innovation, advisory services, etc.), but the regulations on their implementation emphasize agri-environmental issues and may be relevant if they include aspects of climate change.

Climate change adaptation support measures applied at the farm level in Serbia are described in Table 6, and budget allocations for these purposes are shown in Table 7.

Table 3. Budget allocations for incentives to agricultural producers, with an impact on climate change (million RSD)

Name of measure (subsidy)	**2015**	**2016**	**2017**	**2018**	**2019**
Support for the improvement of primary agricultural production*	878.2	1816.0	3502.3	3352.6	4363.5
Risk management (Insurance reimbursement for crops, fruits, perennial crops)	125.7	586.2	604.3	688.6	602.4
Total	1.003.9	2.402.2	4.106.5	4.041.3	4.965.9

Source: Authors' systematization

* The stated amounts, except for the incentives listed in Table 4, which refer to investments in irrigation equipment, shading and hail protection nets, facilities, etc., also include allocations for other investments for primary production (except for the purchase of tractors);

The described rural development support measures applied in Serbia are designed to follow the framework of the Civil Procedure Law in this area. However, during the last few years, there have been frequent changes, both in the allocated funds and in the allowed types of investments. From the aspect of relevance to adaptation, these incentives will only be relevant when they are identified as a priority from the aspect of adaptation or when the selection criteria include aspects of climate change and mitigation.

In principle, it can be said that agricultural policy responds to the challenges faced by farmers, but that before starting to create a new program for the next planning period, it is necessary to

[95] Official Gazette of RS, no. 4/2020

evaluate the entire support system and to include aspects of climate change in creating a new one.

5.4 Institutional framework

Pursuant to the Law on Ministries[96], the Ministry of Agriculture, Forestry and Water Management (MAFWM) is, among other tasks, responsible for the strategy and policy of agricultural development, as well as for the management of agricultural land, protection of plants from infectious diseases and pests; water and forest management.

In the organizational structure of the MAFWM, in addition to several agencies and institutions operating within the scope of the Ministry[97], the two sectors whose activities address climate change issues should be singled out, as follows:

- **Sector for Agricultural Policy** - Within this sector, a Group for monitoring the impact of climate change on the agricultural sector has been established[98], which is responsible for analysing the effects of climate change on the agricultural sector and the impact of agricultural production on climate change; proposing measures for adaptation and mitigation of climate change of importance for agricultural policies as well as monitoring and analysis of the achieved effects of measures.
- - Sector for Rural Development - performs tasks related to: development, monitoring and implementation of IPARD program and National Program for Rural Development in order to increase efficiency, improve the effectiveness of rural development measures and socio-economic aspects of life in rural areas, support rural diversification and create conditions to expand the non-agricultural economy in rural areas; implementation of cooperation with international and national organizations and institutions in the field of rural development in order to harmonize support measures, provide donor assistance for the implementation of development programs and projects in the field of rural development; programming, monitoring and coordination of the work of the agricultural advisory service; monitoring the situation and proposing measures for revitalization and improvement of the development of agricultural cooperatives; as well as programming, monitoring and coordination of the work of the agricultural advisory service.
- **Sector for Agricultural Inspection** - performs inspection supervision over the application of laws and other regulations which refer, among other things, to the use of agricultural resources and production practices. The work of inspection services is regulated by the Rulebook on special elements of risk assessment, frequency of

[96] Official Gazette of the RS, nos. 44/2014, 14/2015, 54/2015, 96/2015 – other law and 62/2017

[97] Administration for Agricultural land - establishes and maintains an information system on agricultural land, and monitors the implementation of annual programs for the protection, arrangement and use of agricultural land; Forest Directorate - performs activities related to forestry policy, forest conservation, improvement and use of forests and wildlife, implementation of forest and wildlife protection measures, and inspection supervision in the field of forestry and hunting; Directorate for Inland Waterways - performs activities related to: water management policy; multipurpose use of water; water protection; implementation of water protection measures; inspection supervision in the field of water management, etc.; Plant Protection Administration - performs activities related to: protection of plants from infectious diseases and pests and forecasting and reporting activities in this regard.

[98] http://www.minpolj.gov.rs/ministarstvo/sektori/sektor-za-poljoprivrednu-politiku/#grupa-za-pracenje-uticaja-promene-klime-na-sektor-poljoprivrede (accessed at 2020/08/04). A more detailed description of the responsibilities and activities of the Group for monitoring the impact of climate change on the agricultural sector was not available at the time of preparing this report. The information available at the indicated address regarding the Group for monitoring the impact of climate change on the agricultural sector referred to the Viticulture and Enology Group.

inspection based on risk assessment and special elements of the inspection plan in the field of agricultural inspection[99], as well as other inspections in the field of agriculture.

In terms of capacity to implement activities within its competences, MAFWM certainly faces a number of organizational problems and distribution of competencies among organizational units, lack of staff and capacity of existing staff for more efficient preparation and implementation of plans and programs, lack of electronic databases and difficult access to them.

The Law on Local Self-Government[100] stipulates (Article 20) that the municipality, through its bodies, takes care of "environmental protection, protection from natural and other disasters ..." and "protection, improvement and use of agricultural land and implementation of rural development policy." In accordance with that, the municipalities are entrusted with the tasks of inspection supervision (Article 22), which, among other things, include the activities in the fields of environmental protection, agriculture, water management and forestry.

Agricultural Advisory and Expert Services (AAES) are under the jurisdiction of the MAFWM and the Provincial Secretariat for Agriculture, Water Management and Forestry and represent a network of institutions involved in the transfer of knowledge to farmers. The medium-term program for the development of agricultural advisory services[101] envisages that AAES activities are specifically focused on knowledge transfer in areas such as: good agricultural practice, environmental protection, good agricultural and environmental conditions, maintaining land in good agricultural and environmental condition, and assistance to agricultural producers in using data obtained from the Agriculture Forecast-Reporting System of Serbia. Obviously, the problem of climate change is not the subject of AAES training.

However, the NPAA[102] states that the advisory system of the Republic of Serbia has not been established in a way to provide services on the application of agricultural practices for the prevention and mitigation of the consequences of climate change and environmental protection related to SMR and GAEC. In this regard, it is planned to strengthen the AAES human capacity (increase the number of agricultural advisors by 5% per year), intensify education and training of employees, provide technical assistance, as well as to define new educational modules and continuing education of advisors in this area in the annual education plan for agricultural advisors.

Strengthening the capacity of advisory services to assist producers in adopting adaptation measures and their practical application is one of the major challenges. Involving a larger number of actors, including those from the private sector, private-public partnerships and local governments in this process, are certainly initiatives that must be better coordinated and encouraged.

During the past accreditation cycles, leading higher education institutions in the field of agriculture have innovated their curricula at all educational levels and enriched them with the topics related to climate change and sustainable use of agricultural resources. Thanks to the projects funded by various international cooperation programs and the Ministry of Education, Science and Technological Development, scientific research institutions have innovated equipment and developed staff, which has resulted in the increasing use of a number of new achievements in the field of digital and precision agriculture and other innovative solutions. The scientific staff is included in the system of knowledge transfer through cooperation with AAES and through participation in training projects of advisors in this field. It should be

[99] Official Gazette of RS, no. 85/18
[100] Official Gazette of RS, nos. 129/2007, 83/2014 – other law, 101/2016 – other law and 47/2018
[101] Official Gazette of RS, no. 39/16
[102] https://www.mei.gov.rs/upload/documents/nacionalna_dokumenta/npaa/third_revision_npaa_18.pdf

emphasized, however, that multidisciplinary projects related to climate change and its effects rarely involve considering economic and social implications, resulting in a lack of valid inputs for policy makers on the economic effects of possible mechanisms and scenarios to strengthen producers' resilience to climate change.

Suppliers of raw materials, equipment and inputs, who often have the role of promoters of modern innovative solutions (irrigation equipment, hail protection, frost protection, mechanization) also play an important role in the knowledge transfer system.

The Republic Hydrometeorological Service of Serbia (RHMS) collects data and conducts agrometeorological research, including drought research and monitoring, important for the agricultural sector, but the results of this research were not used in creating strategic and program documents in the field of agriculture.

The Portal of Forecasting and Reporting Service for Plant Protection has existed since 2010 and was first introduced on the territory of AP Vojvodina as part of the AAES system, and later the availability of services was extended to the rest of Serbia. The work of the portal is based on daily monitoring of harmful organisms on important plant products that cause economic damage. Based on the data obtained by monitoring pests and plant pathogens, climatic conditions and phenophases of host plants, recommendations for the protection of plants that are disseminated to producers are formulated. This portal is available to farmers in the appropriate format through various applications and is actively used.

The Sector for Emergency Management of the Ministry of the Interior (MUP) is responsible for disaster risk reduction and emergency management, but also for organizing and early warning, notification and alerting in case of disasters, including farmers and other actors in the sector.

AP Vojvodina, local self-government units, as well as entities of special importance for protection and rescue, companies and other legal entities prepare and adopt their own risk assessments and disaster risk reduction plans and protection and rescue plans,[103] the content of which is prescribed by a special regulation. [104]

Agricultural insurance is a special type of insurance that applies to crops, fruits, livestock, domestic and wild animals, greenhouses, forests and fisheries, in order to prevent loss of income.[105] Since 2008, the MAFWM has given incentives to producers to regress insurance costs, but the number of farms that insure production is small, as insured areas.[106] Insurance companies see the problem in the low awareness of farmers about climate change and low purchasing power, and producers in the way of calculating damages, the way of assessors' work (untimely field work, unclear contract conditions) and inadequate compensation for lost crops.

In recent times, there have been noticeable shifts insofar as insurance companies have shown greater initiative and readiness to meet the needs of the market. In that sense, insurance companies have started organizing trainings on climate change and adaptation measures for

[103] https://www.paragraf.rs/propisi/zakon-o-smanjenju-rizika-od-katastrofa-i-upravljanju-vanrednim-situacijama.html
[104] Decree on the content, manner of preparation and obligations of entities in connection with the preparation of disaster risk assessment and protection and rescue plans, Official Gazette of the RS, no. 102/2020
[105] In addition, there is crop insurance against loss of income due to falling crop prices as well as compensation for the difference between contracted and realized income.
[106] It is estimated that only 3% of agricultural farms in Serbia insure crops (9% of companies, entrepreneurs and cooperatives), and that only about 10-12% of the area is covered by insurance policies.

their clients, and the offer also includes insurance against accumulated lack of soil moisture (drought according to the definition of an insurance company) based on the application of the index, for leading crops (corn, soybeans and sugar beets).[107]

Framework 1: Farmers' views of the issue of ensuring crops

"Farmer Nenad Božić, from Rača, insured 200 hectares of corn, wheat and sunflower, and the state covered 60 percent of his policy, for only 20 hectares. He spends 1.3 million dinars a year on insurance, and 160,000 dinars are refunded. Last year, he had great hail damage, but the insurance company he had signed a contract with sent an appraiser after 45 days and offered him minimal compensation.

- I sued them - says Božić. - I paid an expert to do the assessment and I will take it to the court. It is not surprising that the appraisers came after a month and a half, because they cover a huge territory, and fruit growers are always the first to be covered. By the time they reached us, farmers, the picture in the fields completely change. The corn has already "risen", and the damage is no longer the same as in the first seven days.

Complaints from farmers that appraisers arrive late are received by the Ministry of Agriculture, but also by the municipal boards for agriculture.

