ENVIRONMENTAL ASSESSMENT

OF

A DRAFT OF UPDATED STRATEGY FOR MANAGEMENT OF SPENT NUCLEAR FUEL AND RADIOACTIVE WASTE IN BULGARIA - NATIONAL PROGRAMME IN CONFORMITY WITH DIRECTIVE 2011/70/EURATOM

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LIST OF ACRONYMS

ACRONYM	DEFINITION
AA	*Appropriate Assessment*
AA Ordinance	*Ordinance on the conditions and procedures for carrying out an assessment of the compatibility of plans, programs, projects and investment proposals with the subject and objectives of conservation of protected areas*
AAR	*Average Annual Rate*
ADR	*Average Daily Rate*
AHR	*Average Hourly Rate*
AMS	*Automatic Measuring Station*
AQ	*Air Quality*
BAS	*Bulgarian Academy of Sciences*
BD	*Basin Directorate*
BDA	*Biodiversity Act*
CA	*Controlled Area*
CAA	*Clean Air Act*
CM	*Council of Ministers*
CR	*Cubic Residue*
DC	*Decommissioning*
DGR	*Deep Geological Repository*
DSFSF	*Dry Spent Fuel Storage Facility*
EA	*Environmental assessment*
EA Ordinance	*Ordinance on the conditions and procedures for carrying out an environmental assessment of plans and programs*
EAD	*Sole proprietorship shareholding company*
EAR	*Environmental Assessment Report*
EBRD	*European Bank for Reconstruction and Development*

ACRONYM	DEFINITION
EC	*Efficiency Coefficient*
EC	*European Commission*
ECT	*Evaporator Concentrate Tank*
EEA	*Executive Environment Agency*
EIA	*Environmental Impact Assessment*
EIAR	*Environmental Impact Assessment Report*
EPA	*Environmental Protection Act*
EU	*European Union*
FPI	*Facility for plasma incineration of waste with a high volume reduction factor*
GHG	*Greenhouse gases*
GP	*General Practitioner*
HLW	*High Level Waste*
HM	*Heavy Metal*
IAEA	*International Atomic Energy Agency*
ICA	*Immovable Cultural Assets*
INRNE-BAS	*Institute for Nuclear Research and Nuclear Energy - Bulgarian Academy of Sciences*
IPUF	*Installed Power Utilization Factor*
MARAW	*Moderately active RAW*
MDA	*Minimum Detectable Activity*
MoE	*Ministry of Energy*
MoEW	*Ministry of Environment and Water*
MoH	*Ministry of Health*
NCRRP	*National Centre for Radiobiology and Radiation Protection*

ACRONYM	DEFINITION
NEMS	*National Environmental Monitoring System*
NFDF	*"Nuclear Facilities Decommissioning" Fund*
NPP	*Nuclear Power Plant*
NRA	*Nuclear Regulatory Agency*
NRDF	*National repository for disposal of short-lived low- and intermediate-level waste*
OECD	*Organization for Economic Cooperation and Development*
PA	*Protected area (in the meaning of the BDA)*
PAA	*Protected Areas Act*
PT	*Protected territory (in the meaning of the PAA)*
RAW	*Radioactive Waste*
RAWPW	*RAW Processing Workshop (EAD RAW-Kozloduy)*
RCC	*Reinforced Concrete Container*
RML	*Radiation Measurements Laboratory*
SB	*Special Block*
SD	*Specialized Division (of the State Enterprise "Radioactive Waste")*
SD „DC Unit 1-4"	*Specialized Division "Decommissioning of Units 1-4"*
SD „NRRAW"	*Specialized Division "National Repository for Radioactive Waste"*
SD „PRRAW-Novi Han"	*Specialized division "Permanent repository for radioactive waste - Novi Han"*
SD „RAW-Kozloduy"	*Specialized Division "Radioactive Waste-Kozloduy"*
SE RAW	State enterprise "Radioactive waste"
SFP	Spent Fuel Pool
SNF	Spent Nuclear Fuel
SSC	Structures, Systems and Components

ACRONYM	DEFINITION
SUNEA	Safe Use of Nuclear Energy Act
UAT	Upper Assessment Threshold
WSFSF	Wet Spent Nuclear Fuel Storage Facility
WWER	Water-Water Energetic Reactor

1. Introduction

This document represents an Environmental Assessment of a draft of an updated Strategy for the Management of Spent Nuclear Fuel (SNF) and Radioactive Waste (RAW) in Bulgaria - National Program in accordance with Directive 2011/70/Euratom.

The EA procedure is fully compatible with the current procedures for preparing and approving a draft of an updated Strategy for the Management of Spent Nuclear Fuel (SNF) and Radioactive Waste (RAW) in Bulgaria - National Program in accordance with Directive 2011/70/Euratom and is carried out simultaneously with its preparation. The environmental assessment statement is a mandatory condition for the subsequent approval of the draft of the updated Strategy and the authorities responsible for approving and implementing the project for the updated Strategy must comply with the opinion on the EA and the conditions, measures and restrictions set therein.

1.1 Information about the contracting authority of the environmental assessment

Contracting authority: Ministry of Energy

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1.2 Grounds for preparation of an EA

According to the requirements of Art. 8 of the EA Ordinance, the competent environmental authority – the Ministry of Environment and Water (MOEW) has been notified about the draft of an updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste in Bulgaria - National Program, in accordance with Directive 2011/70/EURATOM of the Republic of Bulgaria.

According to the response of the MOEW, the draft of an updated Strategy for the Management of SNF and RAW is pursuant to Section 5.2 of Appendix No. 1 to Art. 2, para. 1 of the EA Ordinance and in connection with Art. 85, para. 1 of the EPA, and Art. 2, para. 1, item 1 and item 2 of the EA Ordinance, it is subject to a mandatory environmental assessment. Given the provision of Art. 4, item 1 of the EA Ordinance and the fact that the Strategy will be adopted by the Council of Ministers, the competent authority for environmental assessments is the Minister of Environment and Water, and the same is also competent for the procedure for appropriate assessment with the subject and objectives of conservation of protected areas.

Considering the possibility listed in Art. 10, para. 3 of the EA Ordinance, the MOEW will rule on the need to prepare a Report for assessing the degree of impact, at the stage of submitting a ToR for the scope and content of the EA Report.

Under the provision of Art. 81, para. 3 of the EPA, the environmental assessment of the Strategy should be carried out simultaneously with its preparation, taking into account its objectives, territorial scope and degree of detail, so as to identify, describe and evaluate in an appropriate way the possible impacts of the implementation of the investment proposal, which the strategy foresees.

In accordance with the letter of the Ministry of Environment and Water regarding the Terms of

Reference for the scope and content of the EA with reference No. EO-6/25.05.2023 (shown in Annex 3):

I. Regarding the Terms of Reference for the scope and content of the EA:

The ToR has been prepared taking into account the provision of Art. 86, para. 86(3) of the Environmental Protection Act (EPA) and Article 17(1) of the Ordinance on the Conditions and Procedure for Environmental Assessment of Plans and Programmes (the EA Ordinance) with regard to the requirements for the scope and content of the EA Report.

II. Regarding the Appropriate Assessment of the draft updated Strategy for SNF and RAW in Bulgaria - National Programme in accordance with Directive 2011/70/Euratom:

After reviewing the submitted information, pursuant to Art. 36 para. The draft updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste in Bulgaria - National Programme in accordance with Directive 2011/70/Euratom is not likely to have a significant negative impact on the natural habitats, populations and habitats of species of conservation concern in the protected areas of the Natura 2000 network.

Due to this decision of the MoEW, no Appropriate Assessment Report regarding the compatibility with the object and purpose of the protected areas will be elaborated for the Environmental Assessment Report.

1.3 Objective and scope of the environmental assessment

The objectives of the environmental assessment are:

- to integrate the environmental considerations into the development process as a whole and introduction of the principle of sustainable development in accordance with Art. 3 and Art. 9 of the EPA;
- to identify, describe and assess in an appropriate manner the possible impacts of the implementation of the updated Strategy on the components and factors of the environment;
- to ensure preventive control with regard to environmental protection and protection of people's health.

Under the provision of Art. 86, para. 2 of the EPA, the EA Report must include information corresponding to the level of detail of the project for the updated Strategy and the evaluation methods used.

The main objective in preparing the EA, within a certain framework of the level of detail of the draft of the updated Strategy, is to determine the scope and level of detail of the information included in the Environmental Assessment Report (Directive 2001/42/EC) - Strategic Environmental Assessment Directive, (SEA, Article 5, Paragraph 4).

The following requirements have been set by the Contracting Authority on the scope of the environmental assessment:

- Description of the content of the main objectives of the Strategy and connection with other related plans and programs;

- Current state of the environment (baseline conditions) and possible development without the implementation of the Strategy;
- Characteristics of the environment for territories that are likely to be significantly affected by the implementation of the Strategy;
- Existing environmental problems identified at different levels relevant to the Strategy;
- National and international level environmental protection objectives relevant to the Strategy and how these objectives and all environmental considerations are taken into account;
- Probable significant impacts on the environment and human health;
- Measures envisaged to prevent, reduce and compensate as fully as possible the adverse consequences of the implementation of the Strategy on the environment and human health;
- Motives for selecting the considered alternatives;
- Methods for carrying out the environmental assessment, used legal framework and documents and difficulties in collecting the necessary information;
- Measures related to monitoring during the implementation of the Strategy;
- Conclusions of the environmental assessment;
- Note on the results of the consultations held in the process of preparing the Strategy and carrying out the environmental assessment;
- Non-technical summary of the environmental assessment;
- Appendices to the Environmental Assessment Report.

The contents of the Environmental Assessment Report is in accordance with the requirements of the Contracting Authority, under Art. 86, para. 3 of the EPA and the requirements of the Competent Authority - MOEW, according to letter with reference No. EO-6/25.05.2023 regarding the Terms of Reference for the scope and content of the EA Report.

2. CONTENTS OF THE DRAFT OF AN UPDATED STRATEGY, SCOPE AND TIME FRAME

The draft of the updated Strategy has been structured as follows:

- NUCLEAR PROGRAM OF THE REPUBLIC OF BULGARIA - Nuclear facilities;
- MAIN PRINCIPLES, POLICY AND OBJECTIVES - Main principles in the regulation of the management of SNF and RAW, Policy and Objectives;
- LEGAL AND REGULATORY FRAMEWORK;
- RESPONSIBILITIES IN THE IMPLEMENTATION OF THE STRATEGY AND DEPARTMENTS INCLUDED IN THE PROCESS OF MANAGEMENT OF SNF AND RAW
    - Government bodies: Council of Ministers, Ministry of Energy, Ministry of Environment and Water, Ministry of Health, Ministry of Internal Affairs, others;

  - Regulatory body: Nuclear Regulatory Agency and Holders of licenses/permits: "Kozloduy NPP" EAD and State Enterprise "Radioactive Waste".

- SNF and RAW MANAGEMENT
  - SNF Management: Main SNF characteristics, SNF management practices, Existing SNF management facilities, Planned SNF management tasks and activities, Analysis of Long-term SNF management options, SNF availability report, Forecasts and estimation of expected SNF quantities from Kozloduy NPP, Forecasts and estimation of expected SNF quantities of NPP from a new nuclear power unit;
  - RAW Management: RAW Management at Kozloduy NPP, RAW Management at SE RAW, HLW Management.
- DECOMMISSIONING ACTIVITIES OF UNITS 1-4 OF "KOZLODUY" NPP;
- HUMAN RESOURCES MANAGEMENT ACTIVITIES;
- ECONOMIC AND FINANCIAL ASPECTS
  - Assessment of the SNF and RAW management costs, including from decommissioning activities: Costs of the Kozloduy NPP and RAW management costs of SE RAW;
  - Effective financing schemes;
  - Overall assessment of costs and adequacy of the financial schemes.
- MONITORING. ASSESSMENT OF IMPLEMENTATION PROGRESS. RISKS
  - Monitoring of strategy implementation;
  - Indicators for assessment of the progress in implementing the strategy;
  - Risks of delay or failure to implement the strategy.
- POLICY OF TRANSPARENCY AND OPEN DIALOGUE
- Appendices, incl. Appendix 6 - Action plan according to the Strategy.

2.1. Contents of the draft of the updated Strategy

The draft of the Strategy for Management of Spent Nuclear Fuel (SNF) and Radioactive Waste (RAW), represents the national programme of the Republic of Bulgaria for responsible and safe management of SNF and RAW within the meaning of Directive 2011/70/EURATOM of the Council of the EU for establishing a Community framework for responsible and safe management of SNF and RAW (hereunder referred to as “Directive 2011/70/EURATOM”). It has been developed under Article 74, paragraph 3 of the Safe Use of Nuclear Energy Act (SUNEA) and bylaws.

In fulfilment of the obligations of the Republic of Bulgaria arising from Directive 2011/70/Euratom of the Council of 19 July 2011 on the creation of a Community framework for the responsible and safe management of spent fuel and radioactive waste, under the coordination and guidance of the Ministry of Energy, an interdepartmental working group was created with the task of developing a new draft of an updated Strategy for the management of SNF and RAW, taking into account all the findings of the EC, as well as the recommendations of the ARTEMIS mission conducted in 2018 (Integrated IAEA review of programs for management of radioactive waste, spent nuclear fuel,

decommissioning and reclamation). The update presents changes that have occurred, taking into account technical and scientific progress as appropriate, as well as recommendations, lessons learned and good practices from partner reviews.

The draft of the updated Strategy for the management of SNF and RAW is a fundamental document presenting the national policy, principles, goals and tasks related to the safe and responsible management of all stages of the management of SNF and all types of RAW - from generation to disposal. The draft of the updated Strategy outlines the implemented and planned practical solutions, their stages and deadlines for implementation, as well as the method of their financing. Information is presented on the condition and operation of the existing facilities, as well as the steps for the implementation of future facilities.

The nuclear programme of the Republic of Bulgaria was launched in the early 1960s with the construction and commissioning of the IRT-2000 research reactor at the Institute for Nuclear Research and Nuclear Energy of the Bulgarian Academy of Sciences. The construction of Kozloduy NPP Unit 1 started in the late 1960s. Over the years, a total of six nuclear power units have been built on the plant site (four WWER-440 units and two WWER-1000 units), equipped with pressure water reactors, using low-enriched uranium fuel and light water as coolant and moderator.

In fulfilment of Bulgaria's commitments related to the country's accession to the European Union (EU), the operation of the first four power units was terminated before the expiration of their design lifetime. Currently, Units 5 and 6 are in operation, having a total output of about 2160 MWe (achieved after completion of the envisaged measures for modernisations of the units). The Republic of Bulgaria has made a decision to continue developing its nuclear programme by maximum extension of the operational lifetime of Kozloduy NPP Units 5 and 6, while strictly following the requirements for nuclear safety, radiation and physical protection, safe and responsible management of radioactive waste and spent nuclear fuel. The construction of new nuclear facilities is planned, as in the "Strategic vision for sustainable development of the electricity sector with a horizon of 2053" adopted by the Council of Ministers in January 2023, the construction of two nuclear units at the Belene site by 2035/2040 is envisaged, as well as two more units at the Kozloduy site until 2045.

When deciding on the construction of new nuclear facilities, according to Art. 45 of SUNEA, the Strategy must be updated taking into account the expected quantities of SNF that will be generated by them.

The national operator for the safe management of radioactive waste and decommissioning of nuclear facilities is the State Enterprise "Radioactive Waste" (SE RAW), which has been operating since 2004.

2.1.1. Fundamental principles, policy and objectives

The policy of the Republic of Bulgaria in the field of SNF and RAW management is in accordance with the following internationally accepted fundamental principles:

- In SNF and RAW management, nuclear safety and radiation protection take priority over all other aspects of this activity;
- The licensees must observe the requirements, norms and rules of nuclear safety, radiation protection and physical protection in SNF and RAW management, as well as to develop and maintain an effective activity management system that prioritizes safety and ensures a high safety culture;

- SNF and RAW should be managed in such a way as to avoid undue burden on the future generations;
- Optimisation of protection against the ionising radiation from SNF and RAW;
- Application of the graded approach in determining the safety requirements;
- Taking account of the interconnections between all the stages related to RAW generation and management;
- Traceability of RAW at all stages of their management;
- Minimisation of the generated SNF quantities and RAW volumes subject to disposal;
- Participation of all the stakeholders in the decision making on SNF and RAW management.

The policy of the Republic of Bulgaria regarding SNF and RAW management has been specified in the national legislation (mainly in the SUNEA, Environment Protection Act, Health Protection Act and the regulations on their implementation) and includes the following main aspects:

- The SNF and RAW management has to be carried out in a way as to cause minimum negative effects on human health and the environment;
- A fundamental approach to the management of SNF and RAW is their concentration and isolation from the environment, including disposal using passive structures, components and systems to ensure safety;
- The SNF and RAW management is regulated by the Government, represented by legal persons only after they have obtained a permit or licence from the Chairperson of the Nuclear Regulatory Agency (NRA);
- Achievement and maintaining a high level of nuclear safety, radiation and physical protection at all the stages of SNF and RAW generation and management;
- Processing of the entire amount of SNF, interim storage in a specialised facility for all types of RAW shipped back to Bulgaria after processing, and final disposal in the DGR.
- The licensee bears the responsibility for observing the regulatory norms and requirements for safe management of RAW until their transfer to SE RAW, or their exemption from regulation;
- The management of RAW outside the sites of their generation is implemented by SE RAW;
- The state bears the final responsibility for the safe disposal of all types of radioactive waste generated from the operation of the nuclear reactors, and those resulting from SNF processing;
- The SNF generating organisations are obliged to bear the cost at all stages of its management, including the disposal of RAW generated from SNF processing, following the principle "the polluter pays", by paying the respective contributions to the specialised fund;
- The RAW generating organisations are obliged to transfer the waste to SE RAW and bear the cost at all stages of their management including disposal, on the "polluter pays" principle, by paying the respective contributions to the specialised fund;
- The state bears the responsibility for management of RAW with unknown owner;
- Import of RAW in the country is prohibited except for the cases specified in the SUNEA;
- The principle of returning certain categories of radioactive sources to their manufacturer after discontinuing their use is applied;
- Radioactive wastes generated in the Republic of Bulgaria are disposed of on Bulgarian territory, unless an agreement has become effective for using a RAW disposal facility in another country;
- Application of the graded approach to RAW management, depending on the risks they create;
- Taking into account the interrelations between all stages of the generation and management

of SNF and RAW, and the safety requirements:

  - minimisation of RAW volume and activity by implementing all possible measures to reduce their volume and activity during the process of their generation, and by applying appropriate practices in their subsequent management, including recycling and reuse of the materials;
  - taking account of the requirements for RAW minimisation at the stages of design, construction, operation and decommissioning of the nuclear facility;
  - bringing RAW to a safe passive form fit for storage and disposal within the shortest achievable time after their generation;

- Possibility for declaring SNF to be RAW in compliance with SUNEA.

Strategic objectives

The draft of the updated Strategy covers all the stages of the nuclear facilities life cycle, the application of the most modern technologies available for SNF and RAW management including their disposal, planning the necessary activities, the implementation stages and the financial and human resources required to achieve and maintain a high level of nuclear safety, radiation and physical protection. At this stage, the most important strategic objectives compliant with the requirements of Directive 2011/70/Euratom are, as follows:

- Minimising the time for SNF interim storage, taking into account that it is not an alternative to the final stage of SNF management;
- Processing of the entire amount of SNF generated from WWER-440 and WWER-1000 and disposal in the DGR of the vitrified HLW and other RAW generated during processing and returned to Bulgaria;
- Permanent reduction of the SNF quantities stored on the Kozloduy NPP site, through an average annual shipment of at least 77 t of heavy metal (HM) for long-term storage and processing abroad;
- Preparation of a long-term plan for construction of a repository for interim storage of returned vitrified HLW and other RAW from SNF processing;
- Commissioning of Stage 1 of the NRRAW by the end of 2025;
- Design and construction of Stages 2 and 3 of the NRRAW in the mid-term;
- Design and construction of a DGR in the long-term;
- Providing financial resources for the construction of a DGR through the establishment of a new dedicated fund;
- Providing and maintaining sustainable financial and human resources for ensuring the necessary expertise and skills, including for carrying out the research and development required for the SNF and RAW management and regulation;
- Pursuing a policy of openness and transparency and involving the public in public hearings and decision-making on the SNF and RAW management;
- Pursuing a policy of openness and transparency and involving the public in the discussion and decision-making regarding the management of SNF and RAW.

2.1.2. Nuclear Facilities

There are no plants for conversion, enrichment and production of nuclear fuel, as well as for the processing of SNF in Bulgaria.