- The hosts are mostly right, the insurance appraisers come late to spend as little money as possible - says Bojan Gavrilović, the Head of the Group for agriculture in Čačak and the President of the municipal Commission for damage assessment. - We always do damage assessment, and our data often do not agree with the reports of insurance companies. If it comes to court, our reports can be important evidence."

Source: https://www.novosti.rs/vesti/naslovna/ekonomija/aktuelno.239.html:852374-Procena-stete-prekasno-stize-Premalo-osiguranih-oranica (accessed at: 01/08/2020)

When it comes to other actors in the agricultural sector and their roles in adapting farmers and rural residents to climate change (cooperatives, farmers' associations and NGOs), it can be said that this topic is not in their focus. In general, the capacity of these actors to support farmers to adopt environmentally sound practices and strengthen resilience to climate change is insufficient. The activities undertaken so far by the NGO sector concerned education on EU experiences in this area and occasional initiatives to promote environmental protection, the fight against climate change and the like. Farmers' associations and cooperatives, on the other hand, are much more preoccupied with the production, financial and market aspects of doing business, while issues related to business risks (including climate change) are addressed in training for producers, without a systematic approach to this topic.

5.5 Recommendations

The Strategy of Agriculture and Rural Development of Serbia and the Agricultural Development Program based on it, the Rural Development Program and the IPARD II program, include climate change issues and envisage adaptation measures both at the level of producers / farms and the agricultural sector as a whole. The results of various climate change scenarios and indicators derived from them were not used in the preparation of the national strategy for agriculture. However, these documents, in addition to support measures, provided a more or

[107] Satellite index insurance uses remote detection to measure and analyze the monitored index. Indexes are created using time series of satellite images. Indices are calculated and submitted by foreign licensed companies.

less detailed list of indicators for measuring progress in this area, as well as rather unclear financial frameworks for policy implementation in this area.

Decision-making bodies at the sub-national level (Autonomous Province of Vojvodina and local self-government units) harmonized their strategic and program documents in the field of agriculture and rural development with the national agricultural policy, and the measures applied most often coincided with those financed from the national budget. Few have used the opportunity to adapt incentives for adaptation to climate change to locally specific needs and risks. Local budgets financed the reconstruction and/or compensated damage to farms affected by natural disasters, but did not encourage the adoption of new, innovative practices to strengthen resilience to climate change. In that sense, it can be said that the great role and importance that the law gives to local self-governments in the field of environmental management and climate change, possibly exceeds their capacities.

In the field of agricultural legislation, it is important to point out that in Serbia, agricultural policy measures within the first pillar of support are still not conditioned by the provision of environmental protection services, and thus by the adaptation of production practices to climate change. However, under the second pillar of agricultural policy, incentives for improvement of physical assets of agricultural holdings, premiums for insurance of crops, fruits and animals, sustainable use of land and forests, as well as incentives for knowledge transfer, support adaptation to climate change at the level of farms, as well as for the sector as a whole.

Institutional capacities for creating, monitoring and implementing adaptation measures are low, which is reflected in the shortage of staff, but also in low technical and technological equipment. Existing databases and historical data on local natural disasters and other risks are insufficiently systematized, not stored in single databases, not updated, nor are all the necessary indicators for valid and data-based decision-making derived from them. This problem poses a serious threat and requires urgent response, as the preparation of program documents for the next planning period is expected during the next year, which must include all relevant knowledge about the effects of climate change and expected changes.

There is little knowledge about the effects of natural disasters on the production and economic results of agricultural production, and even less those disaggregated on certain types of farms, sectors, regions, products and the like. Existing models and simulations do not include economic variables, especially not at a level lower than the national one.

Agricultural advisory services in cooperation with scientific institutions are a key actor in the dissemination of knowledge and information on climate change and adaptation measures to agricultural producers. However, their capacity to respond to this role is relatively limited, given the available staff, burdened with a range of other tasks for which they are responsible, as well as limited technical capabilities.

Budget allocations for financing climate change adaptation measures cannot be determined with sufficient precision. Nevertheless, there is an obvious increase in funds for investments that contribute to strengthening the resilience of agricultural farms and rural areas. It is expected that the accreditation of the new package of IPARD support measures (agri-environmental and climate measures), as well as increasing the dynamics of withdrawal of funds for already accredited IPARD measures, will increase investment in equipment, facilities, machinery and infrastructure which would certainly contribute to a more efficient response to climate change.

Slow procedures and lack of funds for the preparation of technical documentation, as well as for the investments themselves, are the most important challenges faced by local governments. It is expected that the IPARD III program will contain measures to support the improvement of rural infrastructure where it is necessary to include aspects of the impact of climate change,

which would be a huge and sustainable investment incentive for local self-governments. On the other hand, it would require training of the municipal administration and other institutions to prepare project proposals for these purposes, and the key recommendation is to strengthen the capacity of these, as well as the AAES capacity.

6 FORESTS AND FORESTRY

6.1 Legislative framework

The Law on the Spatial Plan of the Republic of Serbia for the period from 2010 to 2020[108] determines the organization, regulation, use and protection of the space of Serbia for the period in question. It states what has already been said about the condition of forests. It prescribes that the total forest cover in Serbia should be 41.4% of the total territory. The main objectives of this law are to improve the condition of forests, increase the area under forests, support private forest owners and implement the objectives of the Forestry Development Strategy. The law also prescribed the scope of afforestation at the level of 45,000 ha by 2014, but not the need to select adaptable species. The law does not deal with the issue of adaptation of forests to changed climatic conditions, nor does it contain provisions related to the need for adaptive forest management.

The Forest Law as a sectoral law, adopted in 2010 (with the latest amendments in 2018), defines the main goal. It is sustainable forest and forest land management as a good of public interest, which includes improving their potential for climate change mitigation and adaptation.

Article 4 (Public interest) prescribes the protection of the public interest, inter alia, by (1) prohibiting the permanent reduction of areas under forests, and (2) increasing the total forest fund.

Article 6 (Forest functions and land use) also determines the functions (4) of mitigating the harmful effects of the "greenhouse effect" by binding carbon, production of oxygen and biomass, and (10) favourable impact on climate and agricultural activity.

Article 7 obliges the user, i.e. forest owner to implement the measures of forest protection, to protect forests and forest lands against degradation and erosion, to execute forest management plans, and to perform other measures stipulated by this Law and regulations passed based on the Law.

Article 9 (Forest conservation) prohibits devastation and deforestation, as well as clear-cutting, which is not a regular form of restoration. The change in land-use form of forests (Article 10) can be done only in accordance with the Plan for the development of the forest area or with the determination of the public interest in accordance with the Law on Expropriation.[109]

Article 35 (Forest chronicle) prescribes that the owner or user of forests has the obligation to keep a book of forest chronicle which is a component part of forest management, i.e. Program (for private forests). This chronicle especially contains data on phenological, biotic and abiotic

[108] 2010: The Law on the Spatial Plan of the Republic of Serbia for the period from 2010 to 2020 ("Official Gazette of RS", no. 88/2010)

[109] Law on Expropriation ("Official Gazette of the RS", No. 53/95, "Official Gazette of the FRY", No. 16/2001 - decision of the SUS and "Official Gazette of the RS", No. 20/2009, 55/2013 - decision US and 106/2016 - authentic interpretation), article 47-48 prescribes the compensation for expropriated mature forest where the value of forest assortments and other forest products determined according to market prices on the truck route is reduced by production costs. It is increased by the amount of compensation for land (Article 42). In the case of young forest, the costs of raising young forest increased by the value increase factor by which the value of mature forest is achieved are taken into account.

phenomena in forests and may be important for monitoring the impact of climate change on forests. Although there is a provision that the forest chronicle content and method shall be more closely prescribed by the Minister, the bylaw has not been adopted, and its adoption is planned for 2021.

Article 44 (Reporting and diagnostic-prognostic service in forest protection) stipulates that the Ministry provides reporting and diagnostic-prognostic activities in forest protection, which is assigned to a forestry scientific institute in the field of forestry in accordance with the regulation on plant health. The provisions oblige the owner or user of forests to act pursuant to the recommendations and proposals of the legal person that deals with the affairs of this service and to deliver samples of plant material to that legal person within the term and by the procedure laid down.

Note: The tasks of reporting and diagnostic-prognostic service are entrusted to the Institute of Forestry in Belgrade and the Institute of Lowland Forestry and Environment in Novi Sad, which are obliged to monitor the condition of all major pests and report to the Forest Administration, forest users and owners who further implement the proposed protection measures.

The ICP Forests (International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests in Europe) in the Republic of Serbia has been running continuously since 2003. The basis for this program is the Convention on Long-Range Transboundary Air Pollution. In 1986, the EU member states harmonized the system at the level of the European Union (EU) related to the protection of forests from atmospheric pollution. Since then, ICP Forests and the EU have worked closely together to monitor the effects of air pollution and other environmental factors on forests.

The ICP Forests takes place simultaneously at 6,000 bioindication points where the vitality and health condition of Europe's forests is monitored. Every year, the Institute of Forestry, Belgrade, as the National Focal Point (NFP) of Serbia, processes data collected in the field, compiles a report (http://www.forest.org.rs/?icp-forests-serbia) and submits it to the Ministry of Agriculture, Forestry and Water Management - Forest Administration.

Article 45 (Extraordinary measures of forest protection) prescribes that in cases of significant disturbance of biological balance and serious damage in forest ecosystems caused by natural disasters (primarily caused by fires, drying, plant diseases and pests, windbreaks, snowstorms, floods, torrents, landslides, etc., the Ministry determines protection and rehabilitation measures carried out by forest owners and users and provides financial resources. Fire protection and procedures related to fires are prescribed by Article 46.

Funds for financing activities of public interest (Articles 76-80) are provided from (1) funds for forest regeneration (in fact, forest depreciation), (2) the budget of the Republic or Province, and (3) the budget fund of the Republic or Province. Reproduction/depreciation funds are used exclusively for the preparation of management plans, and if they are in surplus in the current year, they must be used to finance biological activities (according to the annual decree of the Ministry). These funds in the amount of 15% of the total market value of felled wood assortments at the place of felling, the forest user is obliged to calculate and record their use. The RS/AP budgetary resources are provided for: (1) raising the level of forest cover (afforestation), (2) improving the condition of forest plantations, (3) translating coppice forests into a higher cultivation form, (4-10) production of forest raw materials, protection, care and renewal, forest roads, use of other forest potentials, rehabilitation of areas damaged by disasters and production of development plans (applied development projects, education and propaganda). These funds are used in accordance with the annual program of distribution of funds, and after the competition.

For example, the Decree on determining the annual programme of use of the Budget fund for Forests of the Republic of Serbia in 2020[110] shall determine the activities of forest protection, afforestation, forest care, construction and reconstruction of forest roads, production of forest seeds and planting material, education and promotion development research and other activities of general interest for forestry, as well as the amount of funds for the performance of activities that will be financed from the budget of the RS Forest Fund. This year, the total projected funds amount to 800 million dinars (around 6.8 million euros). This is the average amount of funds in the recent 10 years, and it is clear that the fulfilment of forestry goals is not enough according to the envisaged dynamics planned in the forest development documents, but also in the strategies of other sectors that deal with the issue of forests. The decree does not envisage direct measures related to adaptation to climate change, but the annual funds are distributed to the necessary biological works in the forests of Serbia. Biological works on improving the condition of forests are in the indirect function of adaptation to climate change.

A major problem in spending funds for forest protection and improvement is the lack of a Forestry Development Plan[111] that sets basic goals, guidelines and allocates funds for certain priority projects and programmes.