In Bulgaria there are the following nuclear facilities:

- 2 power reactors (in operation);
- 4 power reactors (in a process of decommissioning);
- 2 SNF storage facilities (in operation);
- National Disposal Facility for LLW and ILW (in construction stage);
- Repository for RAW from nuclear applications (in operation);
- Facility for RAW processing and interim storage at Kozloduy NPP (in operation);
- Facility for RAW treatment and conditioning with high volume reduction factor (plasma melting facility, PMF) (at the stage of commissioning);

In the period 1961 - 1989, a research reactor IRT-2000 operated at the INRNE-BAS. The SNF from it was transported to the Russian Federation and the RAW from its operation was handed over to SE RAW.

The SNF from the two operating power units is stored in the spent fuel pools, at the reactor, and in the wet storage facility (WSFSF) on the Kozloduy NPP site.

The SNF has been removed from the reactors of Units 1-4 and their spent fuel pools, and is stored in the storage facilities on the Kozloduy NPP site;

The construction of a National Disposal Facility for low- and intermediate level RAW is under way.

The repository for RAW from nuclear applications in Novi Han has been accepting for interim storage all the RAW generated outside Kozloduy NPP, including radioactive sources with no owner, investigation material and cargo detained during transit passage.

In the RAW management facility of SE RAW – Kozloduy is conditioned and stored all the RAW generated by the operation of Kozloduy NPP.

2.1.3. Existing sites

The existing sites are located in the area of two municipalities of the Republic of Bulgaria: Kozloduy Municipality and Elin Pelin Municipality.

Kozloduy Municipality - **Kozloduy NPP**

- SNF management facilities:
    - Spent Fuel Pools (SFP) units 5 and 6;
    - Wet Spent Nuclear Fuel Storage Facility (WSFSF);
    - Dry Spent Nuclear Fuel Storage Facility (DSFSF).
- Facility for RAW processing and storage in Kozloduy NPP (in operation);
- Facilities for temporary storage of RAW from units 5 and 6:

- Storage for low- and medium-active solid RAW (category 2a) with a dose rate below 10 mSv/h - bunker-type cells: 18 units with a volume of 2486 m^3;
- Storage for low- and medium-active solid RAW (category 2a) with a dose rate over 10 mSv/h - bunker-type cells: 3 units with a volume of 224 m^3;
- Storage for liquid radioactive concentrate: 7 stainless steel tanks with a total volume of 3584 m^3;
- Storage for spent sorbents: 2 stainless steel tanks with a volume of 100 m^3 each.

Elin Pelin Municipality - **Specialized division "Permanent repository for radioactive waste - Novi Han"**

Specialized division "Permanent repository for radioactive waste - Novi Han" (SD "PRRAW-Novi Han"), in the land of the village of Novi Han, Elin Pelin municipality - disused radioactive sources from about 2300 sites of industry, medicine, agriculture and scientific research institutes are RAW and are handed over to the Specialized Division "PRRAW-Novi Han" of the SE RAW for processing and storage.

2.1.4. Facilities envisaged in the draft of the updated Strategy

The facilities envisaged in the draft of the updated Strategy are also located in two municipalities of the Republic of Bulgaria: Kozloduy Municipality and Elin Pelin Municipality, where the existing facilities are also located, as described below:

- National Repository for Radioactive Waste" ("NRRAW") in the locality "Radiana" in the land of the village of Harlets, Kozloduy Municipality, Vratsa Region - under construction;
- FPI - Facility for plasma incineration of waste with a high volume reduction factor - the program for commissioning the FPI has been successfully completed and the documentation for the issuance of a license for operation by the NRA at the site of units 1-4 of the Kozloduy NPP has been prepared;
- Construction of a facility for the production of StBK type packaging by SE RAW. Commissioning of the facility in 2025;

The existing facilities listed above have undergone procedures under Chapter 6 of the Environmental Protection Act.

The rest of the facilities provided for in the strategy are at the feasibility study level or at the concept level (DGR, Borehole burial of spent and closed radioactive sources, SCRS, Decommissioning of the BAS research reactor IRT-2000, Decommissioning of SD PRRAW-Novi Han) and are described below:

- DGR - a preliminary survey of the possibilities for building a geological repository for high-level and long-lived waste in Bulgaria has been carried out. Potentially suitable geological blocks have been located and should be further explored. SE RAW has developed an exemplary plan - a schedule with a deadline till 2050 (Appendix No. 7 to the draft of the updated Strategy) for carrying out research activities and narrowing down the range of possible sites, conducting detailed studies, selecting and licensing one site for the construction of DGR.

- Borehole burial of spent closed radioactive sources (SRC) - the possibilities of implementing borehole burial as the final stage of SRC management are being studied. Due to the small infrastructure located on the surface of the borehole disposal site, it could be located on the site of another nuclear facility. There is still no experience in the implementation of the concept of borehole burial in the world. There are several IAEA member countries that are actively developing the concept of borehole burial. It is expected that in the near future, the first borehole burial of SRC will be carried out in Malaysia. A feasibility study is currently being developed in order to assess the applicability of the borehole burial concept in Bulgaria, to assess its advantages and disadvantages and to identify the risks of its implementation. Depending on the results of the feasibility study, further actions will be taken;
- Decommissioning of the BAS IRT-2000 research reactor - The IRT-2000 research reactor was shut down in July 1989 for modernization of its nuclear and radiation safety systems. The entire amount of spent nuclear fuel that was stored at the IRT-2000 site was exported to Russia in August 2008 within the framework of the international program Russian Research Reactor Fuel Return, and at the end of 2009, as part of the project for reconstruction of the reactor, a partial dismantling of all internal body elements was carried out. The amounts of RAW generated from the dismantling of the reactor were handed over to SE RAW in May 2020. The decision of the Council of Ministers No. 552 of July 6, 2001 for the reconstruction and partial decommissioning of the research reactor IRT-2000 is still in force, for its reconstruction into a low-power 200 kW reactor. There is no new MC decision on the future of the research reactor, including the possibility of final decommissioning.
- Decommissioning of SD „PRRAW - Novi Han“. It is planned to be decommissioned. A concept of continuous dismantling with subsequent release of the site for limited use was selected.

2.1.5. Radioactive waste (RAW)

The main volume of low- and intermediate-level RAW is generated during the operation of the nuclear reactors, the first of which was commissioned in 1974. The first four units of the Kozloduy NPP were designed and built without RAW processing facilities, in accordance with the concept of storing them until decommissioning. This practice has led to the gradual occupation of the facilities, the need to concentrate the liquid RAW and the formation of crystallized masses in the tanks, the construction of new temporary facilities for the storage of RAW and other negative consequences.

All RAW generated by the operation of the Kozloduy NPP is conditioned and stored in the RAW management facility - SD "RAW - Kozloduy".

The storage facility for RAW from nuclear applications in Novi Han (SD "PRRAW-Novi Han") receives for temporary storage all RAW generated outside of the Kozloduy NPP, including radioactive sources with no owner, investigation materials and RAW detained during the passage of transit cargo.

The Ordinance on Safety in the Management of RAW introduces requirements to the form and content of the draft of the updated Strategy, as well as a national RAW classification system. The types of RAW generated by the operation of the nuclear reactors are liquid, gaseous and solid, the latter representing the main part of them.

In accordance with the activity and specific characteristics, the solid RAW materials are classified into categories and subcategories:

- Category 1 - waste containing radionuclides with low activity, for which the application of radiation protection measures is not required ,or a high level of isolation and containment is not required; RAW of this category is further subdivided into:
    - Category 1a - waste materials that correspond to the levels for exemption from regulatory control according to the SUNEA (no restriction on their use);
    - Category 1b - very short-lived activity waste, containing mainly radionuclides with a short half-life (no more than 100 days), the activity of which decreases below the levels for exemption from regulatory control according to SUNEA. These types of waste are managed by appropriate storage at the site for a limited period of time (usually no more than a few years);
    - o Category 1c - very low-level activity waste - with levels of specific activity minimally exceeding the levels for exemption from regulatory control according to SUNEA and a very low content of long-lived radionuclides, which represent a limited radiological risk; for this category of waste, the application of specific measures for radiation protection or isolation and containment is not required;
- Category 2 - low- and intermediate-level activity waste: RAW containing radionuclides in concentrations that require measures for reliable isolation and containment, but do not require special measures to remove the heat release during storage and burial; RAW of this category is further subdivided into:
    - Category 2a - low- and intermediate level- activity waste, containing mainly short-lived radionuclides (with a half-life no longer than that of ^{137}Cs), as well as long-lived radionuclides at significantly lower levels of activity, limited to long-lived alpha emitters below 4.106 Bq/kg for each individual package, and maximum average value of all packages in the respective facility 4.105 Bq/kg; such RAW requires reliable isolation and containment for a period of up to several hundred years;
    - Category 2b - low- and intermediate level- activity waste containing long-lived radionuclides at activity levels of long-lived alpha emitters exceeding the limits for Category 2a;
- Category 3 - high-level activity waste: RAW with such a concentration of radionuclides that heat release must be taken into account during storage and disposal; this category requires a higher degree of isolation and containment than low- and intermediate-level waste by burial in deep, stable geological formations.

The classification introduced also applies to liquid and gaseous RAW depending on the characteristics and form of solid RAW suitable for disposal, which is expected to be obtained after the conditioning of liquid and gaseous RAW. When there is no technology available in the country for conditioning the liquid or gaseous RAW, the classification is carried out taking into account the best modern conditioning technologies.

The regulatory documents require that RAW should be separated at the source of generation according to their radiation, physical and chemical characteristics.

RAW Management

RAW Management at Kozloduy NPP

The responsibilities for managing RAW from Kozloduy NPP are divided between the NPP (as licensee) and SD "RAW-Kozloduy". Kozloduy NPP is responsible for collection, sorting, processing and temporary storage of the generated RAW. SD “RAW-Kozloduy" is responsible for processing, intermediate storage of conditioned and packaged RAW and its disposal. The RAW management activities are regulated by a Comprehensive Program for RAW Management from the Kozloduy NPP developed and agreed upon by the two companies.

The currently operating facilities for the temporary storage of RAW from units 5 and 6 are located in Spetskorpus-3 and include:

- Storage for low- and intermediate-level solid RAW (category 2a) with a dose rate below 10 mSv/h - bunker-type cells: 18 units with a volume of 2486 m^3;
- Storage for low- and intermediate-level solid RAW (category 2a) with a dose rate above 10 mSv/h - bunker-type cells: 3 units with a volume of 224 m^3;
- Storage for liquid radioactive concentrate: 7 stainless steel tanks with a total volume of 3584 m^3;
- Storage for spent sorbents: 2 stainless steel tanks with a volume of 100 m^3 each.

RAW Management at SE RAW

The State Enterprise "Radioactive Waste" is a national operator for the management of radioactive waste outside the sites where it is generated. The main commitments of the enterprise are related to the collection, handling, pretreatment, processing, conditioning, storage and disposal of radioactive waste. SE RAW is responsible also for the decommissioning activities of units 1-4 of Kozloduy NPP. The enterprise consists of Head Department and four specialized divisions on the location of the nuclear facilities

- Specialized division "Decommissioning of unit 1-4" (SD "DC 1-4 unit") carries out the decommissioning, dismantling and subsequent activities of unit 1-4 of Kozloduy NPP, while managing and operating the rest of the operational technological systems, facilities and equipment in compliance with the safety requirements;
- Specialized division "Radioactive waste-Kozloduy" (SD "RAW-Kozloduy") collects, sorts, transports, processes and stores RAW from the operation of the plant;
- Specialized division "National Repository for Radioactive Waste" (SD "NRRAW"). The division's activity is related to the construction, commissioning and operation of a repository for the burial of low- and intrmediate-level short-lived radioactive waste;
- Specialized division "Permanent repository for radioactive waste - Novi Han" (SD "PRRAW-Novi Han") is designed to receive radioactive waste that is obtained as a result of using radioactive sources in medicine, industry, science and education.

Management of HLW

Internationally, it is accepted that the only way to reliably isolate the long-lived radionuclides in RAW categories 2b and 3 from the environment is by burying them in a repository in deep, stable geological formations.

A preliminary survey of the possibilities for the construction of a geological repository for highly active and long-lived waste in Bulgaria has been carried out, and the conclusion is that in Bulgaria there are suitable geological conditions for the construction of a deep geological repository. A concept has been developed for the construction of a deep geological repository and the ways for its implementation, as well as an indicative plan-schedule (shown in Appendix 7 of the draft of the updated Strategy) for carrying out the activities of the license process for surveys and narrowing down the circle of possible sites, conducting detailed research, selection and licensing of a site for the construction of a DGR with clearly defined stages, timelines and the necessary financial and human resources.

2.1.6. Spent Nuclear Fuel (SNF)

In Bulgaria, SNF is generated by units 5 and 6 of the Kozloduy NPP, and in the past also by units 1 to 4 of the nuclear power plant.

After the energy potential of the nuclear fuel is exhausted, it is removed from the active zone and is further called spent nuclear fuel for clarity. It is an inevitable technological product of the operation of nuclear reactors. It contains at least 95% of all radioisotopes generated during the operation of the NPP. The radioactive emissions are partially absorbed by the nuclear fuel and are turned into heat (residual heat release), which leads to heating of the SNF cartridges and the need for its continuous cooling. For the same reason, when storing SNF, biological protection against the ionizing radiation it emits must be ensured. Due to the presence of fissile isotopes, specific measures must be taken during storage to prevent the formation of a critical mass, as well as physical protection measures, and to prevent unregulated use of the fissile material for other purposes.

SNF management practices in Bulgaria are related to the storage of SNF from WWER-1000 in the near-reactor aging pools and in WSNFS (*Wet Spent Nuclear Fuel Storage Facility)*, and from WWER-440 - in WSNFS and in DSNFS (*Dry Spent Nuclear Fuel Storage Facility)*.

The existing SNF management facilities are described in section 2.1.3.

The planned tasks and activities related to SNF management are determined by the main goal of the Strategy in this area - processing of the entire amount of SNF from WWER-440 and WWER-1000 by 2060, intermediate storage of vitrified HLW and other RAW obtained from the processing on the site and their subsequent burial in the DGR. In connection with the unfavourable geopolitical changes that occurred at the beginning of 2022 after the start of the war of the Russian Federation against Ukraine, these tasks and activities are:

- Conducting intergovernmental negotiations between Bulgaria and France and signing an agreement on the potential processing of the SNF from the previous and future operation of WWER-1000, incl. also from the potential new nuclear power unit in the plants of France;
- Investigation of the technological possibilities for processing SNF from WWER-1000 in the plants of France;

- Development of a transport scheme for the regular removal of SNF from WWER-1000 for processing in the plants of France and for the return of the obtained RAW;
- Development of measures to adapt and test the existing transport scheme for transportation of SNF from WWER-1000 for the purpose of transportation of SNF from WWER-440 for long-term storage and processing;
- Updating the program of Kozloduy NPP EAD for the management of SNF in accordance with the goals set in the Strategy;
- Under favourable geopolitical conditions, regular transportation of SNF from WWER-1000 following the previous practice;
- Reaching an agreement between the Republic of Belarus and the EC for processing according to the previous practice of the planned quantities of cartridges for WWER-1000, delivered to the Kozloduy NPP after 01.01.2007 and planned for transportation after 2024;
- Maintaining readiness for transporting SNF for long-term storage and processing according to a transport scheme via third countries.

Due to the unfavourable geopolitical changes that occurred in early 2022 after the start of the war of the Russian Federation (RF) against Ukraine, a number of risks related to the management of SNF and HLW have arisen.

The generation of SNF, its transportation for processing and the amount of SNF stored at the site are being analysed, taking into account that in 2024 and beyond, the 5th unit will be loaded with fresh nuclear fuel (FNF) produced by Westinghouse, and the operation of the 6th unit in the following years will continue with the traditional manufacturer's FNF, and then with the FNF supplied by Framatom France until the end of their operational life.

The introduction of fuel from another manufacturer must be proven by carrying out a full set of safety analyses, their verification and licensing, especially in mixed fuelling of the core.

According to the available information, Westinghouse only offers an option for intermediate storage of SNF (Westinghouse) in a dry method, but not an option for its processing. This means that the processing of the generated amounts of SNF in another country must be planned and carried out.

The following three SNF processing scenarios have been considered, assuming normal operation of units 5 and 6 and an annual SNF generation containing about 38 t HM:

Realistic scenario

The realistic scenario is based on the following preconditions:

- continuing the established practice of processing WWER-1000 SNF may not be possible or may be greatly impeded as a result of transportation and logistics issues or sanctions imposed both by the EU and the RF;
- development of idea for processing SNF from WWER-1000, incl. SNF from Westinghouse fuel and Framatom fuel in the processing plants of France;
- transporting SNF from WWER-440 for processing in compliance with the current practice;
- achieving the set objective - an average annual shipment of 77 t HM as SNF from the site (for a period of 10 years).

This includes implementation of the following activities until the end of 2029:

- 2023 – implementation of the negotiated two shipments with 118 SNF cartridges from WWER-1000 (around 45.3 t HM), with signed contracts and approved by the ESA (if possible, the two shipments will be aggregated into one shipment).
- 2024 – 2029 – clearing the site of all the SNF from WWER-440, which is now stored in the SNFR and DSNFS (a total of 2864 fuel cartridges containing 330.9 t HM). This means sending two/three SNF shipments from WWER-440 per year, each with 240 fuel cartridges containing 27.7 t HM, or about 55.4/83.1 t HM. The fuel cartridges stored in the SNFR are transported first. The activities for moving the fuel assemblies from the DSFSF to the SNFR shall be synchronised with the schedule for their subsequent shipment.

Thus, by the end of 2029, the site will be cleared of a total of 376.2 t HM, which means an average of 47.03 t HM per year. The quantity of SNF generated during these 7 years will be about 312 t HM, i.e. the amount of SNF stored on site will decrease by about 102 t HM to about 855 t HM;

- 2030 - start of SNF shipping from WWER-1000 for processing in the plants of France;
- after 2030 - performing two/three shipments per year, each with 96 cartridges of SNF from WWER-1000 for processing in the plants of France (a total of 9 shipments till 2040, containing about 347 t HM).

In this way, in the coming years, a sustainable reduction of the amount of SNF stored at the site will be achieved, with the ultimate goal of clearing the site from SNF by 2060.

Optimistic scenario

The optimistic scenario envisages the implementation of all the activities foreseen in the realistic scenario. In addition, it is assumed that at a certain stage the transportation of SNF from WWER-1000 supplied by the Russian company TVEL for processing according to the current practice will begin, starting with the transportation of 379 SNF cartridges from WWER-1000, subject to the approval of the European Commission. Sending SNF from WWER-1000 for processing at the French plants remains an option, but mainly for SNF (Westinghouse and Framatom).

In this scenario, all objectives are achieved as in the realistic scenario, but with lower costs.

Pessimistic scenario

In this scenario, the sending of SNF from WWER-440 and from WWER-1000 for reprocessing will not be implemented according to the current practice.

This means that the main priority of the draft of the updated Strategy is the realization of the processing of SNF from WWER-1000, and possibly from WWER-440 in the plants of France. From 2029 onwards, the annual transportation of two/three shipments for processing in France will begin.

In this scenario, the main goal of the draft of the updated Strategy - a sustainable reduction of the amount of SNF stored on site - cannot be achieved in the next 7 years, and its implementation in the long term is also at risk. It is necessary to build a buffer capacity for dry storage of SNF from WWER-1000.

When implementing any of the SNF management scenarios, the main goals for its safe management must be achieved, which are:

- not to admit any harmful consequences on personnel, the population, the environment and the future generations;
- not to admit the transfer of significant financial burden to future generations;
- to ensure the necessary minimum free volume for emergency removal of the active zone of the operating units of Kozloduy NPP;
- to introduce new, advanced types of nuclear fuel, which lead to a reduction in the amount of SNF generated and of RAW from its processing;
- to fulfil the safety requirements in the management and storage of HLW generated during the processing of SNF.

In the current conditions, long-term forecasting would contain enormous uncertainty, and for that reason it has not been carried out at this stage. This should be done when updating the Strategy, after clarifying the geopolitical situation in Europe, the possibilities for interaction with the Russian Federation, France, the EC and other factors. The goal of the next update of the Strategy should remain the same, namely, for each 10-year period, the transportation of a total of no less than 770 t HM of SNF, and the clearing of the site of the plant from SNF by 2060.

2.1.7. Implementation monitoring of the draft of the updated Strategy

The monitoring of the overall implementation of the draft of the updated Strategy will be carried out by an interdepartmental working group, determined by an Order of the Minister of Energy. The responsibility for the implementation of each specific activity is clearly assigned to the relevant competent organization, according to the Action Plan to the draft of the updated Strategy. The currently outlined framework with strategic priorities will be subject to periodic updating in the presence of a significant change in the political vision, the legislative base of the country or innovative solutions in the technological development on a global scale.