The Law on Game and Hunting[112] is of little importance for this report, except that it provides a good basis for establishing a wildlife monitoring system, which is certainly important for the area of climate change, i.e. to indicate trends in wild fauna populations. The realisation of the project of the Forest administration, in cooperation with the UN FAO is underway, in order to establish this system.

The Law on Fees for Use of Public Goods[113] regulates fees for the use of public goods, as follows: payers, bases, amounts, manner of determination and payment and affiliation of revenues from the fee. Namely, all fees prescribed by special (sectoral) laws dealing with public goods were taken over in this law in 2018, as well as fees that are realized in forestry.

The law prescribes the following types of fees realised in the forestry and hunting sector: 1) fees for changing the purpose of forests and forest land (the amount of compensation is five times the value of forest and forest land calculated according to the Law on Expropriation and budget revenue, 2) fees for the use of forests and forest land which is divided into a) fee for the use of wood (paid by the user/owner in the amount of 3% of the value of wood assortments on the truck and the budget revenue in the amount of 70% and 30% to the budget local self-government), b) fee for the use of state-owned forest land for non-forest purposes (i.e. lease, of which 80% of the revenue from this fee remains with the forest user, and 20% is the revenue of the RS Budget). None of the above is relevant for the adaptation, but the funds raised can be geared towards them.

[110] 2020: Decree on determining the annual programme of use of the Budget fund for Forests of the Republic of Serbia in 2020 (Official Gazette of the RS, No.17/20)

[111] 2010: Article 19, Forest law, prescribes the adoption of the Forestry Development Programme on the territory of the RS, as a strategic planning document which determines the directions of forest and forestry development with an action plan for its implementation. It is adopted by the RS Government for a period of 10 years and is financed from the RS Budget. Forest management plans are adopted for the implementation of the Programme. The document was not adopted due to pressure to change the timing of its implementation (by area and funds). Due to the non-acceptance of the proposed amendments by the forestry profession, the Programme was never adopted.

[112] 2010: The Law on Game and Hunting (Official Gazette of the RS, No. 18/2010 and 95/2018 – secondary legislation)

[113] 2018: The Law on fees for use of public goods (Official Gazette of the RS, No. 95/2018, 49/2019 and 86/2019 – dinar currency realignment.)

The Law on Waters[114]**, in** the light of Climate Change, in the part related to the prevention and elimination of the harmful effects of erosion and torrents, within the preventive measures, devastation, deforestation and unplanned clean cut and stripping of areas, and within the protective measures (biotechnical and biological protective works), the law prescribes, among other things, afforestation (Article 62, paragraph 2, item 2). In line with that, this type of afforestation, as a job of general interest, is financed from the RS Budget (Article 150, paragraph 1, clause 3). The law very poorly recognizes the importance of forests for water protection against waters as well, because forest land (regardless of whether it is overgrown or not) prescribes the payment of drainage fees, or catchment water fees, which is completely illogical and is the subject of constant discussions between the two sectors. If the choice of species for afforestation provided by this law were taken into account, this measure could be understood as a measure of adaptation to climate change.
The Law on Nature Protection[115] recognizes the need to protect forest ecosystems (in terms of preserving biodiversity, and in order to strengthen the general useful functions of forests). The law obliges the implementation of sustainable forest management, on the principles of sustainable development, protection of biodiversity, preservation of natural composition, structure of function of forest ecosystems and in accordance with the conditions of nature protection as an integral part of forest bases. The obligation to manage forests is also determined in such a way that forest clearings (meadows, pastures, etc.) and forest edges are preserved to the greatest extent.

Insisting on indigenous species in the Law may pose a serious problem for the survival of forests in this area in the near future due to expected climate change. Actually in this part, the law shall undergo changes that relate, above all, to the selection of species for afforestation that best withstand the new climate conditions (best adapted to the given habitat), regardless of whether they are indigenous or non-indigenous tree species.

The Law on Environmental Protection [116] in the part related to forests prescribes that forests must be managed in such a way as to ensure their rational management, preservation of the gene pool, improvement of the structure and realization of priority forest functions, for their protection and improvement (Article 25). Although it provides a good basis for further elaboration of the problem of climate change, this law missed the opportunity to address this issue in detail.

6.2 Strategic and planning documents

The Strategy of Spatial Development of the Republic of Serbia 2009-2013-2020 (2009)[117] is an umbrella document for the organisation, use and protection of the space of the Republic of Serbia. In the field of forestry, it determines long-term goals for the development and use of forests and forest land, game management and protection of natural resources. The Strategy

[114] 2010: The Law on waters (Official Gazette of the RS, No.30/2010, 93/2012, 101/2016, 95/2018 and 95/2018 – secondary legislation)
[115] 2009: The Law on Nature Protection (Official Gazette of the RS, No. 36/2009, 88/2010, 91/2010 - corrigendum., 14/2016 and 95/2018 – secondary legislation
[116] 2004: The Law on Environmental Protection (Official Gazette of the RS, No. 135/2004, 36/2009, 36/2009 – secondary legislation, 72/2009 – secondary legislation, 43/2011 – Decision of Const.Court, 14/2016, 76/2018, 95/2018 – secondary legislation and 95/2018 – secondary legislation)
[117] 2008: The Strategy of Spatial Development of the Republic of Serbia 2009-2013-2020 (Official Gazette of the RS, No. 119/2008)

stipulates that forests will be regenerated and their area increased in a sustainable way to provide a greater strategic role for wood biomass in regional development.

The strategy does not take into account the changed climatic conditions, and therefore neither in the part related to forests and forestry. The strategy only "allocates" a certain area of forest and does not deal with the issues of adaptation of forest ecosystems to the changed climate conditions and future changes.

The Forestry Development Strategy of the Republic of Serbia [118] is the main strategic document in Serbian forestry, although it was adopted by the RS Government as early as in 2006. The goal of the strategy is "preservation and improvement of the condition of existing forests and development of forestry as an economic branch". One of the guiding principles of the Strategy is the multifunctionality of forests, which establishes the irreplaceable role of forests in climate change mitigation, and in that respect increasing the forest fund and improving the condition of existing forests is a fundamental task, but without respecting the simultaneous contribution to climate change. Also, the Strategy (which was originally conceived as a forestry policy) envisages the adoption of the Forestry Development Programme with an action plan, as an operational document for the implementation of the Strategy. The development programme for 2011 was not adopted due to the pressure to significantly change some of its provisions, to which the forestry administration did not agree.

The strategy indicates the need to increase the area under forests, which is, above all, necessary to raise the participation of the forestry sector in the state's economy. Therefore, with this document, the state is obliged to provide financial and legal resources for the needs of afforestation, as well as transfer of low into tall forests. Sustainable forest management, which ensures the vitality of forests, their health status and protection from biotic and abiotic factors is clearly defined in the document. The strategy does not provide numerical indicators, because they were planned to be included in the mentioned Forestry Development Programme. The strategy also sets goals related to research, education, international cooperation, transfer of know-how and support to private forests (in terms of better organisation of private forest owners, in order to achieve sustainable forest management). Due to the stated lack of numerical target values, the effects of this document are difficult to measure. Nevertheless, for the first time, the forestry sector has a document that even today, given the broadly set goals and principles, can be considered valid in the absence of the Development Programme as a document that was supposed to replace the Strategy.

It may be said that at the time of drafting this document of importance for forestry, the issues related to climate change, had not been clearly recognised, not only in the forest and forestry sector, but also at the national level and in other sectors. Therefore, the need for a more detailed elaboration of the issues related to adaptation to climate change has not been sufficiently recognised, although the importance of forests has been taken into account in mitigating them.

The Forestry Development Programme of the Republic of Serbia (draft, 2011) is a planning document whose drafting is prescribed by the Forest Law (Article 19). The programme determines the directions of forest development and forestry with an action plan for its implementation. The programme is adopted for a period of 10 years. Although this document which was supposed to be valid for the period 2011-2020 was not adopted by the Serbian Parliament in 2011, it is necessary to point out the basic indicators contained in this document,

[118] 2006: The Forestry Development Strategy of the Republic of Serbia (Official Gazette of the RS, No. 59/2006)

which at the moment, exactly because of its non-existence, has negative implications for the forestry sector. It must be pointed out that the data stated in the Development Programme are still relevant today, because it must be borne in mind that the period of 10 years in the total production cycle of forestry is only a small time segment. The integral document is included in Appendix 1 of the report. Revision or preparation of this document for the period 2021 paves the way for including the aspects of adaptation and the impact of climate change in the goals of forestry development.

The Forestry Development Programme of AP Vojvodina[119] has been in force since 2015 after a long period of harmonisation and is in accordance with the provisions of the Forest Law. Considering the percentage of forest cover in the province (6.51% and 140,000 ha respectively), the main goal of the Programme is to increase forest cover, but also to improve the condition of existing forests by implementing forest-breeding measures. Amendments to the Forest Law have established the existence of only the Forestry Development Programme at the national level, and this document can only be considered temporary. The plan envisages afforestation at the level of 1,074 ha/year. Former implementation has shown that although there are sufficient financial resources for afforestation in Vojvodina, they are not used, primarily for several basic reasons: 1) unrealistic assessment of the availability of land for afforestation, 2) lack of coordination between sectors, forestry, agriculture, water management, nature protection), 3) complicated administrative procedures, as well as 4) out-of-date cadastre.

The issue of drying the most valuable oak forests in the territory of Vojvodina has been current in the recent decades, which puts additional pressure on achieving the goals of this programme with an additional challenge related to the selection of species for afforestation.[120]

The development of the **National Action Programme for Combating Desertification and Land Degradation and Mitigating the Effects of Drought in the Territory of the Republic of Serbia** (proposal, 2020) is underway and the document has not included the aspects of climate change. When it comes to forests and their adaptability, the proposed action programme does not elaborate this issue in detail, but emphasizes measures related to the adaptation of forest management in accordance with the needs of adaptation (improvement of management, through reconstruction, conversion and rehabilitation). Like other strategies, it does not provide recommendations regarding the selection of species for afforestation.

The Strategy of Low-Carbon Development of the Republic of Serbia with the action plan (proposal, 2020) states that the forests of Serbia are especially vulnerable to biotic (such as pests and diseases) and abiotic (such as fire) factors, which will be aggravated by climate change. To reduce their impacts, sustainable forest management requires the adoption of practices that take into account scenarios for future climate conditions.

The Biodiversity Strategy of the Republic of Serbia for the period 2011 – 2018[121] refers to the protection of biodiversity, which, among other things, includes the protection of forests. The document states that the condition of Serbian forests is generally at an unsatisfactory level. Certain activities within the Forest Action Plan, as part of this document, are limited to: 1)

[119] 2015: The Forestry Development Programme of AP Vojvodina (Official Gazette of AP Vojvodina, No. 29)
[120] Forest management in Vojvodina, especially in Srem, requires monitoring of the regime of groundwater and surface water and their impact on forest ecosystems (and especially on those which are very sensitive to these changes in hygrophilous tree species such as the English Oak Tree – Quercus robur L.) PE Vojvodinašume, in that regard monitors these changes, which are caused by excessive water from coastal aquifers, construction of embankments, construction of canals and other hydromeliorative works. This observation is performed at 2 observation points in Donji Srem with 5 piezometers, and in Gornji Srem at 4 observation profiles with 102 piezometers.
[121] 2011: Biodiversity Strategy of the Republic of Serbia for the period from 2011 to 2018 (Official Gazette of the RS, No. 13/2011)

promoting the conservation of forest biodiversity, through forest management certification and guidelines for the ecosystem approach to forest management, and 2) establishing measures and guidelines to prevent the introduction of genetically modified woody species, as well as allochthonous and invasive species. The document itself did not base its conclusions on climate change, the impacts of climate change on biodiversity, nor the need to adapt to changing climate conditions.