2.1.8. Action plan according to the draft of the updated Strategy

The action plan includes the targeted measures and tasks to be implemented in the following specific directions:

I. Safe management of spent nuclear fuel - Responsible and safe management of SNF at the Kozloduy NPP site with planned tasks, measures and actions for the implementation of the realistic scenario and of the optimistic scenario;

II. Responsible and safe RAW management - Responsible and safe interim storage of HLW at the site of Kozloduy NPP; Safe management of low- and intermediate-level activity RAW from units 5 and 6 of the Kozloduy NPP, Achieving and maintaining sustainability in the management of RAW, decommissioning of SD "PRRAW - Novi Han", by combining delayed dismantling and possibility of access of the personnel to the facility;

III. Burial of HLW, MARAW and SCRS cat. 2b and 3 - Construction of DGR, Borehole burial of spent closed radioactive sources (SCRS);

IV. Decommissioning of the BAS research reactor IRT-2000 - Decommissioning (DC) of BAS research reactor - IRT 2000;

V. Decommissioning of units 1-4 of the Kozloduy NPP - DC of the units through continuous dismantling;

VI. Decommissioning of units 5 and 6 of the Kozloduy NPP and SNFR;

VII. Adequate financial and human resources - Provision of sufficient financial resources for the implementation of the programs for the management of HLW and DC, Provision and maintenance of sufficient human resources by the licensee for the fulfilment of his obligations in relation to safety in the management of SNF and RAW, and DC.

The plan includes specific operations on the tasks, the responsible institutions, the deadlines, the resources (financial, human, etc.), as well as key performance indicators.

2.2. Scope of the draft of the updated Strategy for Management of Spent Nuclear Fuel (SNF) and Radioactive Waste (RAW)

The draft of the updated Strategy covers all stages of the life cycle of the nuclear facilities, the application of the most modern available technologies for the management of SNF and RAW, including their disposal, by planning the necessary activities, stages of implementation and the required financial and human resources to achieve and maintain a high level of nuclear safety, radiation and physical protection.

The territorial scope of the draft of the updated Strategy depends on the location of the existing sites and the projects envisaged in the draft of the updated Strategy.

Location of existing SNF facilities - In the Republic of Bulgaria, the spent nuclear fuel of Kozloduy NPP is stored at the Kozloduy NPP site in a dry spent nuclear fuel storage facility (DSNFS), in a "wet" SNF storage facility (WSNFS) and in the near-reactor pools of units 5 and 6 of the Kozloduy NPP, which are in operation and for which the relevant operating licenses have been issued.

Location of the existing facilities for RAW - In the Republic of Bulgaria, the RAW management facilities and related structures, systems and components (SSC) are located at the Kozloduy NPP site and at the site of the Specialized Division "Permanent Repository for Radioactive Waste - Novi Han":

- SD "PRRAW-Novi Han" temporarily stores unprocessed waste, which is obtained from the use of radioactive sources in industry, agriculture, medicine and scientific research, its processing and conditioning, as well as temporary storage of conditioned RAW;
- RAW from the nuclear fuel cycle is processed and stored at the Kozloduy NPP site;
- The National Repository for the Disposal of Low- and Medium-Level Short-Lived RAW (NRRAW), which is in the process of being built at a site in the immediate vicinity of the Kozloduy NPP, will receive the low- and medium-level short-lived RAW after packing them in reinforced concrete containers in the existing facilities of SD "RAW-Kozloduy".

As described above, the existing and planned facilities are located in and around the Kozloduy NPP, as well as on the site of SD ”PRRAW-Novi Han”.

2.2.1. Facilities that have undergone procedures under Chapter Six of the Environmental Protection Act

Existing facilities

The following existing facilities have successfully passed procedures under Chapter Six of the Environmental Protection Act:

- Facility for dry storage of spent nuclear fuel of Kozloduy NPP, with a capacity to receive 10,500 cartridges of spent nuclear fuel and a storage period of 50 years "Kozloduy NPP" EAD, for which there is prepared an EIA report and a Decision on the EIA of MOEW No. 14-7/2006 has been issued.
- Decommissioning of units 1 to 4 of Kozloduy NPP - Kozloduy NPP EAD; SE "Radioactive waste", for which an EIA report has been prepared and a Decision of MOEW No. 8-6/2013 has been issued.
- Facility for plasma incineration of waste with a high volume reduction factor, for which there is an EIA report and an EIA Decision No. 2-2/2014 for "Facility for radioactive waste (RAW) treatment and conditioning with a high volume reduction factor at Kozloduy NPP.

Facilities envisaged

The following envisaged facilities have successfully passed procedures under Chapter Six of the Environmental Protection Act:

- National Repository for the Disposal of Low and Intermediate Radioactive Waste (NRDRAW) - there is an EIA report and Decision of the MOEW No. 7-7/2016. The facility is under construction.
- Facility for the production of StBK-type packaging from SE RAW, located on the site of the Kozloduy NPP - letter with Ref. No. OVOS-79/16.10.2018, MOEW makes an assessment that it is not necessary to conduct a procedure in accordance with Chapter Two of the EA Ordinance. The facility is under construction.

2.2.2. Zones with special status

Zones for emergency planning according to the Ordinance on emergency planning and emergency preparedness in the event of a nuclear and radiation accident

In order to ensure a timely and adequate response in the event of an emergency situation, in accordance with the risk category and class of the emergency situation, emergency planning zones are identified, and they are described below:

Kozloduy NPP

The establishment of the zones with a special status around the Kozloduy NPP is related to the need to create a tool for the organization and management of the area, in accordance with the legal and regulatory framework of the country and the pan-European standards for safety and security, according to the requirements of Art. 104, para. 1 of the *Safe Use of Nuclear Energy Act*.

The following zones for emergency planning of Kozloduy NPP EAD have been identified:

- Zone for emergency planning of the site - protected zone No. 1, at the site of Kozloduy NPP EAD;
- Zone for preventive protective measures (ZPPM) – zone No. 2, with a radius of 2 km and a geometric centre between the ventilation pipes of units 5 and 6. The area of the zone is occupied by the industrial site of Kozloduy NPP, the site for radioactive waste storage and processing of SE RAW Kozloduy and the Radiana site. Its purpose is to limit exposure in emergency situations.
- Zone for urgent protective measures (ZUPM) [1] – zone No. 3, with a conditional radius of 30 km around the Kozloduy NPP EAD. The role of this area is related to carrying out the necessary control for the purposes of radiation protection.

The ZUPM of 30 km is identified for the purposes of emergency planning. The same 30 km zone for radiation monitoring purposes is called the Monitored Zone (MZ).

Radiana site (NRRAW) is located next to the Kozloduy NPP (it is within the limits of the monitored zone of the nuclear power plant), and has the following designated zones:

- zone for preventive protective measures (ZPPM), which is within the boundaries of its fence
- monitored zone (MZ) is below 4 km.

SD "PRRAW-Novi Han"

Until 2017, a Zone for preventive protective measures was identified in SD "PRRAW-Novi Han" with a radius of 470 m, and with central point - the centre of the repository, in accordance with the regulatory requirements at that time.

In 2018, the risk category of the facility was changed from "risk category I" to "risk category III", and accordingly, only one zone for emergency planning was identified in SD "PRRAW-Novi Han". The zone for emergency planning of the site is a protected zone covering the area of the nuclear facility, which is under the direct control of the licensee.

Facilities of INRNE - IRT-2000

The activity of spent nuclear fuel management in the country began with the commissioning of the IRT-2000 research reactor in 1961 at the Institute of Physics of the Bulgarian Academy of Sciences, Sofia. The reactor is intended for scientific research and for the production of radioactive isotopes. The irradiated fuel has been stored in the pool-type shaft facility built within the reactor's biological containment.

The IRT-2000 research reactor was decommissioned in July 1989 for modernization of its nuclear and radiation safety systems. The entire amount of spent nuclear fuel that was stored at the IRT-2000 site was exported to Russia in August 2008 within the framework of the international program Russian Research Reactor Fuel Return at the end of 2009. As part of the reconstruction project of the reactor, a partial dismantling of all internal body elements was carried out. The generated quantities of RAW from the dismantling of the reactor were handed over to SE "RAW" in May 2020. **Therefore, at the moment there is no need to designate zones with special status around IRT-2000.**

For the entire period of operation of IRT-2000, continuous radiological monitoring of the environment has been carried out. The results of this monitoring clearly show that all measured

[1] The ZUPM of 30 km is identified for the purposes of emergency planning. The same 30 km zone for radiation monitoring purposes is called the Monitored Zone (MZ)

values are within the limits of the maximum permissible norms for content of radioactive elements in samples from the environment. These results have been systematized and archived at the Control Laboratory for Radiation Protection of the INRNE-BAS.

Controlled and supervised zones according to the Radiation Protection Ordinance

Controlled zones

For the purposes of radiation protection, controlled zones are created at the nuclear facilities and sites with sources of ionizing radiation, and within the limits of the controlled zone, the access of persons is restricted and controlled, and radiation monitoring is carried out at the workplaces.

Supervized zones

For the purposes of radiation protection, a supervised zone is created in a nuclear facility or site with sources of ionizing radiation, and radiation monitoring of the workplaces in the supervised zone is carried out, taking into account the radiation risk.

These zones are connected with restricting and controlling the access of persons to them and carrying out radiation monitoring of the workplaces, taking into account the radiation risk. Such zones have also been designated for Kozloduy NPP and SD "PRRAW - Novi Han".

Zones for radiation monitoring

The radiation monitoring in nuclear facilities and sites with sources of ionizing radiation, depending on the nature of the activities performed and the specific radiation factors leading to external or internal irradiation, includes measurement and assessment of the content of radionuclides in various components of the environment (air, water , soil, etc.) within the limits of the monitored zone around the nuclear facilities.

Kozloduy NPP

Radioecological monitoring at Kozloduy NPP is an integral part of ensuring the safety of the nuclear power plant and the radiation protection of the population and the environment in the area.

The purpose of the monitoring is to carry out an accurate and detailed assessment of the radiation status of the environment and to locate the possible impact of the operation of the nuclear power plant on the population and the environment in the area.

In order to locate and assess the potential impact of the Kozloduy NPP on the environment and the population, 3 control zones with different radii have been designated around the nuclear power plant:

- Supervised zone - in the security perimeter of the site of the previous units 1-4 and units 5 and 6 of the Kozloduy NPP;
- Zone for Preventive Protective Measures (ZPPM) with a radius of 2 km - The NRRAW site is within the 2-km ZPPM of the Kozloduy NPP;
- Monitored zone (MZ) with a radius of 30 km.

For comparing the results, sampling and measurements are carried out at reference points up to 100 km around the Kozloduy NPP, where no impact is expected from the operation of the plant.

Radioecological monitoring at the Kozloduy NPP is carried out in the 30-kilometer Monitored Zone (MZ), whereas on the territory of the Republic of Bulgaria, this zone includes the municipalities of: Kozloduy, Valchedrum, Hairedin, Mizia and part of the settlements in the municipalities of Lom,

Byala Slatina, Oryahovo, Boychinovtsi, Krivodol and Borovan. In this area, a Program for Radio-ecological Monitoring approved by the National Centre for Radiobiology and Radiation Protection (NCRRP) and the Nuclear Regulatory Agency (NRA) is implemented. A program for radiation control of the industrial site (the supervised zone) is implemented separately, with the aim of preventive monitoring at the source of the radiation emission.

SD „PRRAW - Novi Han“

Radioecological monitoring is carried out according to approved programs included in Appendix 2 of the currently valid licenses for operation issued by the NRA. The programs identify two zones for monitoring:

- Operational zone – a zone with a radius of 1 km around the repository (with a central point - point A2 (KC1));
- Monitored zone - a zone with a radius of 5 km around the repository, within which there are three settlements - the village of Novi Han, the village of Krushovitsa and the village of Gabra.

As described above, the existing and planned nuclear facilities are located in and around the Kozloduy NPP and at SD „PRRAW - Novi Han“. Therefore, the geographical scope of the draft of the updated Strategy has been assumed to be the scope of the monitored zones around the existing and planned nuclear facilities, where radioecological monitoring is carried out, as follows:

- **around the Kozloduy NPP – a 30 km zone, which includes the settlements in the municipalities of Kozloduy, Valchedrum, Hairedin, Mizia (28 settlements) and part of the settlements in the municipalities of Lom, Byala Slatina, Oryahovo, Boychinovtsi, Krivodol and Borovan;**
- **around SD "PRRAW - Novi Han" - a 5 km zone that covers the village of Novi Han, the village of Krushovitsa and the village of Gabra, Elin Pelin municipality.**

2.3. Time frame

The draft of the updated Strategy is updated periodically and there is no time frame limitation.

3. Relation of the draft of the updated Strategy to other plans and programs.

Below are considered and assessed the following national strategies, plans and programs as having direct relevance to environmental management:

3.1. Key EU strategic documents

8th EU Environment Action Program to 2030

The program aims to accelerate the transition to a climate-neutral, resource-efficient economy and to support the European Green Deal and it’s environmental and climate initiatives. To do this, the program sets six priority goals:

- Irreversible and gradual reduction of greenhouse gas emissions and increase of absorption by natural and other absorbers in the Union in order to achieve the objective of reducing greenhouse gas emissions by 2030 and climate neutrality by 2050;

- Continued progress in improving administrative capacity, strengthening resilience and reducing vulnerability to climate change;
- Moving towards a regenerative growth model that gives back to the planet more than it takes, decoupling economic growth from resource use and environmental degradation, and accelerating the transition to a circular economy;
- Pursuit of the ambition for a zero-pollution environment free of toxic substances, including air, water and soil, and protection of the health and well-being of citizens from environmental risks and impacts;
- Protection, conservation and restoring of the biodiversity and enhancement of the nature capital, in particular the air, water, soil, forest, freshwater, wetland and marine ecosystems;
- Promoting environmental sustainability and reducing the key environmental and climate pressures, related to production and consumption, particularly in the areas of energy, industrial development, building and infrastructure, mobility and the food system.

The main principles, policies and objectives of the project of an updated Strategy for the management of spent nuclear fuel and radioactive waste, related to the consideration of the interrelationships between all stages of the generation and management of radioactive waste, traceability of waste at all stages of its management, minimization of the generated amount of spent nuclear fuel and its volumes for disposal, participation of all interested parties in decision-making, management ensuring the absence of negative effects on the population and human health, as well as the provision and maintaining sustainable financial and human resources to maintain expertise at a high level are in full sync and synergy with the objectives of the Eight EU Action Program, relation to the continuous progress in improving administrative capacity, pursuing the ambition of a zero-pollution, toxic-free environment (including air, water and soil), protecting the health and well-being of citizens from risks and impacts, related to the environment and protecting, preserving and restoring the biological diversity and improving nature capital.

EU Circular Economy Action Plan

In March 2020, the European Commission adopted the new circular economy action plan. The plan should ensure a systematic, comprehensive and radical transition to a circular economy – both in the EU and beyond. The plan is one of the main building blocks of the European Green Deal. The EU's transition to a circular economy will reduce pressure on natural resources and create sustainable growth and jobs. The plan is also a prerequisite for achieving EU's goal of climate neutrality by 2050 and halting the loss of biodiversity.

The new action plan has announced initiatives related to each stage of the product life cycle. It targets the way products are designed and created, promotes circular economy processes, promotes sustainable consumption and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible. The plan introduces legislative and non-legislative measures targeted at areas of real added value.

The following objectives are set out in the action plan:

- To make sustainable products the norm for the EU;

- To enable consumers and public buyers to target sectors that use the most resources where the potential for circularity is high, such as: electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients;
- To generate less waste;
- To achieve a circular economy that works for people, regions and cities;
- To play a leading role in the global efforts for circular economy.

In order to achieve its goals, the plan envisages taking key actions in several directions:

- Encouraging the creation of sustainable products;
- Providing more options to consumers and public buyers;
- Application of circularity in production processes;
- Management of sector activities within key value chains.

The objectives of the draft of the updated Strategy for Spent Nuclear Fuel Management and the objectives of the EU Circular Economy Action Plan contain complementary elements in the area of waste generation limitation. The goal of generating less waste in the EU Circular Economy Action Plan will be achieved through the introduction of specific instruments such as a more effective policy toward waste, aimed at preventing waste and supporting its circular nature, increasing circularity in a non-toxic environment, creating a well-functioning EU market for secondary raw materials and taking stricter measures in relation to the export of waste to third countries. On its part, the draft of the updated Strategy defines principles for the traceability of radioactive waste at all stages of its management, minimization of the generated amount of spent nuclear fuel and the volume of radioactive waste for disposal, setting a strategic goal for a sustainable reduction of the amount of SNF at the Kozloduy NPP site and construction of appropriate storage and processing facilities. A main aspect of the policies defined with the draft of the updated Strategy is to take into account the interrelationships between all stages of the generation and management of SNF and RAW and the safety requirements, some of which are:

- Minimizing the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process and by applying appropriate practices in its subsequent management, including recycling and reuse of materials;
- Taking into account the requirements for minimization of RAW in the design, construction, operation and decommissioning of nuclear facilities.

3.2.National strategies, programs and plans

Strategy for sustainable energy development of the Republic of Bulgaria until 2030 with a horizon to 2050 and a project of the Integrated National Plan in the field of energy and climate (INPEC) of the Republic of Bulgaria until 2030.

The strategy for sustainable energy development of Bulgaria sets the following main priorities, which are the result of our country's commitments to achieve the requirements of the common European energy policy:

- Guaranteeing energy security and sustainable energy development;

- Development of an integrated and competitive energy market and consumer protection by guaranteeing transparent, competitive and non-discriminatory conditions for the use of energy services;
- Increasing energy efficiency in the processes from production to final energy consumption;
- Sustainable energy development for clean energy and decarbonization of the economy;
- Implementation of innovative technologies for sustainable energy development.

For the implementation of the national energy priorities set and listed above until 2030, with a horizon to 2050, as well as for ensuring Bulgaria's contribution to the implementation of the common European energy policy, the Strategy sets the following goals for implementation until 2030:

- Reduction of primary energy consumption compared to the base forecast PRIMES 2007 – 27.89%;
- Reduction of final energy consumption compared to the base forecast PRIMES 2007 – 31.6%;
- 27.09% share of energy from renewable sources in gross final energy consumption;
- At least 15% intersystem energy connectivity.

The policies, priorities and objectives of the Strategy are also laid down in the Integrated Plan in the field of energy and climate of the Republic of Bulgaria 2021-2030, which was prepared in implementation of Regulation (EU) 2018/1999 on the management of the Energy Union and the actions in the field of climate.

The Strategy and the Integrated Plan pay special attention to nuclear energy as part of the priority to ensure national, regional and European energy security and sustainable energy consumption, which at the same time delivers energy at affordable prices, and is a key element for the transition to a low-carbon economy. In terms of ensuring energy security and sustainable energy development, the Strategy highlights the following goals at the national level:

- Use of local energy resources in strict compliance with environmental legislation;
- Development of network energy infrastructure and increase of intersystem energy connectivity;
- Ensuring the adequacy and sustainability of the national electric power system;
- Diversification of natural gas supply sources and routes;
- Increasing network and information security of the energy system.

In order to guarantee energy security in the field of nuclear energy, the Strategy for Sustainable Energy Development of Bulgaria states that the operation of nuclear power facilities in the country must be carried out in compliance with the highest levels of nuclear safety, including also the management of spent nuclear fuel. In this regard, the indicated priority is interrelated and complementary with one of the main principles of the project of the updated Strategy for the management of SNF and RAW, which requires that in the management of SNF and RAW, nuclear safety and radiation protection have priority over all other aspects.

Interaction and connection between the Strategy for Sustainable Energy Development of Bulgaria and the draft of the updated Strategy for Management of Spent Nuclear Fuel and Radioactive Waste

also exists in relation to priority 4 of the Strategy for Sustainable Energy Development: "Sustainable energy development for clean energy and decarbonization of the economy". The priority emphasizes the role of nuclear energy as a proven emission-free resource and a factor in the effective fight against climate change. The role of the qualified human potential that our country has in terms of the safe and secure operation of nuclear power as a factor in the fight against climate change is clearly indicated. The directions of this priority are in sync and mutually consistent with the defined strategic goal of the draft of the updated Strategy for the Management of SNF and RAW, which requires the provision and maintenance of sustainable financial and human resources with the necessary high-level expertise and skills.

Strategic vision for sustainable development of the electricity sector of the Republic of Bulgaria 2023 - 2053

The strategic vision for sustainable development of the electricity sector of the Republic of Bulgaria with a horizon to 2053 was developed pursuant to Art. 4, para. 2, item 1 of the Energy Act. It reflects the state's vision for the development of the power sector, consistent with the current European framework of climate and energy policy and the global trends in the development of new technologies. The vision integrates the common European policies and goals for the development of energy and for limiting climate change, reflecting the national specificities in the field of energy resources, production, transmission and distribution of energy. The main strategic decisions aimed at achieving the national goals and interests have been defined. The vision reflects the trends, measures and policies in the field of energy security, energy efficiency, the development of renewable sources and their integration into the common European energy market. The document sets the following main priorities:

- Maintaining a secure, stable and reliable power system;
- Power generation to continue to be a leading branch of the Bulgarian economy with a pronounced foreign trade orientation;
- Preserving the role of the country as a net exporter of electricity in the region and balancer of the national power systems of the neighbouring countries;
- Ensuring security of energy supplies;
- Stimulation of clean and low-emission energy;
- Increasing energy efficiency.

The vision focuses on the development of an appropriate energy mix to achieve Bulgaria's decarbonization goals by 2050. In this energy mix, the role of nuclear energy and its future development through the introduction of new capacities at the “Belene” site and replacement capacities at the Kozloduy NPP site are indicated. The strategic vision for sustainable development of Bulgaria's power sector has an indirect connection with the draft of the updated Strategy for the Management of SNF and RAW, as the sustainable management of radioactive waste and spent nuclear fuel is part of the existence of a secure and stable power system and contributes to security of power supplies.

National human resources development strategy for the nuclear power industry (2022-2032)

The national policy in the field of nuclear energy is carried out in accordance with the requirements and principles of nuclear safety and radiation protection, which have priority over all other activities. An essential component necessary to ensure and maintain nuclear safety and radiation protection at the highest possible level is the presence of personnel with the necessary qualifications in all organizations carrying out activities in the field of nuclear power generation.

The strategy for human resources development in the nuclear field sets a vision for creating and maintaining a sustainable system for the development and improvement of human resources to ensure the effective functioning of the nuclear power sector. To achieve the set vision, the strategy defines seven strategic objectives with key activities for each of them:

- Strategic objective 1: Improving the quantitative and qualitative characteristics of human resources in the nuclear field;
    - Activity 1.1: Providing sustainable solutions for the development of nuclear energy;
    - Activity 1.2: Priority planning of the manpower requirements in the nuclear sector in the plans for the implementation of strategic documents concerning the development of human resources - the Strategy for the Development of Higher Education in the Republic of Bulgaria (2021-2030), the Strategic Framework for Education, Training and Learning (2021-2030), the National Strategy for the Development of Scientific Research in the Republic of Bulgaria (2021-2030);
    - Activity 1.3: Encouraging the development and implementation by employers in the sector of specific policies and programs aimed at human resources development;
    - Activity 1.4: Development and implementation of specialized programs by the companies - users of personnel in the nuclear field to acquire specific knowledge and skills characteristic of the sector;
    - Activity 1.5: The state should annually provide admission places for protected specialties in the nuclear field in the state higher education institutions for persons of Bulgarian nationality and Macedonian citizens, in accordance with the proposals of the higher education institutions and their free capacity for training in the relevant field;
    - Activity 1.6: Developing programs and creating conditions for attracting educated and highly qualified young people from emigration;
- Strategic objective 2: Improving the educational preparation of students in nuclear specialties and specialties related to the nuclear field;
    - Activity 2.1: Concentration of efforts for priority development of STEM-oriented training, for which there are already adopted national strategic documents;
    - Activity 2.2: Provision in the plans for implementation of the strategic documents specified in Strategic Objective 1, Activity 1.2, improvement of the financing of the educational activity in the relevant specialties;
    - Activity 2.3: Creation of incentives on part of the business for the participation of established by practice experts in the discussion and adoption of the curricula and programs in secondary and higher schools related to the preparation of personnel for the sector and the preparation of national exam programs for the state exam;

- Activity 2.4: Creation of effective mechanisms for the participation of established experts from practice in the educational process in secondary and higher schools in the relevant specialties;
- Activity 2.5: Setting up in the city of Kozloduy of a Centre for professional training for the acquisition of qualifications in technical specialties applicable in Kozloduy NPP EAD and SE RAW;

- Strategic objective 3: Improving the preparation and increasing the motivation of the academic and teaching staff, which trains specialists for the nuclear sphere;
  - Activity 3.1: Creation of stimulating mechanisms for exercising the teaching profession in secondary and higher schools - material incentives, career growth, social benefits, work to increase the public image of the profession;
  - Activity 3.2: Ensuring continuity between generations, upgrading existing knowledge and experience in teaching and research work;
  - Activity 3.3: Setting up of stimulating mechanisms for increasing the teaching staff in specific disciplines by creating conditions for a scientific career and research activity;
- Strategic objective 4: Improvement and modernization of the material-technical and experimental base in the academic field;
  - Activity 4.1: Provision in the implementation plans of the strategic documents specified in Strategic Objective 1, activity 1 of financial resources for improving the material, technical and experimental base;
  - Activity 4.2: Provision in the plans of strategic documents indicated in activity 1 of the creation of nuclear information centres where to demonstrate the benefits of nuclear technologies and to direct public attention to the applications of nuclear energy, with the aim of increasing positive attitudes towards training of nuclear specialists;
  - Activity 4.3: Supporting the activity of the higher schools and the Bulgarian Academy of Sciences for specifying and planning the needs for material conditions and a laboratory base for scientific research and experimental activity;
  - Activity 4.4: Creation of effective mechanisms for the participation of economic entities in the planning and financing of the material-technical and experimental base for scientific research;
- Strategic objective 5: Providing conditions for career growth of young people in the nuclear field;
  - Activity 5.1: Ensuring a link between secondary and higher schools and employers with the aim of financial support from employers for the training of pupils and students who will be employed after graduation;
  - Activity 5.2: Encouraging the inclusion of employers in the implementation of dual training at the relevant economic entity;
  - Activity 5.3: Working out by employers of individual plans for increasing the qualification, knowledge and skills of young specialists;

  - Activity 5.4: Linking the increase in qualification and professional improvement of young people with career development;
  - Activity 5.5: Linking the level of pay for the work of young specialists with the development of their professional capacity;
  - Activity 5.6: Creation of a system of social benefits to attract and retain young people;
- Strategic objective 6: Setting up of mechanisms for preservation and exchange of acquired knowledge in the nuclear sphere;
  - Activity 6.1: Making efforts to preserve and upgrade the accumulated knowledge and experience in the nuclear field - through printed publications, organization of trainings, seminars, forums;
  - Activity 6.2: Supporting non-governmental organizations working in the nuclear field to play the role of mediator for the exchange of knowledge between the various entities;
  - Activity 6.3: Setting up of mechanisms for intergenerational exchange of knowledge among those working in the nuclear sector;
  - Activity 6.4: Using the channels of international cooperation - EU, OECD, IAEA, Joint Institute for Nuclear Research (JINR), Dubna, European Centre for Nuclear Research (CERN) for participation in training programs and forums, in order to absorb the positive foreign experience;
- Strategic objective 7: Improving the interaction between government authorities, as well as between government bodies, economic entities and non-governmental organizations in the nuclear field;
  - Activity 7.1: Directing more efforts on the part of the state - ministries, agencies, educational institutions - for interaction in the direction of creating the necessary institutional and normative framework and degree of coordination for the development of human resources in the nuclear field;
  - Activity 7.2: Development of measures to increase the quality control of education;
  - Activity 7.3: Promotion by the state of employers and non-governmental organizations from the nuclear field, with the aim of coordinated actions for the development of human resources;
  - Activity 7.4: Organizing joint forums with the participation of all stakeholders, concerning the solution of the problems for the development of human resources in the nuclear field.

The draft of the updated Strategy for SNF and RAW management is in full compliance with the strategic goals and activities of the Strategy for Human Resources Development in the Nuclear Sector. In practice, the Human Resources Development Strategy provides all the details that are necessary to achieve the strategic objective "Provision and maintenance of sustainable financial and human resources for the availability of the necessary expertise and skills, including for conducting scientific research and development, necessary for the management and regulation of SNF and RAW" from the draft of the updated Strategy for SNF and RAW management. The strategic objectives of the national strategy for the development of human resources outline the framework and tools with which to fulfil the objective of the draft of the updated Strategy for SNF and RAW management.

National Development Program Bulgaria 2030

The National Development Program Bulgaria 2030 is a framework strategic document of the highest order in the hierarchy of national program documents, determining the vision and general goals of the development policies in all sectors of state administration, including their territorial dimensions. The document defines three strategic goals, for the implementation of which it groups the government's intentions in five areas (axes) of development and raises 13 national priorities.

The national program outlines a vision for Bulgaria in 2030 as a country with a high living standard and a competitive, low-carbon economy. The country develops and implements innovations in every sector of the economy, adapting to the changing world through its highly educated, creative, and healthy society with strong solidarity.

The vision is believed to be achieved through the implementation of the following three strategic objectives set out by the development program:

- Strategic objective 1: Accelerated economic development;
- Strategic objective 2: Demographic growth;
- Strategic objective 3: Reducing inequalities.

The implementation of the stated strategic objectives is envisaged through targeted policies and interventions grouped into five interrelated and integrated development axes:

- Development axis “Innovative and Intelligent Bulgaria";
- Development axis "Green and Sustainable Bulgaria";
- Development axis “Connected and Integrated Bulgaria";
- Development axis "Responsive and Fair Bulgaria";
- Development axis "Spiritual and Vibrant Bulgaria".

Development axis 1 "Innovative and Intelligent Bulgaria" puts the main focus on increasing the competitiveness of the Bulgarian economy and transforming it into an economy based on knowledge and intelligent growth. Three national priorities are defined within this axis:

- Priority 1: Education and skills;
- Priority 2: Science and scientific infrastructure;
- Priority 3: Smart industry.

Development axis 2 "Green and Sustainable Bulgaria" focuses on the sustainable management of natural resources, enabling to meet the current needs of the economy and society, while preserving environmental sustainability, so that these needs can continue to be met in the long term as well. Within this axis, three national priorities are set:

- Priority 4: Circular and low-carbon economy;
- Priority 5: Clean air and biodiversity;
- Priority 6: Sustainable agriculture.

Development axis 3 "Connected and Integrated Bulgaria" is focused on providing prerequisites for increasing the competitiveness and sustainable development of the regions in the country, such as the improvement of transport and digital connectivity, as well as the promotion of local development, based on the specific local potential. The following national priorities are defined within this axis:

- Priority 7: Transport connectivity;
- Priority 8: Digital connectivity;
- Priority 9: Local development.

Development axis 4 "Responsive and Fair Bulgaria" is focused on building efficient and responsible public institutions, sensitive both to the needs of business and the needs of citizens. Within this axis, two national priorities have been defined:

- Priority 10: Institutional framework;
- Priority 11: Social inclusion.

Development axis 5: "Spiritual and Vibrant Bulgaria" oriented towards the individual and the improvement of his/her quality of life. Within this axis, the National Development Program sets two main priorities:

- Priority 12: Health and sports;
- Priority 13: Culture, heritage and tourism.

The draft of the updated Strategy for SNF and RAW management is in line with and has taken into account certain applicable aspects of the priorities and development axes of the National Development Program of Bulgaria 2030. The draft of the updated Strategy for SNF and RAW management contributes to the implementation and is in line with Priority 1 and Priority 2 of Axis "Innovative and Intelligent Bulgaria" with its goal of providing and maintaining sustainable human resources that guarantee the necessary expertise and skills. The strategic goal of the draft of the updated Strategy also provides for the implementation of scientific research activities and developments for more innovative and effective management of RAW and SNF. Priority 4 of the National Program: "Circular and low-carbon economy" envisages a sub-priority: "Transition to a circular economy", which includes measures aimed at supporting enterprises for the introduction of waste-free technologies, reducing the amount of waste generated in the production process and the development of industrial symbiosis. In this aspect, there is compliance of the draft of the updated Strategy for SNF and RAW management with this priority and sub-priority of the National Development Program of Bulgaria 2030 by applying one of the main principles of the draft of the updated Strategy, namely: "Minimization of the generated amount of SNF and of RAW volumes for disposal".

National Air Pollution Control Program 2020-2030 (adopted by Decision No. 541 of the Council of Ministers dated 13.09.2019)

The National Air Pollution Control Program has been developed in response to the requirements of Article 6 of Directive (EU) 2016/2284, which puts forward the condition that each EU member state should prepare, adopt, and implement a National Air Pollution Control Program, to be presented to the European Commission. The main objective of the National Air Pollution Control Program is to

meet the obligations to reduce the emissions as compared to 2005 under the provisions of Directive (EU) 2016/2284, which will lead to the gradual achievement of levels of AQ that do not lead to significant negative impacts and risks for human health and the environment. The program envisages measures and responsible institutions in sectors that are more substantial sources of emissions in the air, such as agriculture, road transport and domestic heating.

The reduction of these emissions should contribute to achieving the air quality standards (AQS), that is, pollution levels that do not lead to significant negative impacts and risks for human health and the environment. The program includes the objectives and applicable measures that should lead to the reduction of emissions of sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and fine dust particles, the deadlines for the implementation of the measures, the necessary financial resources, and the responsible institutions.

The draft of the updated Strategy for SNF and RAW management has no direct connection to the implementation of the objectives of the National Air Pollution Control Program. There is an indirect link between the two documents, expressed in the interaction between the quality of air and the contribution of nuclear energy as part of the energy mix for the protection of the purity of the ambient air. The proper management of spent nuclear fuel and radioactive waste is an important process in nuclear power generation and as such has an indirect contribution to ambient air quality.

National program for improving the air quality 2018-2024 (NPIAQ 2018-2024, adopted by Decision No. 334 of the Council of Ministers of 07.06.2019)

The national program contains measures, a plan and a timetable for their implementation, to be implemented by the end of 2024, in order to achieve compliance with the Directive of Cleaner Air for Europe in terms of PM_{10} levels. Domestic heating using inefficient solid fuel stoves and boilers, which are estimated to account for at least 85% of PM_{10} emissions, is indicated as a source of primary PM_{10} emissions in all municipalities. Transport – emissions of exhaust gases, particularly from diesel vehicles – is an additional contributor and can be a significant factor at the local level.

The program proposes four measures to reduce PM_{10} emissions from domestic heating: they relate to the type of fuels, the quality of the fuels and the technologies used to convert the energy from the fuels into useful heat, as follows: (1) earlier introduction of Regulation (EU) 2015/1185 regarding stricter standards for the design of heating sources; (2) introducing fuel quality standards for coal used for domestic heating; (3) adopting organizational measures – banning the sale of firewood by weight and introducing time restrictions when direct extraction of firewood by the population is allowed and when municipalities can provide firewood to households in order to give the wood some chance to dry before using it; and (4) mandatory phasing-out (in municipalities that do not meet the requirements of the CAFE Directive) of heating appliances that do not meet the requirements of the Ecodesign Regulations (EU) 2015/1185 and (EU) 2015/1189 and their replacement with other means of heating.

Two measures have been proposed to reduce PM_{10} emissions from passenger cars: (1) improving the quality of periodic technical inspections, both at the initial registration of the car and during its normal use, combined with penalties for car owners who have not passed the periodic technical inspection because their owners have removed emission reduction devices, and (2) Low Emission Zones (LEZs) in the most urbanized cities such as Sofia and Plovdiv.

The draft of the updated Strategy for SNF and RAW management has no direct connection with the implementation of the objectives of the National Program for Improvement of Air Quality. There is an indirect link between the two documents, expressed in the interaction between the quality of the air and the contribution of nuclear energy as part of the energy mix for the protection of the purity of the ambient air. Proper management of spent nuclear fuel and radioactive waste is an important process in nuclear power generation and as such has an indirect contribution to ambient air quality.

Strategy and Action Plan for the transition to a circular economy of the Republic of Bulgaria for the period 2022-2027, adopted by Decision of the Council of Ministers No. 832 of 26.10.2022

The Bulgarian strategy for the transition to a circular economy is based on the basic principles of the circular economy, which are: 1/ Designing and manufacturing products in a way that does not lead to waste and pollution, 2/ Extending the life cycle of products and materials; 3/ Restoration of natural systems. The vision of the strategy for the transition to a circular economy is related to the provision of economic growth, a clean environment, social well-being and a society with a high environmental awareness that thinks about future generations.

The strategy defines the following objectives:

- Strategic objective 1: Green and competitive economy. Its implementation includes reducing the consumption of resources, introducing circular business models, providing conditions for connectivity between enterprises and contributing to the supply of critical raw materials;
- Strategic objective 2: Less waste, more resources. The target is to generate less and less waste by promoting activities for reusing, repairing, mending and reprocessing of the products. Incentives are envisaged for the construction of recycling centres in the cities. New liability schemes will be introduced to encourage the environmental behaviour of businesses. High-quality recycling will be promoted, by promoting separate collection and providing more and better quality secondary raw materials to processing plants. Landfill waste will be minimized by expanding separate collection systems and new technologies and installations for processing the remaining waste;
- Strategic objective 3: Economy for the benefit of consumers.

The Strategy and Action Plan for the transition to a circular economy of the Republic of Bulgaria for the period 2022-2027 sets the framework for managing the overall flow of waste at a general and specific level. The draft updated SNF and RAW Management Strategy is in line with and contributes to the achievement of Strategic Objective 2: less waste, more resources through its intended objective of minimizing the volume and activity of RAW in the generation process and applying appropriate practices in its subsequent management. The draft updated Strategy also envisages an objective to minimize RAW already at the design stage, as well as during the construction, operation and decommissioning of the facilities, which is in line with the principle of the Circular Economy Strategy for design and production of products in a way that does not lead to waste and pollution.

National waste management plan for the period 2021 - 2028, adopted by Decision No. 459 of the Council of Ministers of 17.06.2021

The National Waste Management Plan (NWMP) has a key role in the effective and efficient waste management in Bulgaria. The plan aims at reducing the harmful impact of waste on the environment and the health of the population, as well as achieving the maximum efficient use of resources, opening up new markets and creating new jobs. An important part of the Plan is the creation of maximum conditions to prevent waste generation.

Objectives of the NWMP 2021-2028 and programs for their achievement

The general strategic goal of the NWMP 2021-2028 in the field of waste management is: "Society and business that improve the implementation of the waste management hierarchy in all processes and at all levels."

To achieve the general strategic goal, strategic objectives and corresponding programs of measures are applied. The objectives are:

- Objective 1: Reducing the harmful impact of waste by preventing its formation and promoting its reuse; For the implementation of this goal, the implementation of the National Program for the Prevention of Waste Generation (NPPWG) is envisaged. The waste prevention program sets strategic and operational objectives. The strategic objective consists in breaking the link between economic growth and improving people's well-being, on the one hand, and on the other - the increase in waste generation and its harmful impact on people's health and the environment. The operational objective of the program is related to reducing the amount of generated waste and the amount of harmful substances contained in the waste;
- Objective 2: Increasing the amount of recycled and recovered waste. The achievement of Objective 2 will be implemented by three programs:
    - Program for reaching the targets of preparation for reuse and recycling of household waste;
    - Program for achieving the targets for recycling and utilization of construction waste and waste from demolition of buildings;
    - Program to reach the targets for recycling and recovery of WSW.
- Objective 3: Reducing the quantities and the risk of landfilled household waste and others. The intended measures towards this objective are both investment and "soft" measures. The investment measures are mainly aimed at building site infrastructure for household waste, closing and reclamation of municipal landfills, treatment of sewage sludge, sustainable management of out-of-use plant protection chemicals/products, etc. The "soft" measures are aimed at the implementation of public, business and scientific projects for the development/implementation of various innovative methods to reduce the quantities and the risk of landfilled household waste. Measures are envisaged to increase the capacity of the public administration regarding the cross-border transportation of waste, etc.

The connection between the main principles of the NWMP and the draft of the updated Strategy for the Management of SNF and RAW is in the prevention of waste generation, as the draft of the updated strategy envisages an objective related to the minimization of the generated amount of waste for disposal. Both documents provide for the implementation of appropriate practices to reduce the waste

stream by providing for the recycling and recovery (or reuse) of waste. An interaction and connection between the National Waste Management Plan and the draft of the updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste also exists regarding the objective of reducing the harmful impact of waste, such as "The SNF and RAW management must be carried out so that the negative effects on human health and the environment are minimal". Another link between the main principles and objectives of both documents is the involvement of stakeholders in waste management decision-making.

Operational Program Environment 2021-2027

The sectoral nature of the program predetermines its main objective of preserving, protecting and improving the quality of the environment, as provided for in Art. 11 and Art. 191, par. 1 of the TFEU, taking into account the "polluter pays" principle. The objectives of the Operational Program are related to the improvement of the water supply infrastructure and the quality of the air, ecological waste management and protection of the nation's rich biodiversity.

The objectives of Operational Program Environment for the period 2021-2027 are expected to be achieved by setting specific targets and implementing specific measures under individual priorities, as follows:

- *Priority 1: Water*

Specific objective No. 1: Support for ensuring access to water and sustainable water management.

Measures:

- Provision of water for human consumption (infrastructure for extraction, processing, storage and distribution, efficiency measures, drinking water supply);
- Water management and conservation of water resources (including river basin management, specific climate change adaptation measures, reuse, leakage reduction);
- Collection and treatment of waste water;
- Provision of grants;
- Support through financial instruments: loans.