The National Strategy for Sustainable Use of Natural Resources and Goods[122] of 2012, in relation to other strategic documents from the beginning of the previous decade, mostly refers to forests and climate change. The general goal of this Strategy concerning forest resources is to achieve sustainable forest management, while the specific goals are: 1) preparation of a study on the impact of climate change on forest ecosystems, 2) conservation of forest habitats and successors (which is important from the aspect of adaptability in the conditions of continuous climate change, 3) incorporation of the aspect of climate change into all long-term investments (especially with biological works such as conversion of coppice forests and afforestation in terms of technology selection), 4) supporting research and studies on methods and possible amounts of carbon storage in forests, as well as promoting efficient use of wood biomass from sustainably managed forests, in accordance with UNFCCC and the Kyoto Protocol, 5) creating conditions for filing applications to the international funds for increasing the area under forests.

Apart from the fact that the specific goal is 1) to prepare a study of the impact of climate change on forest ecosystems, the document did not base the goals and directions of development, taking into account the aspects of climate change.

The Energy Sector Development Strategy of the Republic of Serbia until 2025, with projections until 2030[123] does not take into account aspects of the impact of climate change on the energy sector, nor on the forestry and forestry sector, which may violate the assumed goals of using wood biomass for energy production. Moreover, the Strategy does not recognize the possibilities of combining classical infrastructure and natural solutions (windbreaks, afforestation, etc.) for more efficient production and consumption of energy and at the same time reducing the pressure of this sector on environmental factors.

The National Programme for Rural Development in the period 2018 – 2020[124] prescribes medium-term directions for the development of rural areas and describes in more detail the ways of implementing rural development measures for the programming period 2018 – 2020. Within chapter 6.2.6. Incentives for the preservation and improvement of the environment and natural resources, incentives for forests and forestry are also defined. Sub-measures that can be subsidized under this point are: 1) development of forest areas and improvement of profitability of forest management[125]; 2) investments in forestry technologies, processing and mobilization and marketing of forest products; 3) support for the construction of forest infrastructure with the aim of increasing the availability and efficiency of the use of forest resources; 4) development of a forestry advisory service; 5) establishing producer groups and organisations; 6) support for the establishment of the NATURA 2000 network; 7) support for cooperation and

[122] 2012: The National Strategy for Sustainable Use of Natural Resources and Goods (Official Gazette of the RS, No. 33/2012))
[123] 2015: The Energy Sector Development Strategy of the Republic of Serbia until 2025, with projections until 2030 (Official Gazette of the RS, No. 101/2015)
[124] https://www.infotim.rs/site/img/laws/ministry of agriculture adopted the national programme for rural development from 2018 to 2020 - 1533643094_580.pdf
[125] Which means support for a) afforestation and creation of new areas under forests, b) the establishment of agro-forestry systems, c) the prevention and elimination of damage to forests from forest fires, natural disasters and catastrophes (including insect infestations, diseases and climate disturbances), d) improving the resilience and value of the environment, as well as the potential of forest ecosystems.

the creation of clusters and networks in forestry. For sub-measure 1) support is planned for: 1) afforestation and creation of new areas under forests; 2) establishment of agro-forestry systems; 3) prevention and elimination of damage in forests from forest fires, natural disasters and catastrophes (including insect infestations, diseases and climate disturbances); as well as for 4) improving the resilience and values of the environment, as well as the potential of forest ecosystems. It may be concluded that the proposed financing measures are complementary to the measures of adaptation to climate change, but in order to be so, they must include in their implementation the aspects of climate change and adaptation.

This measure is classified as a measure of rural development, but due to human resources and available funds, the implementation of this measure, monitoring the implementation of this measure, is the responsibility of the Forest Administration, the administrative body within the MAFWM.

6.3 Institutional framework

Four ministries are directly or indirectly responsible for forestry and related policies:

The Ministry of Agriculture, Forestry and Water Management. As a line ministry, it is in charge of adopting policy in the field of forests and forestry, as well as the legislative and planning framework, which significantly influences activities related to climate change mitigation and adaptation.

Forest Administration, is a body within the Ministry that performs state administration and professional activities related to: forestry policy, forest conservation, improvement and use of forests and wildlife, implementation of forest and wildlife protection measures, control of seeds and planting material in forestry, and inspections in the field of forestry and hunting, as well as other activities determined by law.

The Ministry of Environmental Protection. Performs tasks related to the basics of environmental protection, the system of environmental protection and improvement, national parks, climate change, etc.

The Ministry is divided into a number of sectors, including the Sector for Nature Protection and Climate Change. As part of its activities in the previous year (2019), the Ministry allocated funds for afforestation programmes.

The Ministry of Mining and Energy. Is in charge of the Serbian energy sector and is in charge, among other things, of creating a legislative framework related to energy production, energy efficiency and the use of energy sources. Within the Ministry, there is also the Energy Efficiency Sector with the Division for Sustainable Development and Climate Change in the Department of Energy. In terms of impact on the forestry sector, within its policy, it can influence the increase in the use and production of wood biomass, as well as the establishment of plantations of fast-growing woody species for energy purposes, but also by planning measures that will include nature-based solutions.

The Ministry of Construction, Transport and Infrastructure is in charge of construction, construction land, urban planning, spatial planning, and land use planning in the RS. The Ministry can have a significant impact on the forestry sector in terms of the impact on reducing or increasing the area under forests, and thus on the processes of climate change mitigation and adaptation to them. This particularly concerns the urbanization process in special-purpose forest areas. Compensation measures are also planned for changing the purpose.

Local governments. They have little impact on policy making, but significant impact on its implementation. Namely, 30% of the total income from the fee for the use of wood is allocated to the budget of local self-governments and must be spent for the needs of the forest**.** Namely, 30% of the total income from the fee for the use of wood is allocated to the budget of local self-governments and must be spent for the needs of the forest. This measure is unclear to local governments rich in forests (e.g. Šid, Sremska Mitrovica), where wood is used to a greater extent, the funds generated by compensation cannot be used for afforestation (because the land is fully afforested), and vice versa, in local communities where there is a real need for afforestation (e.g. municipalities in south-eastern Serbia) the funds generated from this fee are so low that it is unrealistic to expect that they can perform afforestation. The creators of the Forest Law (2010) were against allocating these 30% for the needs of local governments in the field of forestry.

Public enterprises for management of state-owned forests (PE Srbijašume, PE National Parks) are in charge of managing state-owned forests. Also, these companies are in charge of providing professional and technical work in private forests (including drafting plans, remittances and issuing documents for timber trade).

Private forest owners. In addition to individuals, the Serbia Orthodox Church has been the largest forest owner after restitution, which began in 2006/2008 following the adoption of the Law on Property Restitution. By 2016, as much as 33.063 ha of forests and forest land had been restituted. The Church manages forests either through companies it has established, in accordance with the Forest Law, or signs contracts with public or private forest management companies. There are no other private forest owners besides the church.

Individuals own about 47% of all forests in Serbia. The number of owners ranges from 500-800.000 and the size of the property (which is otherwise fragmented and scattered) is around 3 ha. Therefore, one cannot speak of sustainable private forest management. For more than two decades, the need to unite private forest owners in order to achieve their interests, and at the same time enable the achievement of sustainable management goals with subsidies which they could receive from the state through association. The efforts and funds invested so far in private forests have not yielded the desired results.

University and institutes. The Faculty of Forestry in Belgrade has a special role in the field of forestry and biomass. The faculty educates staff for forest management, biomass production and use, but has not developed a curriculum that addresses climate change issues and the role of forests in adapting and mitigating these changes. In addition to the Faculty of Forestry, two other institutes (the Institute of Forestry in Belgrade and the Institute of Lowland Forestry and Environment in Novi Sad) conduct research within variously funded projects related to forests and forestry, including climate change. The work of these institutes, although directly controlled by the Ministry of Agriculture, Forestry and Water Management, has been under the jurisdiction of the Ministry of Education, Science and Technological Development since 2012, thus losing direct influence in defining research priorities in the field of forests and forestry.

Non-governmental sector. The non-governmental organisations (especially in the field of environmental protection) are currently playing an increasingly prominent role in the climate change and renewable energy sector. Although they are non-governmental organisations, they are still increasingly involved in the implementation of projects related to climate change. Only a few of them are related to the forestry sector, out of which it is necessary to mention the Gorani Movement of Serbia, as the oldest and most influential non-governmental organisation in the field of forestry. The main tasks of these NGO's are to improve the state of forests and

the environment in Serbia, as well as the education of young people (starting from school age) to forestry experts (when speaking of the Chamber of Forestry Engineers of Serbia), as an interesting organisation dedicated to educating forestry experts at work). Among the international NGO's, the influential WWF, which finds its interest in forests, needs to be mentioned.

6.4 Recommendations

Based on the previous analysis, it is clear that the key recommendations in terms of the importance of including climate change and adaptation to the goals and directions of development in the forestry sector can be identified as:

1. Revision of the forestry development policy, and above all the Republic of Serbia Forestry Development Program, which will include the issue of climate change and biodiversity protection;
2. Revision of the legislative framework of the forestry sector that will support the implementation of this Development Program.

In order to effectively achieve the goals in the forestry sector, it is necessary to:

1. Provide support to creation of interest associations of private forest owners (taking into account that about 50% of forests are privately owned), as well as the creation of an appropriate advisory service) as a system that will effectively support private forest owners (by indirect and direct support) and strengthen their capacity to recognize the problems caused by climate change in forest ecosystems
2. Improve cross-sectoral cooperation
3. Strengthen the capacity of the Forest Directorate to monitor and propose measures, as well as coordinate forestry activities related to climate change
4. Carry out detailed habitat mapping in order to define productivity for certain tree species in certain habitats, and especially in the territory of Vojvodina
5. Management of risks in forest management in relation to climate change (in order to create forest ecosystems resilient to climate change)
6. Introduction of "Climate-Smart Forestry" as a current approach in forest management.
7. Develop guidelines for forest management in preventing erosion.
8. Introduction of new curricula at the university, and especially at the Faculty of Forestry, which would deal with the problem of climate change in forest ecosystems (such as habitat mapping, risk management, monitoring of forest ecosystems, management instructions, etc.).

7 TRAFFIC, CONSTRUCTION AND ENERGY INFRASTRUCTURE

7.1 Legislative framework

Starting from Report 1, it is clear that a common denominator influencing climate change on the transport, construction and energy sectors is infrastructure. The importance of assessing the impact of climate change on these sectors through the impact on infrastructure, but also adequate adaptation, which implies changes in construction standards, is found in the lifespan of that infrastructure, and the size of the required investments. Therefore, further analyses of

the legislative and policy framework in these three sectors will take into account the aspect of the need to adapt infrastructure standards to the changed climate conditions.

In Serbia, the share of road transport in total freight traffic is 80% and 74% in total passenger traffic. On the other hand, the EU White Paper for the transport sector for the period 2011-2050[9] sets a goal to redirect 30% of road transport at distances of over 300 km to other modes of transport, rail and water, i.e. more than 50% in 2050. The EU White Paper should be the basis for a new strategic document in the sector.