- *Priority 2: Waste*

Specific objective No. 1: Promoting the transition to a circular economy based on efficient resource utilization economy.

Measures:

- Household waste management: preventive measures, measures for minimization, sorting, reuse and recycling;
- Provision of grants;
- Support through financial instruments: loans.

Specific objective No. 2: Improving the protection and conservation of nature, biological diversity and environmentally friendly infrastructure, including in urban areas, and reducing all forms of pollution.

Measures:

- Rehabilitation of industrial sites and contaminated sites;
- Provision of grants.

- *Priority 3: Biological diversity*

Specific objective No. 1: "Improving the protection and conservation of nature, biological diversity and environmentally friendly infrastructure, including in urban areas, and reduction of all forms of pollution.

Measures:

- Protection, recovery and sustainable use of Natura 2000 areas;
- Protection of nature and biological diversity, natural heritage and resources, green and blue infrastructure;
- Other measures to reduce greenhouse gas emissions in the field of conservation and restoration of natural areas with high potential for carbon absorption and storage, for example by restoring wetlands and capturing landfill gas;
- Provision of grants.

- *Priority 4: Risk and climate change*

Specific objective No. 1: "Promoting adaptation to climate change, disaster risk prevention and sustainability, taking into account ecosystem approaches".

Measures:

- Measures for adaptation to climate change and prevention and management of climate-related risks: floods and landslides (including awareness raising, civil protection and disaster management systems, infrastructures and ecosystem approaches);
- Provision of grants.

- *Priority 5: Air*

Specific objective No. 1: Improving the protection and preservation of nature, biological diversity and environmentally friendly infrastructure, including in urban areas, and reduction of all forms of pollution.

Measures:

- Measures to improve air quality and reduce noise;
- Energy from renewable sources: solar energy;
- Other measures to reduce greenhouse gas emissions in the field of conservation and restoration of natural areas with high potential for carbon absorption and storage, for example by restoring wetlands and capturing landfill gas;
- Provision of grants.

A link between the Operational Program Environment 2021-2027 and the draft of the updated Strategy for SNF and RAW Management exists with regard to the objective of promoting the transition to a circular and resource-efficient economy, through the common measure of domestic

waste management: preventive measures, minimization measures, sorting, reuse and recycling. In the Program Environment 2021-2027, emphasis is placed on improving the protection and preservation of nature, biological diversity and environmentally friendly infrastructure and reducing all forms of pollution, which is related to the management of SNF and RAW and the reduction of the negative impacts on the environment.

Interreg VI-A Romania - Bulgaria Program 2021-2027

The Interreg VI-A Romania - Bulgaria Program 2021-2027 is a program of the European Union for cross-border cooperation, in which the Republic of Bulgaria and Romania participate. The program focuses on projects that jointly solve region-specific challenges, have a real cross-border impact and benefit the population, businesses and institutions in the cross-border region. The program invests in operations related to climate change, risk prevention and management, environmental conservation and protection, promoting resource efficiency, sustainable transport, promoting employment and labour mobility.

The vision of the Interreg VI-A Romania-Bulgaria Program focuses on enhancing the socio-economic dimension of the Romania-Bulgaria cross-border territory by developing and retaining human capital, creating opportunities for personal and professional development, providing an attractive, safe and sustainable living environment and supporting innovation and entrepreneurship.

The program is organized around 4 priorities and 5 specific objectives as follows:

- Priority 1: A well-connected region
  - Specific objective: Developing and strengthening climate sustainability to climate change, smart and intermodal mobility at national, regional and local level, including better access to TEN-T and cross-border mobility;
- Priority 2: A greener region
  - Specific objective: Promoting climate change adaptation, disaster risk prevention and sustainability, taking into account ecosystem approaches;
  - Specific objective: Improving the protection and conservation of nature, biodiversity and environmentally friendly infrastructure, including in urban areas, and reducing all forms of pollution;
- Priority 3: An educated region
  - Specific objective: Improving equal access to inclusive and quality services in education, training and lifelong learning through the development of accessible infrastructure, including by promoting the sustainability of remote training and e-learning;
- Priority 4: An integrated region
  - Specific objective: Promoting integrated and inclusive social, economic and ecological local development, culture, natural heritage, sustainable tourism and security in non-urban areas.

The connection between the two strategic documents - the updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste and the Interreg VI-A Romania - Bulgaria 2021-2027 program exists both at the spatial level (some of the main facilities for processing, storage and

treatment of radioactive waste and spent nuclear fuel are located on the territory of Kozloduy municipality), as well as at the strategic and planning level. The Interreg VI-A Romania - Bulgaria Program 2021-2027 envisages a "Greener Region" priority with a specific objective related to the improvement and protection of nature conservation and the reduction of all forms of pollution. On its part, the draft of the updated Strategy has envisaged some main aspects related to the minimization of waste and the implementation of measures to reduce its volume and activity in the process of design, construction, operation and decommissioning.

River Basin Management Plans (RBMPs) 2016-2021 for the four river basin management regions

River basin management plans are prepared for each of the country's river basin management regions, and more specifically:

- For the Danube region – its RBMP refers to the management of the Danube River, rivers west of Ogosta river, the rivers Ogosta, Iskar, Vit, Osam, Yantra, Rusenski Lom, Danube Dobrudzha rivers, Erma and Nishava;
- For the Black Sea region - its RBMP refers to the management of the Dobrudzha rivers, Provadiyska river, Kamchia river, rivers north of Burgas, Mandrenski rivers, South Burgas rivers;
- For the East Aegean region - its RBMP refers to the management of Maritsa River, Tundzha River, Arda River and Byala River;
- For the West Aegean region - its RBMP refers to the management of the Struma River, the Mesta River and the Dospat River.

The main objective to be achieved through the implementation of an RBMP is a good state of the waters and the related ecosystems, as well as the water protection zones. Achieving the goals for good water condition is related to the implementation of measures to remove or reduce the negative impact of human activity and improve the water condition in each RB region. Each of the four RBMPs sets out provisions for the implementation of measures that are aimed at a specific types and sources of pressure, causing significant problems in water management, taking into account the specific conditions and the status of the individual water bodies.

The programs of measures in the RBMPs include measures to limit and reduce the impact on the waters and on the ecosystems of various human activities, which are related to the driving forces for their origin: urbanization, industry, agriculture, forestry, climate change, power generation (hydroelectric and non-hydroelectric), fish farming and aquaculture, flood protection, tourism and recreation, transport. For each measure, specific actions are envisaged to achieve the relevant environmental objectives in response to the specific pressure.

The river basin management plans and the draft of the updated Strategy for SNF and RAW Management have no direct connection. However, both documents act synergistically, with the final effect of applying them together being greater than the final effect of applying each document separately. The draft of the updated Strategy for SNF and RAW envisages the management of specific waste in a way that ensures the absence of impacts or minimum influence on human health and the environment. On the other hand, the main objective in the implementation of an RBMP, namely the good condition of the waters and the related ecosystems, and the water protection zones, is a prerequisite for the absence of negative impacts on human health and on the environment.

Flood Risk Management Plans (FRMPs) 2016-2021 for the four river basin management regions

These plans are based on prepared in advance flood risk assessments and include flood risk management objectives and priorities for mitigating the potential adverse impacts of flooding on human health, the environment, on cultural heritage, technical infrastructure, and economic activity, and reducing the probability of flood occurrence. The flood risk management plans aim at flood prevention, preparedness and protection, incl. by establishing early warning systems. In order to achieve this, the flood risk management plans have set out five priorities, supported by objectives to be fulfilled through basin-specific management measures.

The priorities and objectives of the FRMPs are, as follows:

- Priority No. 1: Protection of human life and public health
  - Objective 1.1: Minimizing the number of people affected by and suffering from floods;
  - Objective 1.2: Ensuring the rapid removal of water from urbanized areas in case of intense rainfall and flooding;
  - Objective 1.3 Restoration of normal living conditions;
  - Objective 1.4 Minimizing the number of affected items of the social infrastructure;
- Priority No.2: Higher degree of protection of critical infrastructure and businesses
  - Objective 2.1: Improving the protection of items of the technical infrastructure;
  - Objective 2.2: Improving the protection of significant economic and cultural-historical sites;
- Priority No. 3: Increasing environmental protection
  - Objective 3.1: Improving the protection of the sewage systems;
  - Objective 3.2: Improving the protection of industrial sites (mainly IPPC and SEVESO sites);
  - Objective 3.3: Minimizing the affected areas for water protection, protected areas and protected zones;
  - Objective 3.4: Improving the water-retaining capacity of agricultural, forest and riverside areas;
- Priority No. 4: Improving the preparedness and response capacity of the population
  - Objective 4.1 Increase the preparedness of the population for floods;
  - Objective 4.2 Improving population responses to floods;
- Priority No. 5: Improving the administrative capacity for flood risk management
  - Objective 5.1: Setting up of a modern regulatory framework for spatial planning and flood risk management;
  - Objective 5.2: Provision of operational information for flood risk management;
  - Objective 5.3: Enhancing the skills of the personnel involved in flood risk management;
  - Objective 5.4: Minimizing flood risk along the water courses for the entire river basin;
  - Objective 5.5: Ensuring adequate response of public institutions to floods.

The Flood Risk Management Plans and the draft of the updated Strategy for RAW and SNF Management have a mutually complementary, synergistic effect, manifested through the main principles and priorities of the two documents aimed at protecting human life and public health. In

addition, both documents emphasize the need to introduce and implement strategic objectives related to the maintenance and development of sustainable human and professional resources in their individual fields of application.

National Strategy for Management and Development of the Water Sector of the Republic of Bulgaria

The National Strategy for Management and Development of the Water Sector has been prepared to meet the requirements of Article 151 of the Water Act. The Strategy also includes an Action Plan with a short (2013-2015), medium (2016-2021) and long (2022-2037) time horizon. The Strategy was developed on the basis of a series of analyses describing the existing situation in the water sector at the time of its preparation: an analysis of water consumption and future water needs, an analysis of water infrastructure, an analysis of the activities of companies providing services in the water sector, an analysis of the satisfaction of the population and business with the services provided in the water sector, an analysis of the regulatory framework governing relations in the water sector, an analysis of the capacity of institutions with responsibilities in the management of water resources, and an analysis of the capacity of the water sector. On the basis of the analyses carried out, the strategy outlines the development perspective of the water sector and sets the following objectives and sub-objectives:

- Objective 1: Guaranteed water supply for the population and businesses in the face of climate change leading to drought
  - Sub-objective 1: Ensure uninterrupted water supply through rehabilitation of existing and construction of new reservoirs and tanks, rehabilitation of water mains and water sources
  - Sub-objective 2: Reduce the total quantities of water used through investments in water management infrastructure and measures to improve the efficiency of water resource use
- Objective 2: Maintain and improve the status of surface water and groundwater
  - Sub-objective 1: Eliminate the discharge of untreated wastewater into artificial and natural water bodies and into the Black Sea through the construction, reconstruction and upgrading of wastewater disposal and treatment systems.
  - Sub-objective 2: Strengthen the institutional monitoring and control system to ensure the good status of surface and groundwater.
  - Sub-objective 3: Make River Basin Management Plans a key planning document in integrated water management.
- Objective 3: Improve the efficiency of integrated water management as economic resource
  - Sub-objective 1: Establish an institutional framework to ensure the transfer of decision-making responsibility for water sector development at national, regional and local levels from economic actors to public authorities - state, municipalities
  - Sub-objective 2: Funds from the population and business, EU funds and required national co-financing to ensure self-financing of the water sector, respecting the polluter and user pays principle.
  - Sub-objective 3: Increase the capacity of all actors involved in water sector management
- Objective 4: Reduce the risk of flood damage
  - Sub-objective 1: Identify areas at risk
  - Sub-objective 2: Implement the measures included in flood protection plans

The strategy contains an analysis of water supply in relation to water quality. It provides a detailed assessment of the availability of water resources with good or poor water quality and the causes of

water quality deterioration.

There is a link between the National Strategy for Management and Development of the Water Sector and the draft updated Strategy for the Management of RAW and SNF, which is a prerequisite for complementarity and common contribution to the implementation of the objectives and measures in both documents. As a result of the analysis carried out, the Strategy identifies the need to implement integrated water resources management to overcome the shortage of water with good quality.

By introducing the principle of integrated water resources management, the Strategy for Management and Development of the Water Sector introduces measures that concern society as a system that determines the use of the resource, the generation of waste and the pollution of the resource. The strategy emphasises the need to introduce additional measures as part of the principle of integrated water resource management to ensure that the water resource is returned to nature in a way that ensures the same quality as before its use.

Marine Strategy of the Republic of Bulgaria

The Marine Strategy of the Republic of Bulgaria has been prepared in response to the requirements of the Marine Strategy Framework Directive 2008/56/EU (Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for Community action in the field of marine environmental policy. The Directive defines a good state of the marine environment as one in which marine waters provide ecologically diverse and dynamic oceans and seas that are clean, healthy and productive, using the marine environment to an extent that is sustainable, thereby maintaining the potential for uses and activities by present and future generations. Achieving good environmental status is the responsibility of each Member State, as there are specific problems, conditions and challenges that can only be addressed at national level.

Bulgaria is responding to the requirements set out in the Directive by developing a Marine Strategy at national level, the aim of which is to achieve and maintain a good state of the marine environment. The Marine Strategy, together with its Programme of Measures, has taken into account the main activities that have a negative effect on the ecological status of the marine environment and whose impacts need to be mitigated or avoided. These are activities related to wastewater treatment (WWTP) and sewage service delivery, agriculture, industry, shipping, port operations, fisheries and aquaculture, tourism and recreational activities. The impact of these sectors on the marine environment has been reported, resulting in habitat loss, biodiversity loss, nutrient enrichment of waters, introduction of chemical pollutants, physical damage to the seabed, introduction of waste and noise.

To address the challenges of increasing pressures on the marine environment, the Marine Strategy of the Republic of Bulgaria formulates environmental objectives and indicators under 11 separate descriptors, as required by the Framework Directive, as follows:

- Descriptor 1: Biodiversity
- Descriptor 2: Non-native species
- Descriptor 3: Commercial fish and shellfish species targeted by commercial fisheries
- Descriptor 4: Food networks
- Descriptor 5: Eutrophication
- Descriptor 6: Seabed integrity
- Descriptor 7: Changes in hydrographic conditions
- Descriptor 8: Concentrations of chemical contaminants in the marine environment
- Descriptor 9: Contaminants in fish and other seafood

- Descriptor 10: Marine litter
- Descriptor 11: Introduction of underwater noise and energy into the marine environment

For each of these descriptors, the Marine Strategy sets out definitions, targets and specific indicators of good status for the marine environment.

The updated Strategy for the Management of SNF and RAW has no direct link to the Marine Strategy as the facilities and activities envisaged for the management of radioactive waste and spent nuclear fuel have no connection to marine waters and the marine environment. The objectives of the updated Nuclear Fuel Management Strategy and the objectives of the Marine Strategy are nevertheless not in conflict. This stems from the fact that both documents provide for measures regarding the reduction, prevention and control of waste and pollution. Thus, both strategies make a contribution, albeit without a direct link between them, to achieving a better environmental status.

Strategic Action Plan for Environmental Protection and Restoration of the Black Sea

The Strategic Action Plan for Environmental Protection and Restoration of the Black Sea was established in 1996 as an agreement between the following six countries: Bulgaria, Georgia, Romania, the Russian Federation, Turkey and Ukraine. The plan was updated again in 2009, reflecting the efforts of the Black Sea countries to act in synergy to support the continuing recovery of the Black Sea as one of the world's most unique ecosystems. The Strategic Plan for Environmental Protection and the Black Sea is based on a defined vision for the Black Sea that identifies the conservation of the Black Sea and its ecosystem as a precious natural gift to the region, ensuring the protection of its marine and coastal living resources as a condition for sustainable development for the Black Sea resources, well-being, health and protection of the population. The Strategic Plan addresses four identified transboundary issues to be resolved: eutrophication, changes in living marine resources, chemical pollution and changes in biodiversity (including the emergence of non-indigenous species). Addressing the identified problems requires the application of three key environmental management principles, namely:

- Integrated coastal zone management;
- Ecosystem approach;
- Integrated river basin management.

The plan also sets the following four core ecosystem quality objectives (CEQOs) and corresponding sub-objectives:

- CEQO 1: Conservation of living commercial marine resources.
  - CEQO 1a: Sustainable use of available fish and other living marine resources for commercial purposes.
  - CEQO 1b: Restore/rehabilitate the availability of living commercial marine resources.
- CEQO 2: Conserve the diversity and habitat of the Black Sea.
  - CEQO 2a: Reduce the risk of extinction of threatened species.
  - CEQO 2b: Conserve coastal and marine habitat and nature.
  - CEQO 2c: Reduce and manage human intervention
- CEQO 3: Reducing eutrophication
- CEQO 4: Ensure good water quality for human health, recreational use and aquatic biota.
  - CEQO 4a: Reduce pollutants from land-based resources, including air emissions.
  - CEQO 4b: Reduce pollutants from vessels and land facilities.

The updated Strategy for the Management of SNF and RAW has no direct link to the Strategic Action Plan for the Protection of the Environment and the Restoration of the Black Sea, as the planned facilities and activities related to the management of radioactive waste and spent nuclear fuel have no link to marine waters and the marine environment. However, the objectives of both documents are not in conflict as both strategies provide for measures regarding the reduction, prevention and control of pollution from waste. The implementation of both documents will contribute to improving the state of the environment.

National Programme for Conservation, Sustainable Use and Restoration of Soil Functions (2020-2030)

The main objective of the National Programme for the Conservation, Sustainable Use and Restoration of Soil Functions until 2030 is the conservation of soil resources and their sustainable use, as well as the implementation of good practices to prevent soil damage. It is a programme document with defined objectives, priorities and measures for practical implementation of the state policy for soil resources conservation at national, regional and local level. The Soil Conservation Programme 2030 is the tool that specifies the ways and means of implementing the soil conservation policy in Bulgaria, which is based on the following principles:

- An ecosystem and integrated approach;
- Sustainable use of soils;
- Preventive controls to prevent or limit damage to soils and their functions;
- Implementation of good soil use practices;
- Polluter pays for damage caused;
- Public awareness of the environmental and economic benefits of protecting soils from damage and measures to protect them.

The programme has 4 priorities, each of which contains a number of directions and measures:

- Priority 1 of the Programme foresees the improvement of administrative capacity, legal tools for the implementation of environmental legislation and information provision for sustainable soil management. The priority includes activities under two axes: "Improving administrative capacity and effective legal tools" and "Information provision". These axes cover measures such as improving the legal framework for soil protection, sustainable use and restoration, developing guidelines for the preparation of district and municipal programmes for soil protection, sustainable use and restoration, strengthening monitoring of compliance with the stubble burning ban, aligning soil data with the requirements of the INSPIRE Directive, updating information on soil conditions in the vicinity of major industrial risk areas, and improving the capacity of the infrastructure for soil protection, sustainable use and restoration;
- Priority 2 of the Programme concerns the prevention of degradation, restoration and preservation of soil functions. For the purpose of this priority, the following areas are foreseen which focus the implementation of specific measures and actions: 'Prevention and reduction of erosion processes', 'Prevention of landslide processes', 'Restoration and reclamation of disturbed sites', 'Minimisation of soil compaction processes', 'Prevention of soil acidification', 'Local soil contamination', 'Preservation and increase of soil organic matter'. Each of these areas includes measures such as the establishment and maintenance of anti-erosion engineering and technical infrastructure, the implementation of preventive geoprotective measures in landslide areas, the closure and reclamation of unregulated landfills and landfill sites, implementation of a range of agro-technical measures to prevent soil compaction, reduction of the area of acid soils, detailed surveys of areas with contaminated soils, implementation of good agricultural practices (introduction of crop rotation and protein crops)

to preserve and increase soil organic matter;

- Priority 3 of the programme concerns the sustainable management of soils as a natural resource and environmentally sound land use. The priority includes the following main axes: 'Utilisation of agricultural land in areas facing natural or other specific constraints', 'Agricultural development towards improved soil fertility and sustainable soil management', 'Efficient and effective irrigation of agricultural land' and 'Restoration of forest areas'. The priority and its corresponding axes cover the implementation of measures aimed at utilising wasteland and stimulating the development of agriculture with a view to preserving and improving soil fertility, sustainable land management, such as: afforestation of low-category land unsuitable for agricultural use, introduction of new technologies and techniques in agriculture related to improving soil functions and preserving soil fertility, restoration, maintenance and modernisation of irrigation systems, development of systems for early prediction of the need for irrigation and determination of the optimal parameters of the irrigation regime, application of inefficient water-saving and energy-saving irrigation techniques and technologies;
- Priority 4 relates to engaging the public in soil management, sustainable use and conservation processes. The priority covers two main axes, as follows: "Improving the knowledge and awareness of those involved in soil conservation, sustainable use and restoration" and "Improving the awareness and knowledge of farmers regarding the application of good soil management practices and technologies to conserve soil as a natural resource". The priority and the areas mentioned include measures related to raising awareness and engaging the public in soil conservation management activities, such as: conducting information campaigns related to the promotion of soil conservation, sustainable use and restoration of soil functions, informing and promoting among farmers good practices related to soil erosion factors and prevention methods, including the presentation of anti-erosion practices, related to soil erosion factors and prevention methods, including the presentation of anti-erosion practices adapted to the soil conditions and crops grown, and appropriate farming techniques for tillage, information and promotion of the practice of extensive farming.