In the road traffic area, a number of laws are in force, of which the Law on Roads ("Official Gazette of the Republic of Serbia", 41 - 2018 and 95-2018[8]) regulates the legal status of public and uncategorized roads, conditions and methods of management, protection and maintenance of public roads, special conditions for construction and reconstruction of public roads, sources and methods of financing the reconstruction, protection and maintenance of roads. This Law provides the basis for the inclusion of aspects of climate change and adaptation to these changes, in measures to protect public roads from leaching and landslides, rehabilitation and regular maintenance, rehabilitation and emergency maintenance.

Tangible changes and the inclusion of climate change projections in the methods of maintaining road infrastructure, eventually, is possible by amending the Rulebook on Works on Regular Maintenance of Public Roads ("Official Gazette of the Republic of Serbia", No. 15/2020).

In the field of railway transport, the Law on Railways ("Official Gazette of RS", no. 54/18), the Law on the Safety and Interoperability of Railways ("Official Gazette of RS", no. 104/13, 66/15- other law, and 92/15), the Law on Contracts for Rail Transport ("Official Gazette of RS", No. 38/15) and the Law on Accident Investigations for Aviation, Railways and Waterborne Transport ("Official Gazette of RS", No. 66/15) are in force. The Law on Railways regulates the management of railway infrastructure, as well as the competencies of the Directorate for Railways. The Law defines that the management of public railway infrastructure includes, inter alia: maintenance of railway infrastructure, protection of railway infrastructure and performing the investor function on construction and reconstruction, i.e. modernization of railway infrastructure, as well as construction of railway infrastructure in accordance with the law governing planning and construction of facilities and laws governing railway safety and interoperability of the railway system. This Law provides a basis for including aspects of climate change and adaptation to them.

In principle, the common denominator for these modes of transport, as well as energy, from the aspect of the inclusion of climate change through the construction of facilities is the **Law on Environmental Impact Assessment** ("Official Gazette of RS", no. 135/2004 and 36/2009). The current Law does not introduce provisions related to climate change. On the other hand, Directive 2014/52/ EU introduces climate change and GHG (Greenhouse gas emissions), i.e. defines specific issues that must be included in the screening of projects from the so-called Annex 2 of the list as follows:

a) The impact of the project on climate change, in the context of GHG emissions including LULUCF (Land use, land-use change, and forestry);
b) Contribution of the project to improving resilience;
c) Impacts of climate change on the project.

In addition, Article 3 and Annexes 3 and 4 of the Directive introduce the concept of disaster risk reduction. Harmonization of the Law with this Directive would also incorporate aspects of climate change into the transport, energy and infrastructure sectors.

The Energy Law[126] is the basic law which regulates legal relations in the field of energy as a special field of economy. This law regulates the goals of energy policy and the manner of its realization, the use of renewable energy sources, incentive measures and Guarantees of Origin, and other elements of the energy sector. The Law does not recognize adaptation measures in the energy policy planning process. However, the Energy Law sets rules that the application of the principle of energy efficiency in performing energy activities and construction of energy facilities is a mandatory part of regulatory elements that guide the development of energy, such as regulations, licenses, permits, approvals and more. If energy efficiency measures in building design and construction can be indirectly considered as adaptation measures, then the Law has laid the groundwork for adjustment in part of the energy sector.

Also, the Law stipulates that the National Renewable Energy Action Plan must be harmonized with the regulations governing energy efficiency and reduction of greenhouse gas emissions[127]. The Ministry prescribes the method of calculating the share of energy from renewable sources in gross final energy consumption, the method of calculating electricity produced from hydropower and wind power plants, the energy content of fuels in traffic, the method of calculating the impact of biofuels, bioliquids and their comparable fossil fuels on greenhouse gas emissions, as well as the method of calculating energy from heat pumps. The abovementioned represents only forms of reducing emissions, but not adapting to climate change.

The Law on Efficient Use of Energy regulates the conditions and manner of efficient use of energy and energy generating products (hereinafter: energy) in the sector of production, transmission, distribution and consumption of energy; energy efficiency policy; energy management system; marking the levels of energy efficiency of products that affect energy consumption; minimum energy efficiency requirements in the production, transmission and distribution of electricity and heat and the delivery of natural gas; financing, incentives and other measures in this area, as well as other issues of importance for the rights and obligations of individuals and legal entities related to the efficient use of energy.[128] This law stipulates that in accordance with the Energy Sector Development Strategy of the Republic of Serbia, Action Plans for Energy Efficiency in the Republic of Serbia are adopted, as well as other energy efficiency programs and plans adopted by local self-government units and other obligors of the energy management system. As in the case of the Energy Law, this law does not address issues of adaptation.

The subordinate legislation of the Law on Efficient Use of Energy, which regulate the Budget Fund for Improving Energy Efficiency, include: 1) The Decree on the Program for Financing Activities and Measures for Improvement of Efficient Use of Energy in 2019[129], 2)

[126] The Energy Law („Official Gazette RS“ no. 145/14 and 95/18 – other law).
[127] Article 65 and 76 of the Energy Law („Official Gazette RS“ no. 145/14 and 95/18 – other law).
[128] Article 1 of the Law on Efficient Use of Energy („Official Gazette RS“ no. 135/14).
[129] The Decree on the Program for Financing Activities and Measures for Improvement of Efficient Use of Energy in 2019 (“Official Gazette of the RS“ no. 4/19).

Rulebook on Conditions for Distribution and Use of Resources of the Budgetary Fund for Energy Efficiency Improvement of the Republic of Serbia and Criteria for Exemption from the

Mandatory Energy Audit[130] and 3) Rulebook on the Application Form for the Records of the Obligors for Energy Efficiency Improvement, Form of the Monthly and Annual Calculation of Energy/Energy Generating Products Delivered to Consumers or Placed on the Market of the Republic of Serbia, i.e. Imported on the Territory of the Republic of Serbia, Form of Monthly and Annual Calculation of the Obligation to Pay the Energy Fee, Form of the Report on Payment, as well as the Manner of Submitting These Forms[131]. Indirectly, it could be considered that these regulations also improve the area of adaptation to climate change, given that they regulate the method of financing of the energy efficiency measures. The fund is intended for all levels of government, households and residential buildings, with the aim of financing projects that achieve energy savings after implementation. Projects that could be considered as adaptation to climate change include the improvement of the thermal envelope of the building and the improvement of thermo-technical systems in buildings by replacing the system or part of the system with a more efficient system.

Other subordinate legislation in the field of energy efficiency include: 1) Regulation on Minimum Energy Efficiency Requirements for New and Revitalized Facilities[132], 2) Rulebook on Determining the Model of Energy Services Contract for the Implementation of Measures to Improve Energy Efficiency When the Consumers are from the Public Sector[133], 3) Rulebook on Minimum Energy Efficiency Requirements in the Public Procurement Procedures[134], 4) Rulebook on Controlling Heating Systems and Detailed Requirements for Legal Entities Authorized for Controlling Heating Systems[135], 5) Rulebook on Controlling Air Conditioning Systems[136], 6) Rulebook on the Content of the Study on Energy Efficiency of Electricity Generation Plants, Plants for Combined Heat and Electricity Generation, Electricity Transmission and Distribution Systems, Heat Production and Distribution Plants[137], 7) Rulebook on the Manner and Deadlines for Submission of Data Necessary for Monitoring the Implementation of the Energy Efficiency Action Plan in the Republic of Serbia and the

[130] Rulebook on Conditions for Distribution and Use of Resources of the Budgetary Fund for Energy Efficiency Improvement of the Republic of Serbia and Criteria for Exemption from Mandatory Energy Audit ("Official Gazette of the RS" no. 12/19).
[131] Rulebook on the Application Form for the Records of the Obligors for Energy Efficiency Improvement, Form of the Monthly and Annual Calculation of Energy/Energy Generating Products Delivered to Consumers or Placed on the Market of the Republic of Serbia, i.e. Imported on the Territory of the Republic of Serbia, Form of Monthly and Annual Calculation of the Obligation to Pay the Energy Fee, Form of the Report on Payment, as well as the Manner of Submitting These Forms ("Official Gazette of the RS" no. 41/19).
[132] Regulation on Minimum Energy Efficiency Requirements for new and Revitalized Facilities ("Official Gazette of the RS" no. 112/17).
[133] Rulebook on Determining the Model of Energy Services Contract for the Implementation of Measures to Improve Energy Efficiency when the Consumers are from the Public Sector ("Official Gazette of the RS" no. 41/15).
[134] Rulebook on Minimum Energy Efficiency Requirements in the Public Procurement Procedures ("Official Gazette RS" no. 111/15).
[135] Rulebook on Controlling Heating Systems and Detailed Requirements for Legal Entities Authorized for Controlling Heating Systems ("Official Gazette of the RS" no. 58/16).
[136] Rulebook on Controlling Air Conditioning Systems ("Official Gazette RS" no. 82/16).
[137] Rulebook on the Content of the Study on Energy Efficiency of Electricity Generation Plants, Plants for Combined Heat and Electricity Generation, Electricity Transmission and Distribution Systems, Heat Production and Distribution Plants ("Official Gazette of the RS" no. 30/18).

Methodology for Monitoring, Verification and Evaluation of the Effects of its Implementation[138].

The Regulation on minimum energy efficiency requirements that new and revitalized plants must meet, prescribes minimum energy efficiency requirements (minimum degree of efficiency) that new and revitalized plants for electricity and heat production, as well as plants for combined heat and electricity production, i.e. systems for the transmission of electricity, i.e. systems for the distribution of electricity and heat, must meet. This Regulation is an act which could prescribe provisions for improving the degree of efficiency in accordance with climate change, as a form of adaptation to climate change. The provisions would refer to the obligation to monitor climate change and, accordingly, changes in the area of maintenance, and even more so in the construction of new facilities.

Other subordinate legislation adopted on the basis of the Law on Efficient Use of Energy are not relevant for the area of adaptation.

In addition to the Law on Energy Efficiency and the Energy Law, as key laws to the implementation of energy efficiency policy, there are other laws, technical and other regulations that directly or indirectly mandate the application of energy efficiency, but do not fall within the domain of the ministry responsible for energy. The most important law in this area is the **Law on Planning and Construction**,[139] the provisions of which not only encourage the implementation of energy efficiency policy, but also oblige it to be implemented, especially in building design and construction.

Chapter XIV: Authorization for the adoption of subordinate legislation (Article 201) stipulates that the Minister shall prescribe in more detail:

- energy performance of buildings and the manner of calculating the energy performance of buildings, energy requirements for new and existing buildings, conditions, content and manner of issuing certificates, as well as the content and manner of keeping the Central Registry of Energy Passports;

- technical regulations which determine the requirements for use, installation and performance, that construction products which are installed in the facility must have in relation to their essential characteristics and other technical requirements related to the facilities and their construction;

- technical regulations whose integral part are standards that define mandatory technical measures and conditions of design, planning and construction.

[138] Rulebook on the Manner and Deadlines for Submission of Data Necessary for Monitoring the Implementation of the Energy Efficiency Action Plan in the Republic of Serbia and the Methodology for Monitoring, Verification and Evaluation of the Effects of its Implementation ("Official Gazette of the RS" no. 41/19).

[139] Law on Planning and Construction ("Official Gazette RS" no. 72/09, 81/09, 64/10 – Decision of the Constitutional Court of RS, 24/11 (121/12, 42/13 – Decision of the Constitutional Court RS, 50/13 – Decision of the Constitutional Court of RS, 98/13 – Decision of the Constitutional Court of RS, 132/14 , 145/14, 83/18, 31/19 and 37/19 – other law and 9/20).

This law regulates the conditions and manner of spatial development, development and use of construction land and construction of facilities.

In order to implement the provisions of the Law on Planning and Construction, in which the provisions on energy efficiency are implemented, the following **subordinate legislation** has been adopted: 1) Rulebook on Energy Efficiency of Buildings[140] and 2) Rulebook on Conditions, Programme and Manner of Issuing Energy Performance Certificate of Buildings[141].

The Rulebook on Energy Efficiency of Buildings prescribes in more detail the energy performance and the method of calculating the thermal performance of buildings, as well as the energy requirements for new and existing buildings (there are certain exceptions).

The Rulebook prescribes that the annual energy consumption for heating and cooling, preparation of sanitary hot water, ventilation and lighting is calculated in accordance with Serbian standards: SRPS EN ISO 13790, SRPS EN 15316, SRPS EN 15241, SRPS EN 15243, SRPS EN 15316-3, SRPS EN 15193, as well as the national specifics given in Addendum 6. However, the calculation and expression of the energy class of the building is performed only on the basis of the energy required for heating $Q_{H,nd}$ [kWh/(m^2a)]. This means that the following are not taken into account for the energy classification of a building: the heating system, its performance and regulation, as well as the energy generating product, and their impact is often greater than all parameters taken into account in this Rulebook.

In order to increase the energy efficiency of buildings, this Rulebook limits:

- maximum allowable value of heat transfer coefficient, U_{max} [W/(m^2K)],for building thermal envelope elements;

- maximum permissible specific heat transfer loss through the building's thermal envelope, H'T [W / (m2K)]. This indicator is listed in the table, depending on the factors of the shape of the building and the share of transparent areas in residential and non-residential buildings. This approach "abolishes" energy inefficient architectural solutions;

- allowed maximum annual energy consumption for heating [kWh/m2a] for new or old buildings.

The meteorological data required for the calculation of the required heat for heating are: number of heating degree days HDD, number of days of heating period HD and average outdoor temperature of heating period $\theta_{H,mn}$ for places in the Republic of Serbia (Table 6.3 - without citing sources. Based on old meteorological measurements).

Table 6.9 lists the average monthly sums of solar irradiation and average monthly outdoor air temperatures for Belgrade, noting that the values of the average sums of solar irradiation given in Table 6.9 are used to calculate heat gain from solar irradiation for all locations in the Republic of Serbia.

From the attached meteorological data, it is clear that this Rulebook envisages energy consumption on a monthly basis. Practice has shown that with this approach of average monthly

[140] Rulebook on Energy Efficiency of Buildings ("Official Gazette of the RS" no. 61/11).
[141] Rulebook on Conditions, Programme and Manner of Issuing Energy Performance Certificate of Buildings ("Official Gazette of the RS" no. 69/12 и 44/18 – other regulation).

values, unrealistic values of the energy required for heating in the transition period (April, May, September, October) are often obtained, while they are inapplicable for the calculation of cooling and air conditioning in the summer period.

The Rulebook on Conditions, Programme and Manner of Issuing Energy Performance Certificate of Buildings prescribes in more detail the conditions, programme and manner of issuing energy performance certificates of buildings. The certificate is a document that contains the calculated values of energy consumption within a certain category of buildings, energy class and recommendations for improving the energy performance of the building (Energy passport).

Until the adoption of the national software for the calculation of the total required energy used in the building, the calculation and expression of the energy class of the building is performed

only on the basis of the required heat for heating $Q_{H,nd}$ [kWh/(m^{2}a)], which is calculated on the basis of average monthly values of meteorological parameters. Energy classes for residential buildings (from A+ to G) are given separately for new and old buildings, depending on the purpose of the building.

Rulebook on Controlling Air Conditioning Systems prescribes: the programme, manner and deadlines for control of air conditioning systems, nominal cooling power greater than 12 kW, as well as the content of the report on the performed control. The control includes available parts of the air conditioning system that can be safely accessed and whose control can be performed without the use of equipment or tools. The air conditioning system is inspected at least once every 5 years.

This Rulebook is only indirectly linked to climate change. The control and maintenance of air conditioning devices increases the energy efficiency of the system and reduces energy consumption, but also reduces greenhouse gas emissions.

A new Rulebook on Energy Efficiency of Buildings is being drafted. Unlike the current one, the new Rulebook will take into account the energy consumption in the building for: heating, cooling/air conditioning, ventilation, lighting. According to the existing Rulebook, only the required energy for heating is calculated. The new Rulebook will obligatorily calculate all forms of energy: required energy for all purposes (depends primarily on the architectural and construction solution of the building), delivered (final) energy to the building according to types of energy (takes into account the characteristics of HVAC systems and regulation), primary energy (according to the defined coefficients of transformation of primary into final energy), and CO_2 emissions (according to the adopted emission coefficients of the unit amount of energy generating product). Instead of calculating the energy required for heating on a monthly basis according to the existing Rulebook, the new Rulebook prescribes calculations on an hourly basis. A single climate zone will be considered for all locations.

Determination of the energy class of the building will be performed according to the calculated required primary energy (for average meteorological indicators - reference model year) and standard use of the facility (not taking into account the future actual behaviour of users).

What is necessary, but not certain, is the inclusion of climate scenarios.

The Law on Planning and Construction prescribes the rules of spatial planning, including the application of energy efficiency measures in construction, which should be **included in spatial**

and urban plans, such as: spatial plans of special purpose areas, spatial plans of local governments and urban plans.

Regarding spatial planning by applying the principles of energy efficiency in spatial planning, the **Law on Spatial Plan of the Republic of Serbia from 2010 to 2020**[142], in the *SWOT* analysis of spatial development of the Republic of Serbia, states that the potentials of spatial development of the Republic of Serbia are: recognition of climate change as a factor of sustainable development of certain sectors of the economy and overall economic development, introduction of EU standards in the field of risk management of natural disasters, renewable energy sources, energy efficiency, design and construction of infrastructure systems relevant to various aspects of climate change;[143] as well as development of new communal contents and facilities (recycling, energy efficiency, mini hydropower plants that use water accumulation, wind power plants, gasification, contract mail) and inclusion in European, especially regional, energy efficiency programs and projects, harmonization of national rules and technical standards with those of the European Union. The development of a new Spatial Plan of the Republic of Serbia is in the process.

Regarding the implementation of energy efficiency measures and the realization of their goals, they are directly related to the **Law on Housing and Building Maintenance**[144]. This law determines the obligation to maintain buildings and regulates the functioning of housing communities, which are prerequisites for the efficient implementation of energy efficiency measures in building design and construction.

In the electricity sector, several important regulations can be pointed out for the area of recognition and application of adaptation measures to climate change. Of special importance, and especially in relation to EMD, are the regulations relating to technical standards for the construction of power lines, as follows:

- Rulebook on Technical Standards for Construction of Overhead Power Lines of Nominal Voltage from 1kV to 400 kV („Official Gazette of the SFRY“ no. 65/88 and „Official Gazette of the FRY“, no. 18/92)[145];
- Rulebook on Technical Standards for Construction of Low Voltage Overhead Lines („Official Gazette of the SFRY“ no. 6/92)[146];
- Rulebook on Technical Standards for Construction of Medium Voltage Overhead Lines with Self-supporting Cable Bundle „Official Gazette of the FRY“, no. 20/92)[147];

[142] Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 (“Official Gazette of the RS” no. 88/10).
[143] Table 6. SWOT Analysis of Spatial Development of the Republic of Serbia, section Nature, Ecological Development and Protection – the Law on Spatial Plan of the Republic of Serbia from 2010 to 2020 (“Official Gazette of the RS” no. 88/10).
[144] Law on Housing and Building Maintenance (“Official Gazette of the RS” no. 104/16).
[145] Rulebook on Technical Standards for Construction of Overhead Power Lines of Nominal Voltage from 1kV to 400 kV (“Official Gazette of the SFRY“ no. 65/88 and „Official Gazette of the FRY“, no. 18/92)
[146] Rulebook on Technical Standards for Construction of Low Voltage Overhead Lines („Official Gazette of the SFRY“ no. 6/92)
[147] Rulebook on Technical Standards for Construction of Medium Voltage Overhead Lines with Self-supporting Cable Bundle “Official Gazette of the FRY“, no. 20/92)

- Rulebook on Technical Standards for Protection of Low Voltage Networks and Associated Transformer Stations ("Official Gazette of the SFRY", no. 13/78 and "Official Gazette of FRY", No. 37/95)[148];
- Rulebook on Technical Standards for Protection of Buildings from Atmospheric Discharge ("Official Gazette of the FRY", No. 11/96)[149];
- Rulebook on Technical Standards for Electric Power Plants of Nominal Voltage Above 1000 V ("Official Gazette of the SFRY", No. 4/74 and 13/78, "Official Gazette of the FRY" No. 61/95)[150];
- Rulebook on Technical Measures for Operation and Maintenance of Electric Power Plants ("Official Gazette of RS", No. 19/68)[151]

Although the calculation requirements prescribed by these documents define the limits of external temperature, burden of additional frost, ice or wet snow, wind effects, types of beams and burden they withstand, grounding, upon transition of lines over facilities, i.e. upon bringing lines closer to facilities, protection against rotting and corrosion, as well as other special requirements, they do not actually include aspects of expected climate changes, which can significantly affect pressure and resilience of plant facilities.

The Rulebook on technical standards for construction of low voltage overhead electric power lines and the Rulebook on technical norms for construction of medium voltage overhead electric power lines with self-supporting cable bundle define that the value of icing and wind pressure is determined for a return period of five years.

The Rulebook on technical standards for protection of low voltage networks and associated transformer stations, defines in its Article 92 that all equipment, devices and other elements in the transformer substation and in the low voltage network must be constructed and installed so that they can withstand all dynamic and other mechanical strains envisioned by existing regulations and standards, both under normal conditions as well as in case of short circuits and other local conditions of additional strains (ice, wind, soil bearing capacity, water penetration, etc.).

The Rulebook on technical standards for protection of facilities from atmospheric discharge for new facilities or during reconstruction of existing facilities prescribes that projects for lightning protection installations must be developed. A project must contain basic data such as: location of the facility, measures, shape, materials, specific soil resistance, protection level, climate conditions and other required designing data. During the operation of the facility, the lightning protection installation must be maintained in the prescribed manner in order to preserve its efficiency with respect to the protection level. Maintenance of lightning protection installation consists of periodic checks of basic parameters according to the former Yugoslav standard JUS IEC 1024-1 (this standard has meanwhile been withdrawn and replaced with SRPS EN 62305-

[148] Rulebook on Technical Standards for Protection of Low Voltage Networks and Associated Transformer Stations ("Official Gazette of the SFRY", no. 13/78 and "Official Gazette of FRY", No. 37/95)
[149] Rulebook on Technical Standards for Protection of Low Voltage Networks and Associated Transformer Stations ("Official Gazette of the SFRY", no. 13/78 and "Official Gazette of FRY", No. 37/95)
[150] Rulebook on Technical Standards for Electric Power Plants of Nominal Voltage Above 1000 V ("Official Gazette of the SFRY", No. 4/74 and 13/78, "Official Gazette of the FRY" No. 61/95)

[151] Rulebook on Technical Measures for Operation and Maintenance of Electric Power Plants ("Official Gazette of RS", No. 19/68)

3: 2011) including appropriate repairs according to the procedure and instructions specified in the project.