The draft updated Strategy for the Management of RAW and SNF and the National Programme for the Protection, Sustainable Use and Restoration of Soil Functions are complementary documents, the implementation of which will have a synergistic effect on improving the state of the environment. Both documents foresee an integrated approach to pollution management, including the application of the polluter pays principle. Both the strategy and the national programme foresee broad participation of all stakeholders, publicity, openness and transparency policies and measures related to strengthening administrative capacity and sustainable provision of expert resources.

Draft of the Strategy for Biodiversity in the Republic of Bulgaria (in the process of adoption) and Draft of the National Plan for Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 (in the process of preparation and adoption)

The Strategy reflects Bulgaria's commitment to biodiversity conservation and restoration in Europe, in the context of the EU Biodiversity Strategy for 2030, providing the framework for the implementation of the European Strategy in the local context of our country.

Bulgaria's Biodiversity Strategy sets out the medium-term objectives and priorities for biodiversity conservation in the country. The vision of the Bulgarian Biodiversity Strategy is that biodiversity, representing national and global natural heritage, is protected, restored, valued, sustainably and equitably used, through long-term and strategic policies and approaches, integration into other national sectoral policies, participation and involvement of government, scientific, educational institutions, NGOs and initiatives, business and civil society by 2050.

To achieve this vision, the strategy identifies actions in three priority areas as follows:

- Priority 1 - Conservation, sustainable use of biodiversity and fair and equitable sharing of benefits arising from the use of genetic resources.
- Priority 2 - Protecting and restoring ecosystems and conserving the services and benefits they provide.
- Priority 3 - Maintain and effectively manage the National Ecological Network (NEN).

Following these priorities, the strategy defines 13 objectives to achieve the defined vision. These objectives are:

- Achieve full implementation of the Birds and Habitats Directives.
- Ensure the protection, conservation and development of the network of protected areas and biosphere parks.
- Protect and improve the state of biodiversity throughout the country.
- Biodiversity conservation in the Black Sea and coastal marine ecosystems.
- Protecting waters, restoring wetlands, maintaining the structure and function of aquatic ecosystems and conserving their biodiversity.
- Conserve and restore ecosystems and the ecosystem services and benefits they provide.
- Sustainably improve information provision in the biodiversity sector.
- Introduce procedures for access to genetic resources and control of their use in the country.
- Increase the contribution of agriculture to the conservation and enhancement of biodiversity, reduce the use of pesticides and increase the proportion of agricultural land managed according to the principles of organic farming; achieve sustainable use of fishery resources.
- Minimise the introduction and naturalisation of alien species into the wild and control widespread invasive alien species.
- Conserve and enhance the function of forests in biodiversity conservation and reduce climate change trends by increasing their area, quality and sustainability.
- Protect, restore and expand green infrastructure in urban and peri-urban areas.
- Improve the education system and conduct regular public awareness campaigns and work at local level.

Besides the Strategy, a draft National Plan for Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 is under development and adoption. Information on this plan is not publicly available at the time of writing. In the event that information on the National Plan for Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 is published in the course of the environmental assessment procedure of the draft updated Strategy for the Management of SNF and RAW, the present analysis of the relationship of the draft updated Strategy with other plans and programmes will be supplemented in due course.

There is no direct link between the Biodiversity Strategy and the updated Strategy for the Management of SNF and RAW. However, both documents work synergistically as both documents have been developed in the context of priorities, objectives, measures and activities aimed at protecting the environment and avoiding negative impacts on specific components of the environment.

4. Current state of the environment (baseline)

In order to identify the interaction between the draft updated Strategy and the environment, the EA will include a review of the existing status of environmental components and factors in order to identify relevant environmental aspects and sensitive receptors that may be affected in the management of SNF and RAW.

The EAR provides a brief analysis of the existing state of the environment for the entire country, then focuses the analysis on the areas of the territorial scope of the draft updated Strategy, as follows:

- the area around Kozloduy NPP - 30 km monitored area covering the municipalities of Kozloduy, Valchedrum, Hairedin, Mizia (28 settlements) and part of the settlements in the municipalities of Lom, Byala Slatina, Oryahovo, Boychinovtsi, Krivodol and Borovan.
- the area around the SD „PRRAW- Novi Han" - 5 km monitored area around it, covering the villages of Novi Han, Gabra and Krushovitsa in the municipality of Elin Pelin, Sofia region.

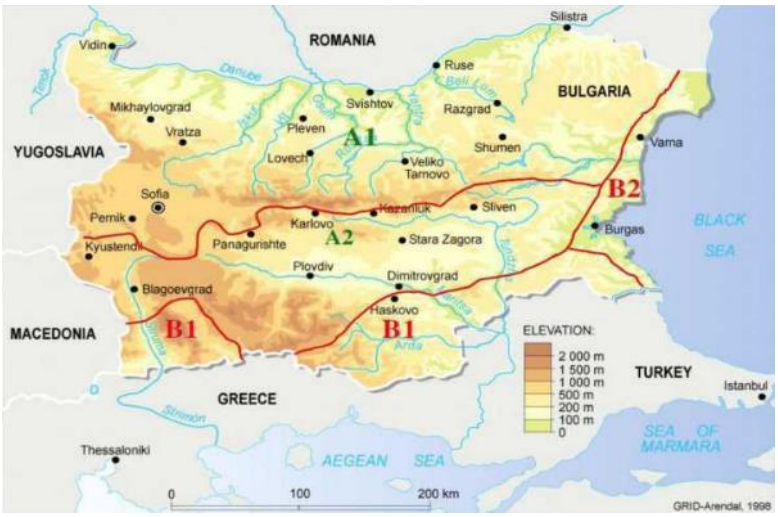
For the analysis of the state of the environment were requested and used data from the EEA, RIEW Sofia, RIEW Vratsa, RIEW Montana, Regional Health Inspectorate (RHI) - Sofia region, RHI Vratsa and RHI Montana, National Centre for Radiobiology and Radiation Protection (NCRRP) and National Centre for Public Health and Analyses (NCPHA) at the Ministry of Health, as well as data from the own radiation monitoring of the environment in the area of the SD „PRRAW-Novi Han".

4.1. Climatic factors

4.1.1. Climatic regions for the territory of Bulgaria

The territory of Bulgaria belongs to two climatic regions: the European-continental and the continental-Mediterranean climatic regions (source: *L. Sabev, Sv. Stanev, 1959; J. Galabov, 1982*). The climatic zonation in Bulgaria (including climatic regions and subregions and areas) is presented in Figure 1.

In spite of the established trends of increasing temperatures and changes in rainfall intensity, the general climatic zonation of the country has not changed, as the main climate-forming factors (latitude, nature of the topography, position in relation to major water bodies and general atmospheric circulation) have not changed, and the two climatic regions have therefore maintained their location and territorial extent.



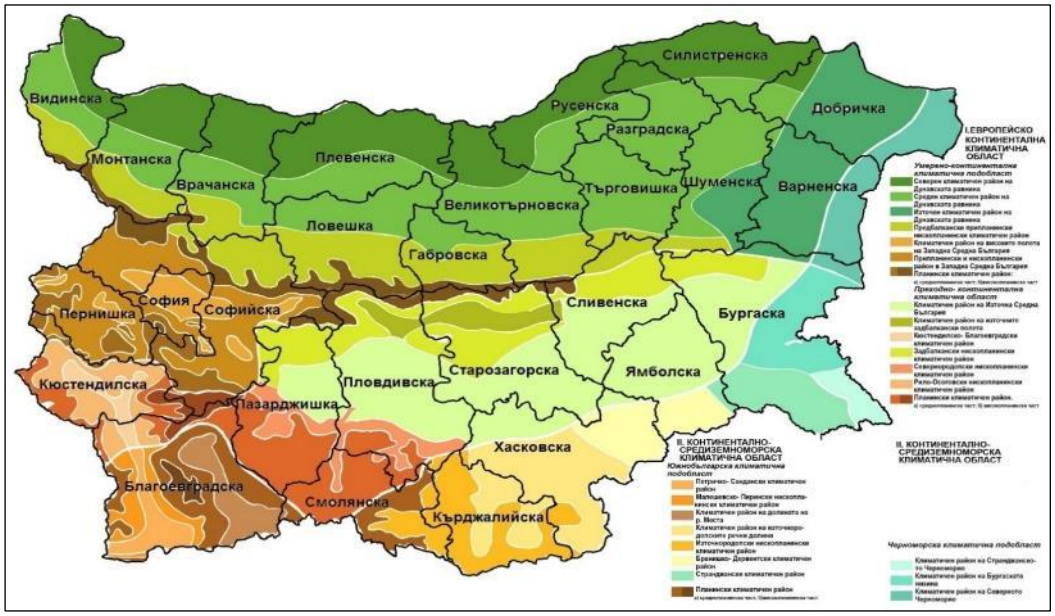
A) Climatic regions and subregions

A - European-continental climate region

A1 - Temperate-continental climate subregion *A2 - Transitional-continental climate subregion*

C - Continental-Mediterranean climate region

B1 - Southern Bulgarian climatic subregion *B2 - Black Sea climatic subregion*



C) Climatic areas

Figure 1 - Climate areas in Bulgaria

4.1.2. Climate norms for the last reference climate period - 1991-2020

The World Meteorological Organization (WMO) has defined the climate norm as the average value of a climatic element over a fixed base period of 30 years. The base periods accepted so far are 1901-1930, 1931-1960, 1961-1990, with the latest climate period being 1991-2020.

The distribution of the mean annual air temperature norm for the territory of Bulgaria for the period (1991-2020)2 is presented in Figure 2. The temperature norm for the area of the Kozloduy NPP and

[2] http://www.meteo.bg/meteo7/bg/normi19912020

NRRAW sites is 12÷13° C, and for the site of the SD „PRRAW - Novi Han” - 10÷11° C.

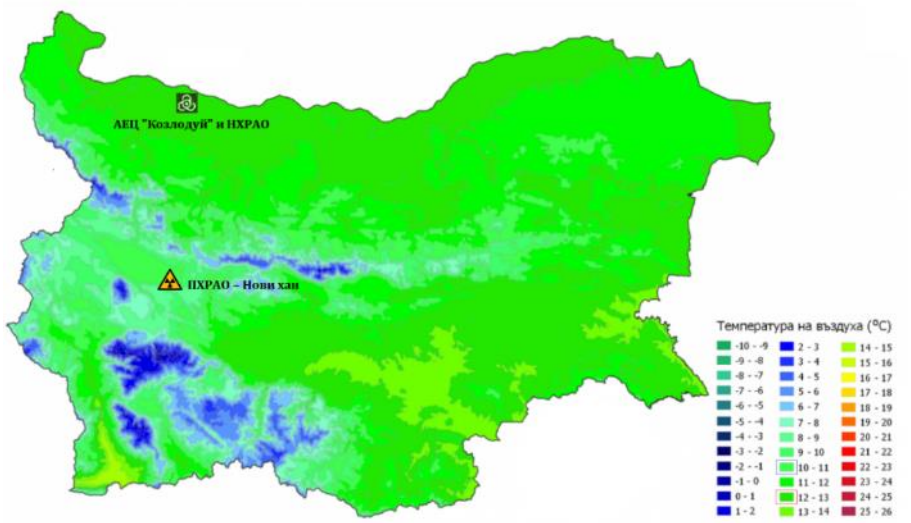


Figure 2 - Spatial distribution of climatic norms of the mean annual air temperature for the period 1991-2020

Figure 3 shows the average annual climatic norm for precipitation, which for the area of the Kozloduy NPP and NRRAW sites is 500÷550 mm, and for the site of the SD „PRRAW-Novi Han” - 600÷650 mm.

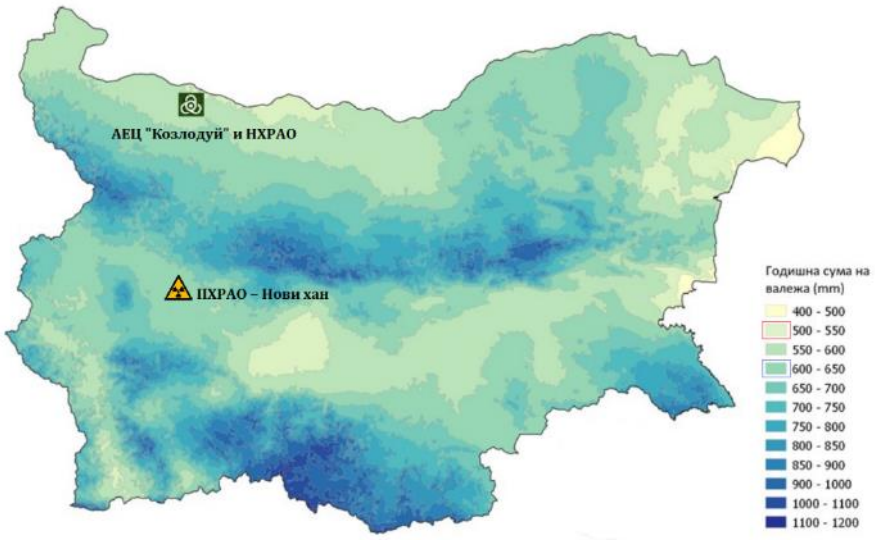


Figure 3 - Spatial distribution of climatic norms of annual rainfall sum for the period 1991-2020

4.1.3. Climatic factors for existing sites in the Updated Strategy

Site of Kozloduy NPP

The considered area around the Kozloduy NPP and the "Radiana” NRRAW site (Figure 4) is located in the western parts of two climatic regions according to the climatic zonation of Bulgaria - the Northern and Middle climatic regions of the Danube Highlands of the Temperate-Continental climatic subregion.

Figure 4 - Kozloduy NPP site and "Radiana" NRRAW site (outlined in orange)

The climate in this region is characterized as distinctly continental due to the sharp contrast between winter and summer heat conditions. The influence of the Balkan Mountains is felt in the west region of Ogosta River.

The proximity to the Danube River, which is considered as a large aeration channel, is of essential importance for the local climate. It leads to the appearance of significant heterogeneities in the fields of meteorological elements, and especially those such as minimum temperatures and surface wind, which are markedly sensitive to the shape and location of the terrain. Establishing these needs is of great importance for many meteorological tasks and in particular for the distribution of pollutants in atmospheric air.

To characterize the climate in the area, data from the Meteoblue website[3] was used, which for the period since 1985 uses the global climate model NEMS to obtain the meteorological parameters at any point on the globe at any time, regardless of whether there is a weather station available for the point. The meteorological data simulations are performed at an average spatial resolution of 30 km, and the obtained meteorological data provide good information about typical weather events and expected meteorological parameters (temperature, precipitation, solar periods and wind).

The following meteorological factors have a significant influence on the processes of the spread of pollutants, and hence on their level in the atmospheric air:

Solar radiation

The annual course of the monthly sums of sunshine duration is determined both by astronomical factors and by the features of atmospheric circulation manifested by the cloud regime, and to some extent also by the orographical conditions of the locations under consideration.

The region is characterized by the low annual sum of solar radiation duration - it is one of the lowest in the country - around 2005 h, and in some years even lower. In December-January, some of the

[3] https://www.meteoblue.com

lowest values of the duration of solar radiation, 50 - 76 hours, were registered here, which represents about 3% of the annual amount. The incoming solar energy on the earth's surface is a major factor determining the resistance class of the surface air layer, which in turn has a significant impact on the conditions of dispersion and distribution of impurities in the atmosphere.

The radiation characteristic for the area does not stimulate secondary photo-chemical reactions between the pollutants and the occurrence of ground-level ozone in ambient air.

Temperature

At Figure 5 are analysed in gradation the days on which the average monthly maximum temperatures have reached average values.

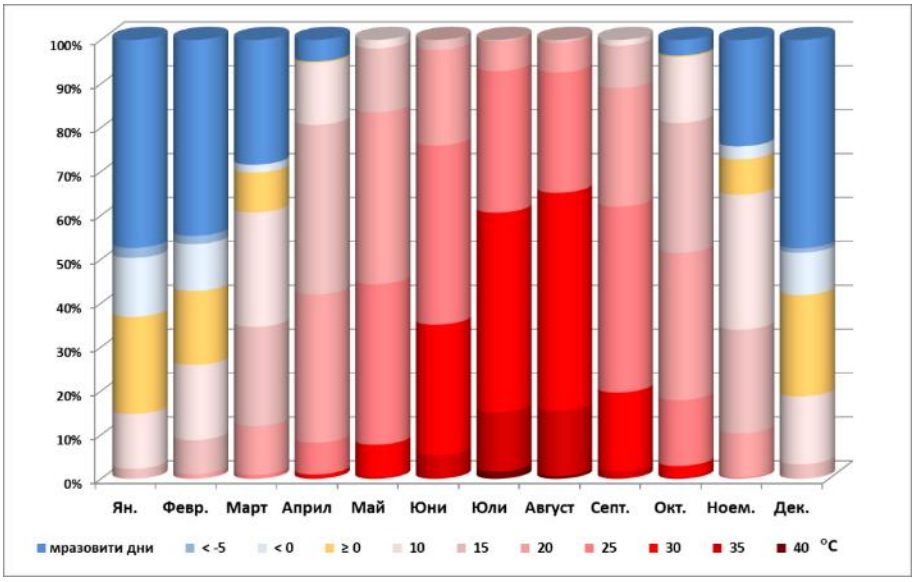


Figure 5 - Gradation of maximum temperatures by day of the month for the Kozloduy NPP area based on data from Meteoblue

A total of 76 days of the year are frosty - days on which, at any observation during the day, the air temperature is below 0° C, on 12 days the daily mean maximum air temperature is above 30° C, and on 59 days it is above 25° C. During the months of July and August, the temperature also reaches 40° C for a few hours during the day in the afternoon.

The integral monthly index calculated by the product of the days with maximum temperature in the range of 5ºC to 35ºC for the spring months (March, April, May) and that for the autumn months (September, October November) are the same – it is 16.2° C and 17.0° C, respectively, indicating that spring and autumn are equally warm seasons. The summer index is 27.8° C, the winter 4.4° C.

The average annual air temperature is 12.4° C, which is **within the climatic norm** for the region (12÷13° C) according to the modern climate period 1991-2020.

Precipitation

Monthly rainfall is shown at Figure 6, with an annual total of 352 mm well below the climatic norm for the region of 500-550 mm.

More than half of the days during the months are dry - the number of rain-free days is very high - 76% during the year - 276 days. The highest number of days with rainfall below 2 mm are 45 days during the year, and the number of days with rainfall above 2 mm are 44.

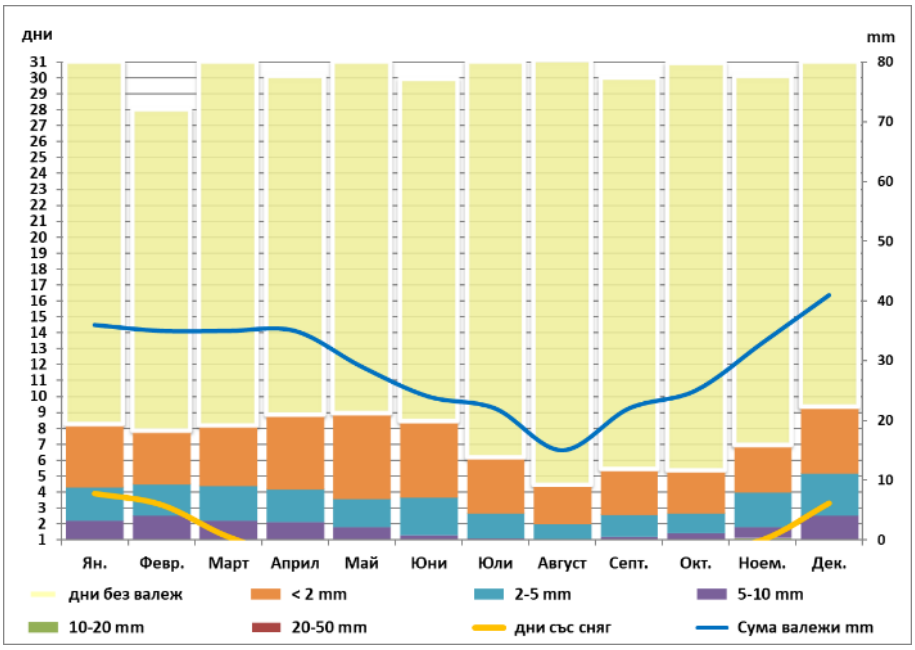


Figure 6 - Number of precipitation days in gradation and the amount of precipitation for the region of Kozloduy NPP, according to data from the Meteoblue website

Cloudiness

The mode and character of cloud cover in a location is related to both the mode of precipitation and fog and the amount of solar radiation reaching the ground.

Figure 7 shows the annual trend of cloudy and sunny days by month. The clear days (including days with slight cloud cover, which are 140) are 282, and the dark days are 83.

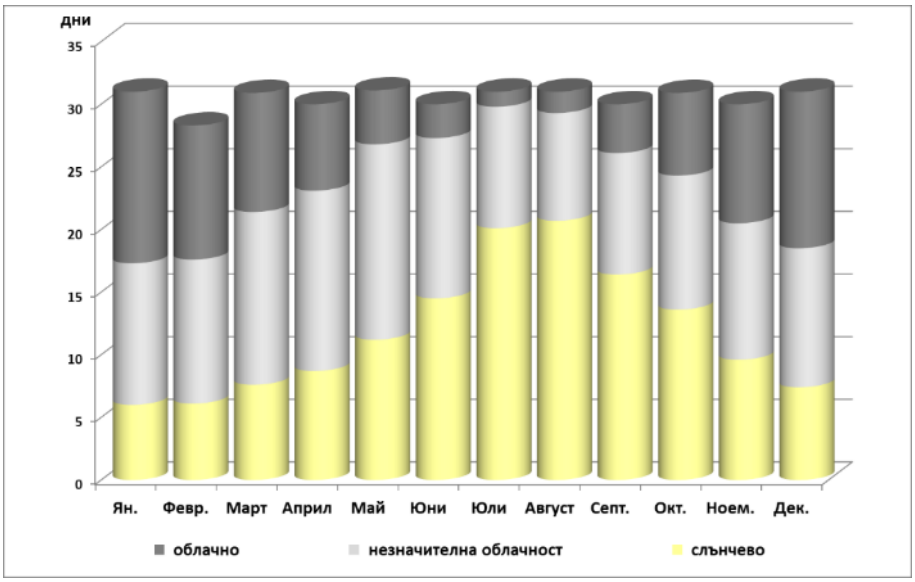


Figure 7 - Days with clouds during the year for Kozloduy NPP area according to data from the Meteoblue website

Atmospheric (general and local) circulation and winds

The important climate-forming role of atmospheric circulation is reflected in the transport of air masses of different geographical origin and different thermodynamic properties.

Figure 8 shows the representative for the air transport dynamics for the area of Kozloduy NPP wind frequency rose by velocity gradation.

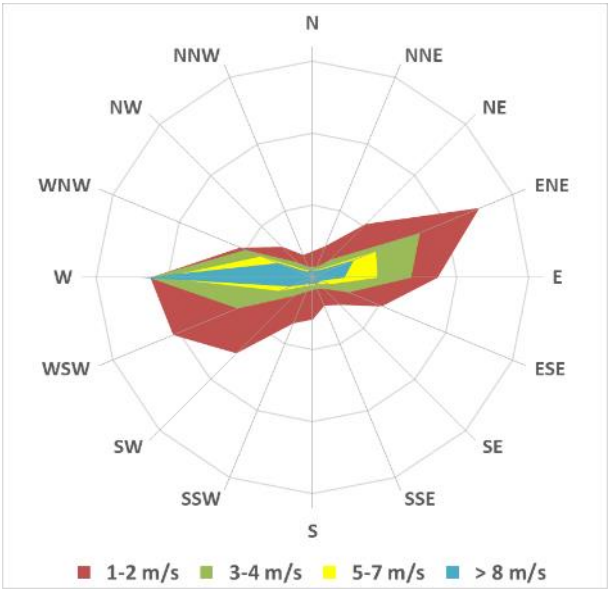


Figure 8 - Frequency rose (in %) by wind speed in gradation for the Kozloduy NPP area according to data from the Meteoblue website

The corresponding "calm weather" parameter - the cases of wind speeds below 1 m/s, which determines the local potential of the atmosphere to trap pollutants in the near-surface atmospheric layer of the emission area (inversely related to the strength of the wind scattering field) and is expressed in percentages from 1 to 100. A high pollution potential is assumed to be in the range 75÷100%, a low potential 0÷25%. A potential of 25÷50% is medium and a potential of 50÷75% is

medium-high. For the Kozloduy NPP area, quiet weather is 25.2% of the time during the year - the wind field potential is on the low to medium range.

Figure 9 shows the expected days during the month when the wind has a certain speed.

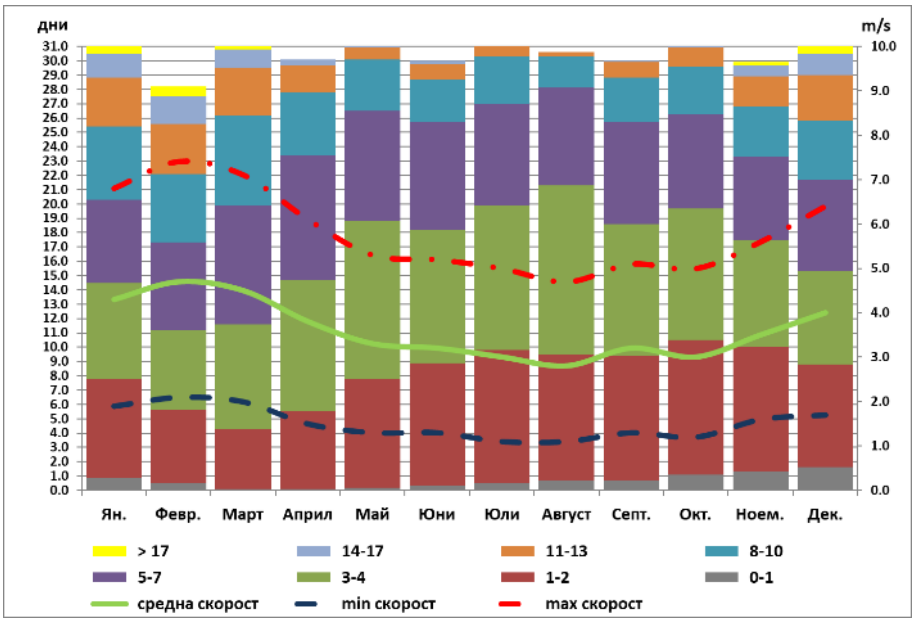


Figure 9 - Wind speed gradation by day of the month for the Kozloduy NPP area according to data from the Meteoblue website

During 98 days of the year (27%) the winds are light - with speeds up to 2 m/s. In 28% (101 days) the wind speed is between 2 and 4 m/s, and in 44% (163 days) the winds are above 5 m/s.

Therefore, the climatic and meteorological characteristics of the area are favourable in terms of dispersing harmful non-radioactive emissions released into the atmosphere and reducing the local impact on environmental components.

Site of SD "PRRAW - Novi Han"

The climatic characteristic for the site of SD "PRRAW - Novi Han" is presented by data from the automatic meteorological station, which is located on the site of the repository (Figure 10) for a 5-year period - 2017-2021.

Figure 10 - The site of SD "PRRAW- Novi Han"

Ambient air temperature

Presenting the data from the Radioecological Monitoring of the SD "PRRAW-Novi Han", 2017-2021, Figure 11 shows the average monthly minimum temperatures for individual years, as well as the average monthly minimum temperature averaged over the period of these 5 years. It can be seen that the year with the lowest winter temperatures is 2017 and the year with the highest winter temperatures is 2020.

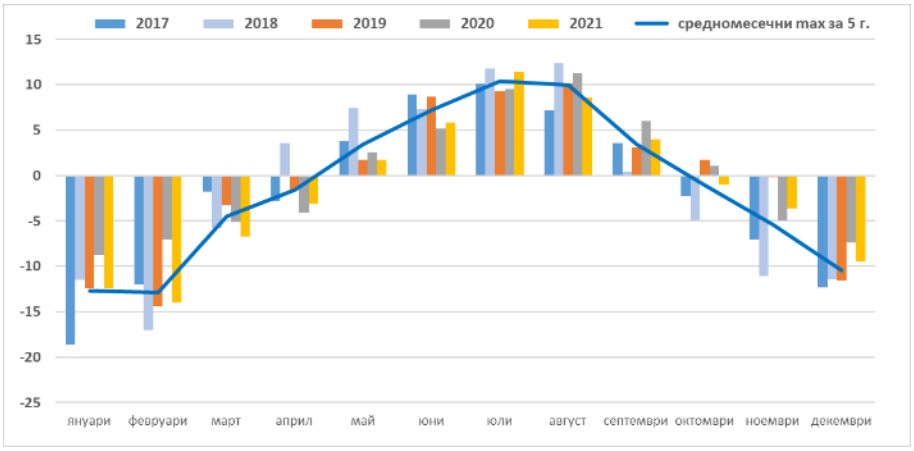


Figure 11 - Average monthly minimum temperatures for individual years in the period 2017-2021, and the average monthly minimum temperature averaged over 5 years

Figure 12 shows the average monthly maximum temperatures for individual years between 2017 and 2021, and the average monthly maximum temperature and average annual temperature for 5 years. It can be seen that the highest summer temperatures are recorded in 2021.

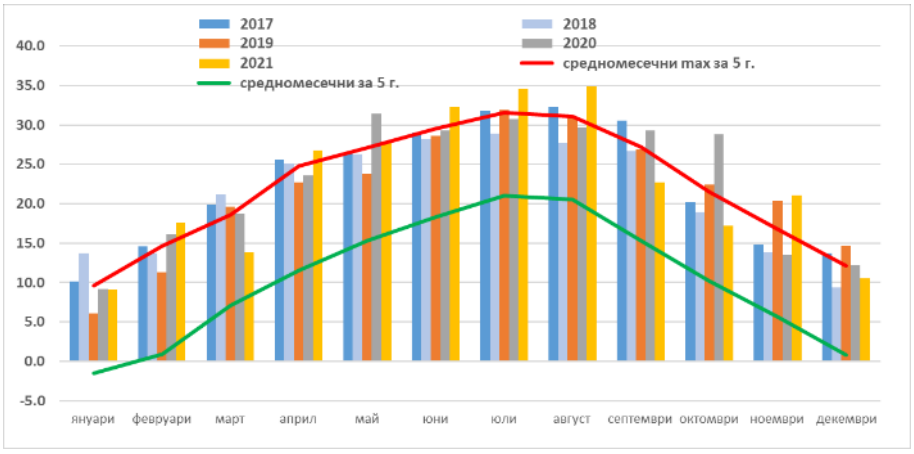


Figure 12 - Average monthly maximum temperatures for individual years in the period 2017-2021, as well as averaged monthly maximum temperature and 5-year average annual temperature

The average annual temperature for the 5-year period is 10.4° C, and in 2020 the average annual temperature is 0.9° C higher, namely 11.3° C, which is **within the climate norm** (10÷11° C) for the modern climate period 1991-2020.

Precipitation

Seasonal rainfall totals are shown in Table 1 (*Full data is only available for 2017 and 2019*).

Table 1 - Seasonal precipitation in the period 2017-2021

Year	Winter	Spring	Summer	Autumn	Annual amount
	mm				
2017	113.2	164.6	130.0	185.0	592.8
2018	95.6[(1)]	113.4	142.0[(1)]	-	351.0
2019	83.2	155.8	140.6	92.0	471.6
2020	53.8[(2)]	203.0	144.8[(2)]	-	401.6
2021	-	-	-	-	-

(1) *There are no measurements from August to December in 2018.*

(2) *There are no measurements from September to December in 2020.*

As it can be seen from the data in the table above, the annual rainfall amounts (for the years with complete data - 2017 and 2019) are below the rainfall norm (600-650 mm) defined by the 1991-2020 climate period for the PRRAW area.

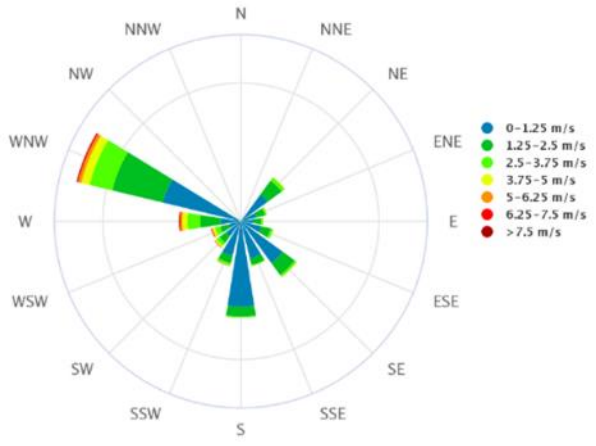
In 2017, seasonal precipitation in autumn (185.0 mm) is higher than spring (164.6 mm), in contrast to those in 2019, where the spring precipitations (155.8 mm) are higher than autumn precipitations (92 mm).

The highest spring precipitation (203 mm) was observed in 2020.

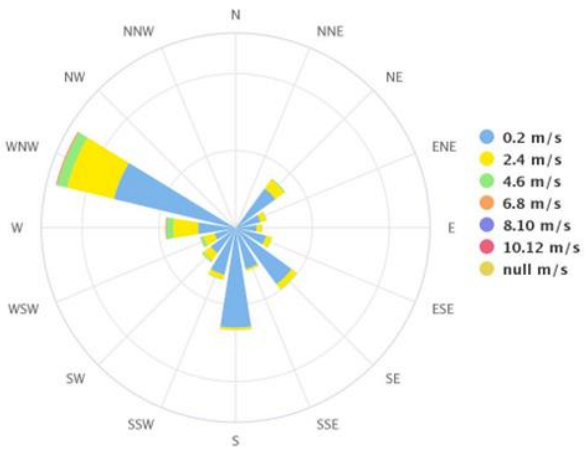
Wind roses

Figure 13 shows the wind roses along the 16 azimuth directions for the PRRAW site in 2018, 2019, 2020, and 2021, which define the prevailing wind direction. It can be seen that the prevailing winds are from the west-northwest (WNW), which is where the highest wind speeds were measured, above 6 m/s for all years. But a "shadow" for the northerly component in the wind rose is also seen for all years.

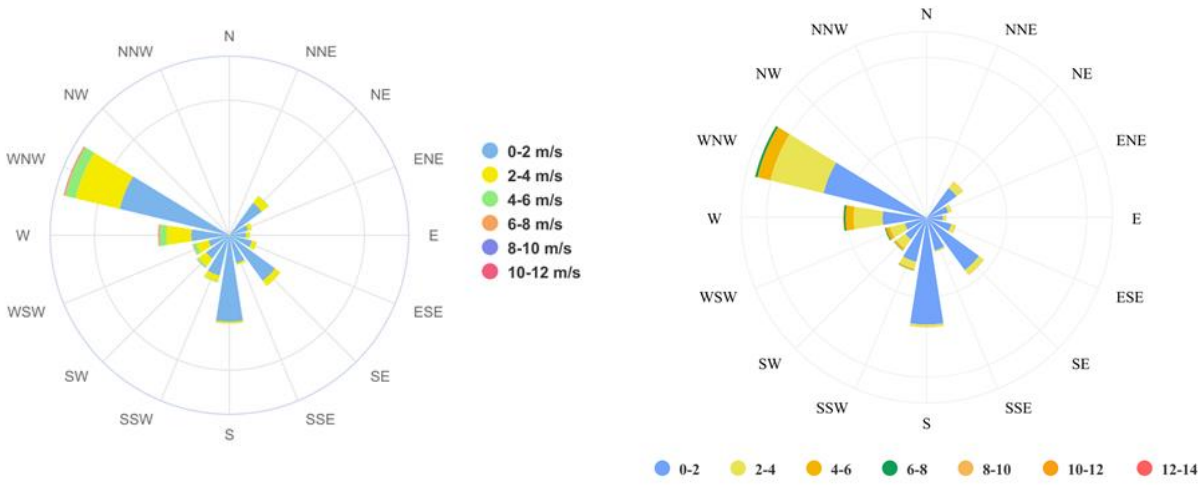
The wind rose is a strictly local characteristic (depends on the location where the anemometer is placed), so the location of the automatic station cannot account for northerly winds.



2018



2019



2020 **2021**

Figure 13 - Wind roses for the period 2018-2021

4.1.4. Climate change - scenarios

Bulgaria is located in one of the regions that is particularly vulnerable to climate change (mainly through temperature increase and intense precipitation) and to the increasing frequency of extreme climate change events such as droughts and floods. The risks caused by climate change-related events can lead to loss of life or cause significant damage, affecting economic growth and prosperity at both national and cross-border levels.

There is consensus in the scientific community that climate change is likely to increase the frequency and magnitude of extreme weather events. This frequency has increased significantly in Bulgaria in recent decades. The most common hydrometeorological and natural disasters are extreme precipitation and temperatures, storms, floods, forest fires, landslides and droughts. The number of deaths and casualties due to natural disasters is significant, indicating vulnerability to weather and climate. The vulnerability of Bulgaria's population and economy to the impacts of climate change is amplified by the relatively high levels of poverty in the most affected areas, the continued concentration of the country's population in a few industrial and urban areas, and the various consequences of the transition from a state-controlled economy to a free market economy. There is growing evidence that economic losses from weather and climate-related disasters are also increasing.

Scientific projections indicate that the average temperature is likely to rise with between 1.8°C and 4°C by 2100, with the rise in Europe expected to be even higher than the projected global average.

Climate change scenarios and models are based on the work of the IPCC. A new generation of scenarios (Moss, et al., 2008,12 201013) known as Representative Concentration Pathways (RCPs) has been proposed with the latest Assessment Report Five (AR5, 2013/2014). These new scenarios are preferred over the SRES scenarios from the previous AR4 report. There are four main scenarios, depending on how future developments are assessed and the measures taken to limit greenhouse gases and their impact.

- The RCP 8.5 scenario can be called a "business-as-usual scenario" with increasing GHG emissions over time and correspondingly increasing GHG concentrations. Radiation pressure increases to 8.5 W/m^2 by 2100, which corresponds to concentrations of 1370 ppm CO_2 eq.

- The RCP 6.0 scenario is a stabilising scenario in which emissions will increase rapidly until 2060, after which they will decrease. The radiation pressure by the 2100 is estimated at 6 W/m^2 which corresponds to concentrations of approximately 850 ppm CO_2 eq.
- The RCP 4.5 scenario foresees a faster implementation of adequate mitigation measures. Emissions are expected to peak around 2040, after which they will decrease sharply by 2080. The radiation pressure by 2100 is estimated to be 4.5 W/m^2, which corresponds to concentrations of approximately 650 ppm CO_2 eq.
- The RCP 2.6 scenario describes the most optimistic scenario, which assumes that all measures to limit emissions are implemented and that global warming is limited to 2°C. Emissions are expected to decrease sharply after 2020.

The expected changes in terms of average temperatures and precipitation for the territory of the country, obtained as a result of climate modelling, show that:

- Temperatures are forecasted to rise. The expected increase in temperatures is greatest for the summer months towards the end of the century. For the same period, the assumption for the winter months is also towards an increase in the average temperatures;
- Signals of expected changes in precipitation totals are generally multidirectional, both spatially and temporally. The model results for both scenarios contain signals of decreasing precipitation amounts in summer and increasing them in autumn.

It should be emphasized that the obtained results are the product of numerical simulation and are based on a certain physico-mathematical model of the atmosphere and may therefore differ from other models that use different approaches. In particular, they depend on a specific emission scenario of greenhouse gases and aerosols, which is predictive in nature.

As stated above, according to the existing climate change scenarios for Bulgaria, there is a trend towards increasing frequency of extreme events and disasters, as evidenced by frequent intense precipitation, heat and cold waves, floods and droughts, hurricanes, wildfires and landslides.

Biodiversity, terrestrial and aquatic ecosystems, as well as the water resources, agriculture and forestry sectors are expected to be affected by the anticipated changes. These changes will further affect society and its citizens, as well as the economy as a whole. Climate change does not affect all people and territories equally due to different levels of exposure, their respective vulnerability and adaptive coping capacities. The risk is greater for segments of society and business that are less prepared and more vulnerable.

4.1.5. Greenhouse gas emissions

Pursuant to **Regulation (EU) 2018/842** of the European Parliament and of the Council of 30 May 2018 *on the mandatory annual reductions in greenhouse gas emissions for Member States in the period 2021-2030,* as well as **Regulation (EU) 2018/841** of the European Parliament and of the Council of 30 May 2018 *on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework* for the implementation of the **Kyoto Protocol** (1997) and to fulfil the obligations assumed under the **Paris Agreement** (2015), the EU Member States are required to participate in the EU-wide inventory of greenhouse gas emissions.

The annual national greenhouse gas (GHG) emission inventory reports for the Republic of Bulgaria are submitted to the EU, the **United Nations Framework Convention on Climate Change** (UNFCCC) and the **Kyoto Protocol**, and include data on anthropogenic emissions from sources and

sinks of all GHGs: Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), nitrotrifluoride (NF_3) and sulphur hexafluoride (SF_6). The last 4 are grouped together in the so-called F-gases.