The Rulebook on technical standards for electric power plants of nominal voltage above 1000 V ("Official Gazette of the SFRY", Nos 4/74 and 13/78, Official Gazette of the FRY" No 61/95) prescribes that in the low temperature zones inside of power plants, when required, heating of devices and their mechanisms ought to be provided in order to ensure proper operation and prevent fogging, facility plateaus should have a sufficient slope in order to drain water during heavy rainfalls, facilities on stepped plateaus should be specially secured from torrents, while special attention should be paid to the possible rockfalls, torrents and landslides upon choosing the location. Moreover, installation of facilities on floodplains should be avoided. If it is necessary to place them on the floodplains, all necessary measures should be taken against facility flooding. The distance between the parts of the facility and trees should be such that the facility is not damaged in the event of a tree fall.

However, the Rulebook on technical measures for operation and maintenance of electric power plants ("Official Gazette of the RS", No 19/68) can also be mentioned, the segments of which have continued being in place even after the Rulebook on technical norms for operation and maintenance of electric power plants and power lines was published on 23rd July 1993 in the "Official Gazette of the SFRY" No 41/93, prescribing that the former Rulebook shall cease to be valid, save for the provisions pertaining to operation and maintenance of electric power plants and power lines, relevant for this analysis. It is prescribed that the technical documentation, depending on the importance and size of the plant, should, by default, contain files of facilities or their parts, which must contain data on the location of the facility, load bearing capacity of soil, geological composition of soil and hydrological and meteorological conditions, as well as situational plan of the facility, facility foundation design and the drawing of all parts under ground, as well as in case of disasters and worsening of atmospheric conditions, i.e. in the event of frost, ice, floods, forest fires, etc., water control shall be intensified by all means. Such control is necessary even after several consecutive disconnections of water caused by the protection against short circuit and earth fault.

Oil and gas sector is primarily regulated, except by the Law on Energy, by the Law on Pipeline Transport of Gaseous and Liquid Hydrocarbons and the Distribution of Gaseous Hydrocarbons ("Official Gazette of the RS", No 104/09), according to which the minister competent for energy matters shall prescribe the requirements for the following, after obtaining opinions of the minister competent for internal affairs and the minister in charge of environmental protection and spatial planning: selection of the pipeline route, location and manner of construction of facilities that are integral parts of the pipeline; selection of materials, equipment and devices, operating parameters of the pipeline; method of measuring the amount of gaseous and liquid hydrocarbons; pressure regulation and safety measures against exceeding the allowed operating pressure; marking the pipeline route; pipeline protection zone, inhabited buildings, facilities and infrastructure facilities within the pipeline protection zone and operation zone; danger zones and corrosion protection of pipelines. Additionally, the minister shall prescribe the conditions and manner of use and handling of pipelines and their maintenance during operation, overhauls and emergency events; protection against corrosion and leakage of pipelines; inspection and maintenance of safety devices; testing of replaced parts and performed repairs; fault recording; condition of corrosion and leakage of pipelines; manner of obligatory and occasional control of the pipeline and keeping special records on the performed inspection. In addition, the energy entity performing the activity of transport, i.e. distribution through pipelines, is obliged to implement health and safety measures at work, environmental protection measures and fire and explosion protection measures, in accordance with the law, technical and other regulations.

However, although attention is being paid to potential emergencies, expected climate change is not included.

Other regulations in this area do not in any way cover climate and meteorological changes and their impact on the operation and construction of facilities, or even the Rulebook on special elements of risk assessment, frequency of inspection based on risk assessment and special elements of the plan of inspection in the field of pressure equipment, ("Official Gazette of the RS", No 85/2018).[152]

The field of mining is regulated by the Law on Mining and Geological Research ("Official Gazette of the RS", No 101/2015)[153] and bylaws. The Law itself does not recognise climate changes, nor the impact of climate changes on this area, including the need for adaptation. However, the aspect of climate change can be of great importance for the following:

- Rulebook on the content of the study on the conditions of exploitation of groundwater or hydrogeothermal resources, i.e. petrogeothermal resources and the conditions and manner of technical control of the study ("Official Gazette of the Republic of Serbia", No 7/18) envisions that the text of the study on the conditions of exploitation of groundwater or hydrogeothermal resources, as well as petrogeothermal resources shall contain data on general characteristics of the research area, including climatic, hydrographic, hydrological and hydrogeological characteristics, but not changes in climatic parameters or the effects of climate change, water and geothermal resources.
- Rulebook on the content of geological research projects and studies on the results of geological research ("Official Gazette of RS", No. 51/96)[154] prescribes that data on the exploration area shall contain information on climatic conditions, which implies climatological characteristics, and not the climate changes. The study on the results of geological research shall contain the characteristics of the area.
- Rulebook on the content of mining projects ("Official Gazette of the RS", No 27/97)[155] prescribes that data on the deposit or part of the mineral deposit and accompanying rocks, shall refer to water flows and precipitations and climatic conditions in the area of the deposit, i.e. exploitation area. The general part of the concept of works also contains an overview of the basic characteristics of soil, mineral resources, climatic and ventilation conditions, drainage, communication and geographical connections. However, aspects of climate changes (trends and projections) and their impacts are not included in the analyses.

It is evident from the previous analysis of the three sectors, that aside from integrating the impact of climate changes and adaptation into the already mentioned enactments and aspects regulating the area, it is necessary to integrate them into construction standards and legislative acts based on them. In that context, the Rulebook for building constructions ("Official Gazette

[152]Rulebook on special elements of risk assessment, frequency of inspection based on risk assessment and special elements of the plan of inspection in the field of pressure equipment, ("Official Gazette of RS", No 85/2018)
[153]Law on Mining and Geological Research ("Official Gazette of RS", No 101/2015)
[154]Rulebook on the content of geological research projects and studies on the results of geological research ("Official Gazette of RS", No. 51/96)
[155]Rulebook on the content of mining projects ("Official Gazette of RS", No 27/97)

of the RS", No 89/2019 and 52/2020) is important, which defines the recommended standards and other provisions of importance for building constructions.

7.2 Planning and strategic documents

The energy policy is further elaborated and implemented by the Energy Development Strategy of the Republic of Serbia until 2025[156], with projections until 2030 and by the Strategy Implementation Programme[157]. The strategy is an act determining the energy policy and plans development in the energy sector. The program determines the conditions, manner, dynamics and measures for the Strategy implementation.

The strategy identifies changes in restrictions with respect to the tightening of criteria regarding environmental protection, the impact of energy on climate change, water supply, uncontrolled or undirected urbanisation and installation of infrastructure facilities in the zone and in areas where energy resources are located, i.e. areas favourable for exploitation of energy resources. The strategy recognises that for the entire hydroelectric power sector, it is necessary to consider the impact of climate changes on the availability of the use of watercourses for electricity production. This is important for considering the expected production of electricity from existing hydroelectric power plants, as well as for the possible potential of hydroelectric power for building new hydroelectric power plants.

The adverse impact of climate change on the energy sector has been detected as a threat to development. Furthermore, achieving sustainable energy development of the Republic of Serbia in the period by 2030 in accordance with the needs and capacities of the economy and society and achieving the set goals shall require further development of energy sector in the Republic of Serbia to be based on activities that include, *inter alia*, further harmonisation with the regulations in place with the EU regulations and standards, with mutual harmonisation and development of national regulations, whereby it is necessary that these activities are accompanied by appropriate organisational and other measures that provide analysis of the climate changes impact on the energy sector in the Republic of Serbia and adoption of adequate adaptation plans. However, energy development scenarios (reference scenario (business as usual) and scenario with application of energy efficiency measures), are based on the assumptions of consumption, needs and development of the sector, where previous assumptions and potential threats, as well as adaptive measures are not included.

Based on this Strategy, the Government adopted the Decree on the Program for the Implementation of the Energy Sector Development Strategy of the Republic of Serbia by 2025, with projections until 2030 for the period from 2017 to 2023. Climate changes, i.e. their impact on energy is recognised in the choice of criteria based on which the proposed projects shall be prioritised by this programme. One of the criteria is network security, system control and quality of supply. This criterion is evaluated by assessing the relationship between reliable available

[156] Energy Development Strategy of the Republic of Serbia until 2025, with projections until 2030 ("Official Gazette of the RS", No. 101/15).
[157] Decree on determining the Programme for the Implementation of the Energy Development Strategy of the Republic of Serbia until 2025, with projections until 2030 for the period 2017-2023 ("Official Gazette of the RS" No 104/17).

production capacity and peak consumption, the share of electric power produced from renewable energy sources, the stability of the electric power system, the duration and frequency of outages per customer, including the climate-related disturbances and the impact on the voltage quality. Specifically, for the field of natural gas and oil, sustainability is recognised as a criterion, among other things, by reducing emissions, by supporting the occasional production of electricity from renewable energy sources and by increasing the use of biogas. This criterion is assessed on the basis of the project's contribution to emissions reduction, the operation of a backup system for the production of electricity from renewable sources or the conversion of energy into gas and the transport of biogas, taking into account expected changes in climatic conditions. The program proposes measures for improving environmental protection and reducing the impact on climate changes in the process of production, transport and distribution of natural gas. Adaptation to changed climatic conditions in the sector is not recognised in this document.

The energy sector strategy determines, *inter alia*, the directions of energy use development from renewable and new sources and improvement of energy efficiency. The last adopted action plan of such kind is the **Third Action Plan for Energy Efficiency of the Republic of Serbia by 2018**[158], which was adopted by the Conclusion of the Government on 29th December, 2016. This plan envisages measures to fulfil the obligation of the Republic of Serbia to reduce final energy consumption by 9% in the period from 2010 to 2018 with respect to the final energy consumption in 2008, and to achieve the final energy savings of 0.7524 Mtoe, by applying the measures of the Methodology for calculating energy savings based on the principle "top to bottom".

The objective for the near-zero energy buildings (nZEB) has not been set yet. Measures for reducing energy consumption in the household sector do not include cooling.

Concurrently, it should be borne in mind that the National Integrated Climate and Energy Plans, the development of which is an obligation of Serbia arising from the EU accession process, require inclusion of aspects of climate change impact on hydropower and biomass availability within the analyses required for developing the given plan. Aspects of the climate change impact on the energy sector and international and EU trends are described in Report 1 and should certainly be the subject of a revision of the Strategy. In other words, in addition to the inconsistency of the Energy Development Strategy with new world trends, it is evident that this document requires revision in terms of the impact of climate change on the availability of energy sources planned in this document.

The National Action Plan for the Use of Renewable Energy Sources of the Republic of Serbia[159], which elaborates the goal that the share of renewable energy sources in the gross final energy consumption in the Republic of Serbia in 2020 will be 27%, as well as the report on the implementation of this action plan, considering that it deals with the field of energy and its realization, affect sustainable development and have an impact on the implementation of energy

[158] Third Action Plan for Energy Efficiency of the Republic of Serbia by 2018 ("Official Gazette of the RS" No 1/17).
[159] Conclusion of the Government on adopting the National Action Plan for the Use of Renewable Energy Sources of the Republic of Serbia ("Official Gazette of the RS" No 53/13)

efficiency measures in the field of renewable energy sources. This plan does not consider the use of renewable energy sources in the building sector. Alternately, the potentials of introducing the obligation to use renewable sources, especially for the production of thermal energy and sanitary hot water, in newly built and during the adaptation of existing facilities should be considered.

The comprehensive strategic document in the field of transport expired in 2015 - Strategy for the Development of Railway, Road, Water, Air and Intermodal Transport in the Republic of Serbia from 2008 to 2015 ("Official Gazette of the RS", No 4/08). New strategic documents have been prepared for the railway and water transport subsectors, which is not the case for road transport. The current General Master Plan for Transport Development (GMPT) in the Republic of Serbia from 2009 to 2027 is a comprehensive study of traffic flows and traffic infrastructure in Serbia, and provides a proposal for investment in all-traffic networks, which should be specified and whose priorities should be determined through specific development plans, especially for each type of traffic.

Transport development plan for the period 2015-2020, defined in the GMPT in more detail, develops projects for the specified period.

The National Programme of Public Railway Infrastructure for the period from 2017 to 2021 ("Official Gazette of the RS", No 53/2017) determines the priorities of construction, reconstruction and maintenance of railway infrastructure and its development is determined by the Law on Railways ("Official Gazette of the RS", Nos 45/13 and 91/15).

Water Transport Development Strategy of the Republic of Serbia from 2015 to 2025 (Official Gazette of the RS, No 3/15) and Action Plan for the implementation of the Water Transport Development Strategy of the Republic of Serbia for the period from 2015 to 2020 (Official Gazette of the RS, No. 40 / 15) states low water as the causes of suspension of navigation, several times a year, but not climate change as the cause of this problem.

None of the planning documents in the field of transport in any way recognises the impact of climate change or the need to adapt to changed climatic conditions.

7.3 Institutional framework

The Ministry of Mining and Energy. It is in charge of the Serbian energy sector and is, among other things, in charge of creating a legislative framework related to energy production, energy efficiency and the use of energy sources. There is also the Sector for Energy Efficiency with the Department for Sustainable Development and Climate Changes in the Energy Sector within the ministry.

The Ministry of Construction, Transport and Infrastructure is in charge of issues of construction, construction land, urbanism, spatial planning, and spatial use planning in the RS.

Serbian Railway Infrastructure jsc is responsible for the management of the public railway infrastructure. The construction sector within the Serbian Railway Infrastructure is responsible for maintaining the railway infrastructure and the database of facilities. The Sector for

Development and Modernisation of Railway Infrastructure is responsible for construction works.

Corridors of Serbia Ltd. is responsible for the construction of sections of highways, while the **Public Company "Roads of Serbia"** is responsible for the management, maintenance, construction, reconstruction, toll collection and development of state roads of the II or II category.

Local streets, roads, uncategorised roads are managed by local self-government units.

The activity of **PE Elektroprivreda Srbije** is the production of electricity from thermal power plants, hydroelectric power plants, thermal power plants - heating plants.

"Elektro mreža Srbije" jsc is responsible for the transmission of electricity and the maintenance of the transmission system.

The Republic Geodetic Authority is competent for the establishment, management and maintenance of the national geoportal **National Infrastructure of Geospatial Data**.

The Institute for Standardisation adopts, develops, reviews, amends, supplements and withdraws Serbian standards and related documents; ensures compliance of Serbian standards and related documents with European and international standards and related documents; keeps a register of Serbian standards and related documents in all phases of development, etc.

7.4 Recommendations

Specific individual recommendations for the amendment of laws and bylaws are listed above and are not repeated here having in mind their scope.

In addition to individual recommendations for amendments to regulations in order to achieve the inclusion of adaptation in sectoral policies and legislation, it is crucial to amend the Rulebook on Building Structures ("Official Gazette of the RS", Nos 89/2019 and 52/2020) or standards that are part of the Annexes 1 and 2 to this Rulebook.

8 Public health

8.1 Legislative and strategic framework

Legislative and strategic framework that determines the public health sector includes a number of laws and bylaws, as well as strategic documents, some of which are exclusively the responsibility of the health sector. Conversely, some laws and bylaws are initiated by other sectors, and in accordance with the principle of "health in all policies", the health sector is involved to a greater or lesser extent.

It is necessary to emphasise that public health, by its definition, goes beyond the health sector and that it is necessary to harmonise and harmonize regulations, both those that are adopted within the health sector and those related to health, and are the primary competence of other sectoral policies. This is of particular importance in the field of fighting climate changes, both in the field of adaptation and in the process of mitigation.

The following regulations are of special importance:

- Law on Health Care ("Official Gazette of the RS", No 25/19) – governs the system of health care, its organisation, social care with respect to the health of general population,

general interest in health care, surveillance over the implementation of this law, as well as other matters of relevance for organisation and implementation of health care.

- Law on Protection of Population from Contagious Diseases ("Official Gazette of the RS", No 15/16 and 68/20) – governs the protection of the population from contagious diseases and special health matters, is relied on for determining the contagious diseases which endanger health of general population in the Republic of Serbia and the prevention and suppression of which are of general interest for the Republic of Serbia, implementation of epidemiological surveillance and measures, manner of their implementation and provision of funds required for their implementation, surveillance over the implementation of this law, as well as other matters of relevance for protection of population from infectious diseases.
- Law on Public Health ("Official Gazette of the RS", No 15/16) – governs the area of public health scope of activities, competence, planning, implementation of activities, in relation to preserving and promoting health of population, as well as the method of funding; the objective of the law is to realise public interest by creating conditions for preserving and improving the health of the population through comprehensive activities.
- Public Health Strategy in the Republic of Serbia for the period 2018–2026 ("Official Gazette of the RS", No 61/2018) determines activities for the improvement of health and reduction of inequality in health, which, *inter alia*, envisages the improvement of the environmental condition and the response to climate changes, as well as the development of action plans to tackle climate changes in cities.

Given that there is a complete absence of detailed analyses of the impact of climate changes on health, it is recommended that the Law on Health Documentation and Records in the Field of Health should be amended ("Official Gazette of the RS", Nos 123/2014, 106/2015, 105/2017).

Health documentation and records are used for the following: monitor the patient's health condition; monitoring and studying the health status of the population; monitoring the fulfilment of obligations of all entities in the field of health care; monitoring environmental risk factors and assessing their impact on population health; monitoring resources in the field of health care; monitoring and continuous improvement of the quality of health care; health care funding; health care planning and programming; monitoring and evaluating the implementation of health care plans and programmes; conducting statistical and scientific researches; informing the public; fulfilment of international obligations in the field of health and for the development of the health care and health insurance systems.

8.2 Recommendations

Generally speaking, the recommendation is to improve the quality of data collection on patient health, in order to identify the potential impact of climate change.

The additional recommendation is to establish a legal basis for more effective warning of weather conditions that may adversely affect the health condition, which is currently being done by RHMZ and the Batut Institute of Public Health.

9 IMPACTS OF CLIMATE CHANGE AND ADAPTATION

9.1 Legislative and strategic framework

In addition to sectoral laws and bylaws for impact assessment and planning of adaptation to changed climatic conditions in the RS, the Law on Climate Change (in draft) is of key importance. The law addresses issues of importance for reducing GHG emissions and adapting to changing climatic conditions by establishing an obligation to align sectoral with climate change policies.

Policies in the field of climate change, according to the Law, are:

- Low Carbon Development Strategy with Action Plan (hereinafter: the Strategy), and
- The concept of adaptation policy to changed climatic conditions (which is the National Adaptation Plan, according to the Paris Agreement).

According to the draft Law of the Second National Strategy, general and sectoral plans and policies affecting GHG emissions must be harmonized with the Strategy and must contain a quantitative assessment of the impact on the changing the level of GHG emissions from sources and removal by sinks, calculated in accordance with accepted international methodology.

Furthermore, pursuant to the draft Law, the Ministry in charge of climate change is preparing a Concept of adaptation policy to changed climate conditions (hereinafter: the Concept of Policy), in order to identify the effects of climate change on sectors and systems, reduce adverse effects of climate change and take action in connection with the reduction of adverse impacts.

The policy concept is prepared for a period of at least ten years.

The law defines the content of the Policy Concept:

1) analysis of the socio-economic situation that affects the adaptation to changed climatic conditions;
2) analysis of observed climate changes;
3) presentation of expected climate changes;
4) analysis of the impact of climate change on sectors and systems;
5) identification of the sectors most affected by climate change;
6) a description of the desired change to be achieved, its elements and their cause-and-effect relationships;
7) general and specific public policy goals to be achieved;
8) proposal of measures for adaptation to changed climatic conditions;
9) elaboration and estimate of profits and costs of different combinations of adjustment measures, as well as the results of the conducted analysis of effects for each of the combinations of measures;
10) results of the process of conducted consultations and additional analyses of the effects of the considered options on the basis of conducted consultations;
11) list of priority measures with explanation and manner of their implementation;
12) identification of needs for the implementation of priority adjustment measures;
13) institutions in charge of the implementation of specific adjustment measures.

In accordance with the Concept of Policy, sectoral strategies, programs and other public policy documents are adopted, and they contain in particular:

1) description of specific measures from the list of priorities;

2) areas where a specific measure is planned, with explanations;

3) time frame for implementation of specific measures;

4) analysis of costs and benefits from the implementation of specific measures, the manner of financing specific measures;

5) manner and methodology of monitoring and evaluation of the implementation of specific measures.

Agencies and organizations in charge of drafting and implementing sectoral documents, referred to in Paragraph 1 of this Article, including agencies and organizations of local governments, are obliged to submit to the Ministry by January 1 every fourth year, in relation to the year of adoption of the Policy Concept, a report on implemented adjustment measures and phenomena such as floods, extreme temperatures, droughts and others, and their consequences.

Pursuant to the provisions of the Law, the Government prescribes the list of agencies and organizations, as well as the content and form of the report.

It is clear that the Law introduces a clear competence of the Ministry of Environmental Protection for planning adaptation at the national level.

Given that the Law was drafted before the adoption of Decision 18/CMA.1, the law can be improved, and it is certainly necessary to prepare a bylaw that would define the content and form of the report, specified in the draft Law.

A special recommendation is the preparation of technical instructions and procedures for planning and implementing the adaptation on the level of local governments.

One of the key shortcomings of the Law is monitoring and reporting on the necessary and rendered financial, technical and capacity-building assistance. The inclusion of these aspects in the Law requires close cooperation, first of all, with the Ministry of Finance, in order to clearly define the financing for adaptation to changed climatic conditions.

It is recommended that they prepare options and recommendations to include monitoring and reporting in this context.

It is also recommended to prepare a list of indicators of importance for monitoring climate change, the impact of climate change and the success of the implementation of adaptation, as well as the procedure for exchanging the necessary information and data in this regard.

In this context, it is important to mention that in accordance with the provisions of the Rulebook on the National List of Environmental Protection Indicators (Official Gazette of RS, No. 37/11), the Environmental Agency is responsible for collecting indicators, which include some of those specific to the area of adaptation.

It is recommended that this Rulebook be amended to include all the necessary indicators and the necessary structure and institutional organization for the area of adaptation.

Taking into consideration the identified shortcomings and needs, as well as the recommendations, it is necessary to coordinate and implement the activities in close cooperation with the project of establishing a monitoring and reporting system at the national level.

The strategic framework in the area of adaptation, as defined by the Law on Climate Change and the Paris Agreement, needs to be developed within this project.

9.2 Institutional framework

In addition to the Ministry of Environmental Protection and the Republic Hydro-meteorological Institute, a significant role in integrating adaptation to the changed climate conditions is also played by the Environmental Protection Agency, which, as an administration agency within the Ministry of Environmental Protection, handles the government administration affairs, which are, among others, relevant to government monitoring of the air and water quality, including the implementation of the prescribed and harmonized programs for air, surface water and groundwater quality control of the first aquifer and precipitation, monitors environmental indicators and cooperates with the European Environmental Protection Agency.

Taking into consideration the previous sectoral analysis, the provisions of the Law on Climate Change (which is in the Draft), as well as Report 2, there are a number of institutions and stakeholders that need to be involved in creating and implementing adaptation to changed climate conditions.

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