The estimation of GHG emissions by economic sector is done according to the NFR[4] nomenclature, which ensures consistency between activities and processes by the 6 main sectors used for reporting air pollutant emissions under the **Convention on Long-Range Transboundary Air Pollution** (CLRTAP) and used in the **UNFCCC GHG** emissions inventory.

The profile of the Republic of Bulgaria for GHGs made in the UNFCCC for the period 1988-2020[5] (last reporting year is 2020) is shown in the analyses below.

GHG uptake from the Land Use, Land-Use Change, and Forestry (LULUCF) sector for 2020 increased by 24.3%. This compares with 2019 uptake of 20.2%. The latter is solely explained by the reduced capacity of economic activities in Bulgaria during the pandemic year 2020.

The analysis shows that for **non-CO_2 gases**, the LULUCF sector does not absorb but emits GHGs, albeit in very small amounts, with its share of the increase ranging from 1.6% in the 1988 baseline to 2.3% in 2020 with a maximum of 3.6% in 2000.

The effect of the COVID-19 pandemic is also noticeable - while the trend of non-CO_2 emissions after 2000 (with slight fluctuations) increases by about 3-5% on an annual basis until 2019, emissions in 2020 drop by as much as 29% compared to 2019.

Figure 14 shows the percentage of shares in the sectors that account for 100% of GHG emissions in Republic of Bulgaria, both for the base year 1988 and for 2020, without taking into account the uptake by the LULUCF sector.

The analysis of the data shows that the percentages of the shares **remain the same**, with the largest share of national GHG emissions being held by the "Energy" sector, around 72% always.

***1988** (without absorption by the LULUCF)*

***2020** (without absorption by the LULUCF)*

Figure 14 - Proportion (%) of GHG emissions change by main sectors for the Republic of Bulgaria

Figure 15 shows the percentage change in the amount of GHG emissions for 2019 and 2020 compared to the base year 1988 by the main sector, as the "Energy" sector also shows the 7 sub-sectors that carry the main shares in the total change in emissions.

[4] NFR (Nomenclature for Reporting) - a nomenclature for reporting on the processes and activities generating emissions by sector of economic life.

[5] https://di.unfccc.int/ghg_profiles/annexOne/BGR/BGR_ghg_profile.pdf - UNFCCC – last submission 2021

A decrease in GHG emissions was observed in all sectors, with the exception of the "Transport" sub-sector, which increased its share by 40.9% respectively for 2019. and with 32.64% for 2020. The decrease is again an effect of the pandemic year 2020.

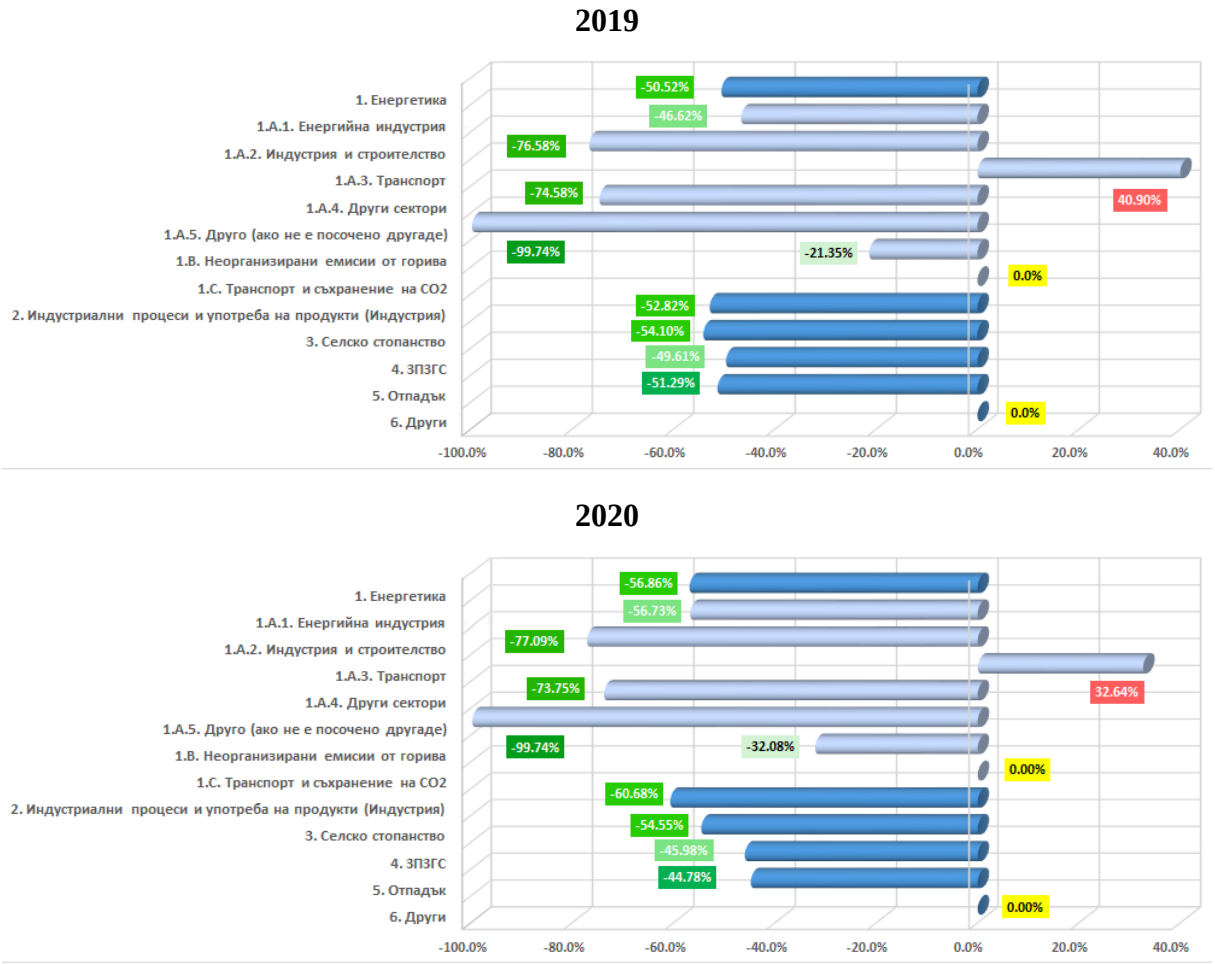


Figure 15 - Proportion (%) in the change in GHG emissions by sector for 2019 and 2020 compared to the base year (1988)

(LULUCF - Land Use, Land-Use Change, and Forestry)

The main reasons for the observed decrease in GHG emissions in the Republic of Bulgaria in the sub-sectors of the "Energy" sector are the structural changes of the economy, due to the radical economic transition process from a centrally planned to a market economy, leading to a reduction in the energy used generated by thermal power plants and an increase in the share of hydro and nuclear energy, structural changes in industry (including a reduction of energy-intensive production and improvement in energy efficiency), better insulation of buildings and a shift from solid and liquid fuels to natural gas.

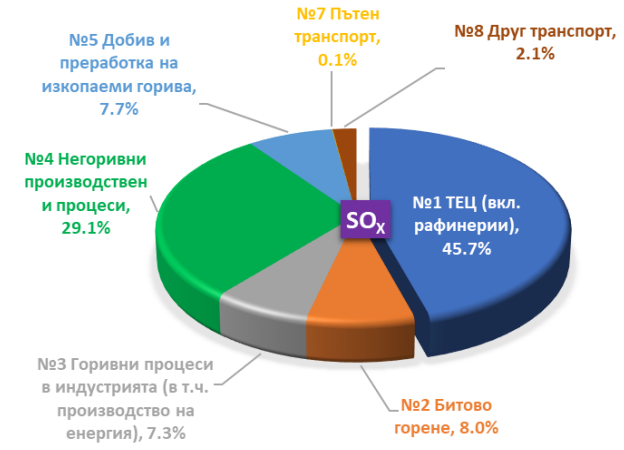
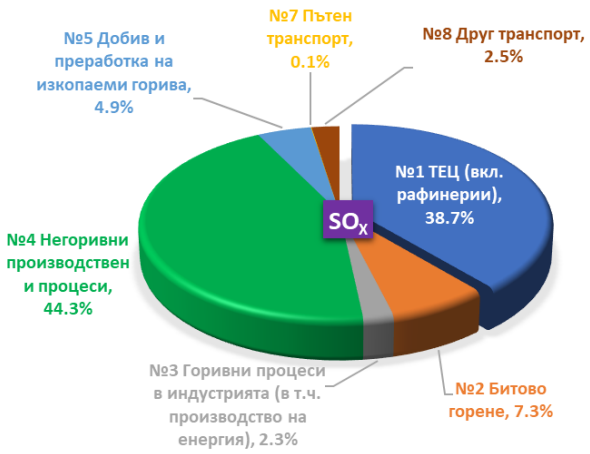
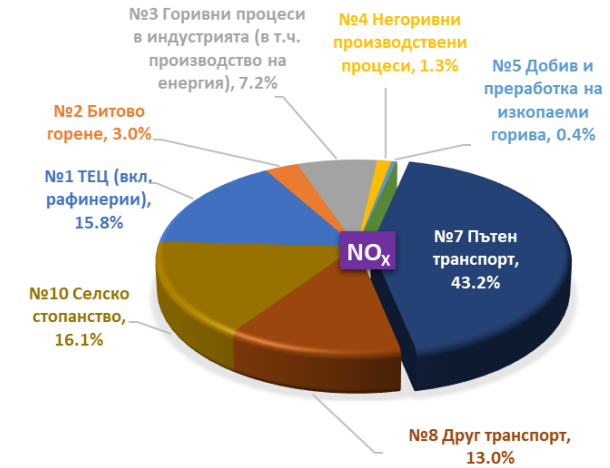
4.2. Ambient air

4.2.1. Emissions of major pollutants by source group

Figure 16 shows for the 4 atmospheric pollutants - sulphur oxides (SO_X), nitrogen oxides (NO_X), particulate matter (PM_{10} and $PM_{2.5}$) the percentage distribution of the amount of emissions (in 2019 and 2020) for the main source groups: **No. 1-TPP** *(including refineries)*; **No. 2-Domestic** *combustion*;

No. 3-Industrial combustion processes *(including energy production);* **No. 4-Non-combustible production processes**; **No. 5-Fossil fuel extraction and processing; No. 6- Use of solvents; No. 7-Road transport; No. 8-Other transport; No. 9-Waste treatment and disposal; and No. 10-Agriculture.**

Their values are calculated according to the technical guidelines for the preparation of national emission inventories - the **EMEP/EEA air pollutant emission inventory guidebook 2019** and according to the "**Updated unified methodology for the inventory of emissions of pollutants into the air"** (Order No. RD-165/20.02.2013 of the MoEW), approved by the Minister of Environment and Water.

2019.	**2020.**
	
	

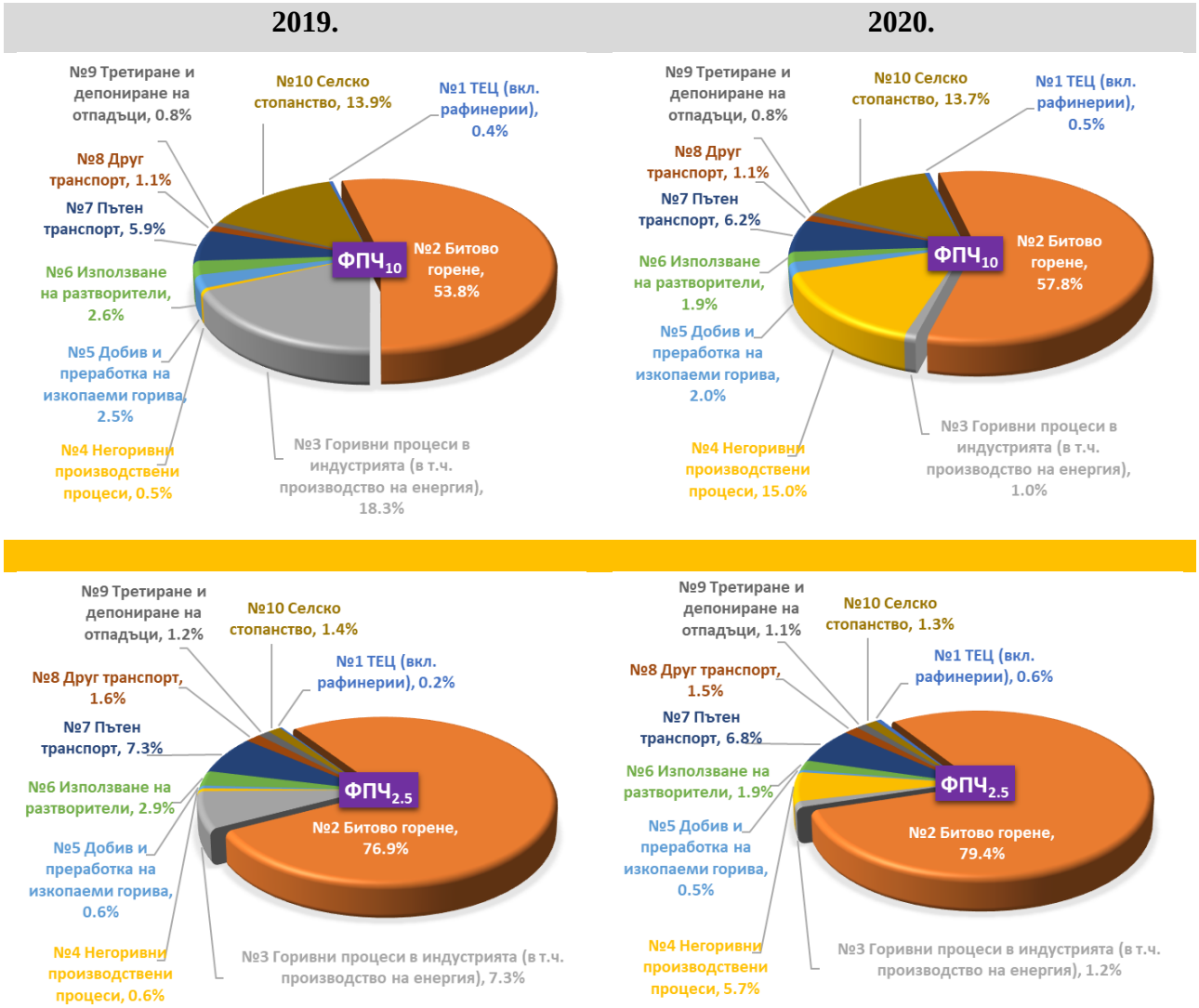


Figure 16 - Comparison of major pollutants generated in 2019 and 2020

The charts above clearly indicate the effect of the COVID-19 pandemic on Bulgaria's economy, affected through different channels and at different depths. (*According to NSI data, in 2020 GDP decreased by 8.1% on an annual basis, compared to that in 2019*).

The percentage comparison of the amount of generated emissions of atmospheric pollutants in 2019 (**pre-pandemic** year) and in 2020 (first **pandemic** year) shows the following:

- **SOx** - the total amount of sulphur oxides emitted in the country decreases from 74.19 thousand tonnes (in 2019) to 69.6 thousand tonnes (in 2020), i.e. a **decrease of 6.2%**.

  → the share of emissions from source **No. 1 - thermal power plants** *(including refineries)* falls from 45.7% to 38.7%, while in quantitative terms emissions from this source decrease from 33.9 thousand tonnes (in 2019) to 26.9 thousand tonnes (in 2020), i.e. a **decrease of 21%**;

  → the share of emissions from **No. 3 - Industrial combustion processes** *(including energy production)* falls from 7.3% to 2.3%, and in quantitative terms, emissions from this source decrease from 5.45 thousand tonnes (in 2019) to 1.57 thousand tonnes (in 2020), i.e. a **decrease of 71.2%**;

→ the share of emissions from **No. 5 - Fossil fuel extraction and processing** falls from 7.7% to 4.9%, while in quantitative terms emissions from this source decrease from 5.69 thousand tonnes (in 2019) to 3.39 thousand tonnes (in 2020), i.e. a **decrease of 40.4%**;

→ the share of emissions from source **No. 4 - Non-combustible production processes** increases from 29.1% to 44.3%, and in quantitative terms emissions from this source increase from 21.58 thousand tonnes (in 2019) to 30.83 thousand tonnes (in 2020), i.e. **an increase of 42.9%**;

→ emissions from other sources show smaller changes.

- **NOx** - the total amount of nitrogen oxides emitted in the country increases from 91.49 thousand tonnes (in 2019) to 91.6 thousand tonnes (in 2020), i.e. an **almost imperceptible increase of 0.1%**.

  → the share of emissions from source **No. 7 - Road *transport*** falls from 43.2% to 39.2%, and in quantitative terms emissions from this source decrease from 39.52 thousand tonnes (in 2019) to 35.91 thousand tonnes (in 2020), i.e. a **50% decrease**;

  → the share of emissions from **No. 3 - Industrial combustion processes** *(including energy production)* falls from 7.2% to 2.9%, and in quantitative terms emissions from this source decrease from 6.56 thousand tonnes (in 2019) to 2.63 thousand tonnes (in 2020), i.e. a **decrease of 59.9%**;

  → the share of emissions from source **No. 4 - Non-combustible production processes** increases from 1.3% to 5.4%, and in quantitative terms emissions from this source increase from 1.16 thousand tonnes (in 2019) to 4.92 thousand tonnes (in 2020), i.e. an **increase of 3.2 times**;

  → the share of emissions from **No. 5 - Fossil fuel extraction and processing** increases from 0.4% to 1.6%, while in quantitative terms emissions from this source increase from 0.37 thousand tonnes (in 2019) to 1.43 thousand tonnes (in 2020), i.e. an **increase of 2.9 times.**

  → emissions from other sources show smaller changes.

- **PM_{10}** - the total amount of PM_{10} emitted in the country increases from 44.18 thousand tonnes (in 2019) to 44.75 thousand tonnes (in 2020), i.e. an **almost imperceptible increase of 1.3%**.

  → the share of emissions from source **No**. **4 - Non-combustible production processes** increases from 0.5% to 15.0%, and in quantitative terms emissions from this source increase from 0.23 thousand tonnes (in 2019) to 6.7 thousand tonnes (in 2020), i.e. an **increase of 28 times**.

  → the share of emissions from **No. 5 - Fossil fuel extraction and processing** decreases from 2.5% to 2.0%, while in quantitative terms emissions from this source decrease from 1.11 thousand tonnes (in 2019) to 0.91 thousand tonnes (in 2020), i.e. a **decrease of 18%.**

→ the share of emissions from **No. 6 - Use of solvents** decreases from 2.6% to 1.9%, and in quantitative terms emissions from this source decrease from 1.17 thousand tonnes (in 2019) to 0.86 thousand tonnes (in 2020), i.e. a **decrease of 26.5%.**

→ emissions from other sources show smaller changes.

- **$PM_{2.5}$ -** the total amount of PM_{10} emitted in the country increases from 30.07 thousand tonnes (in 2019) to 31.725 thousand tonnes (in 2020), i.e. **an increase of 5.5%**.

  → the share of emissions from source **No. 1 - TPP (including refineries)** increases from 0.2% to 0.6%, while in quantitative terms emissions from this source decrease from 0.07 thousand tonnes (in 2019) to 0.18 thousand tonnes (in 2020), i.e. **an increase of 1.57 times**.

  → the share of emissions from **No. 3- Industrial combustion processes (including energy production)** falls from 7.3% to 1.2%, and in quantitative terms emissions from this source decrease from 2.2 thousand tonnes (in 2019) to 0.37 thousand tonnes (in 2020), i.e. a **decrease of 83.2%**.

  → the share of emissions from source **No. 4 - Non-combustible production processes** increases from 0.6% to 5.7%, and in quantitative terms emissions from this source increase from 0.17 thousand tonnes (in 2019) to 1.81 thousand tonnes (in 2020), i.e. **an increase of 9.65 times**.

  → the share of emissions from **No. 6 - Use of solvents** decreases from 2.9% to 1.9%, and in quantitative terms emissions from this source decrease from 0.87 thousand tonnes (in 2019) to 0.61 thousand tonnes (in 2020), i.e. a **decrease of 29.9%.**

  → emissions from other sources show smaller changes.

4.2.2. Non-radioactive air pollution

Kozloduy NPP Site

Non-radioactive contaminants

The area of the Kozloduy NPP site (as well as the NRRAW) are located in Kozloduy municipality, which is characterised by a low pollution potential - the climatic conditions do not favour the retention of atmospheric pollutants in the ground air layer.

Kozloduy NPP has no workshops and production activities "sources of dust and harmful gases". Only the diesel generators and diesel pumps intended for backup and emergency power supply of the plant are a negligible source of greenhouse gas emissions, as they are tested periodically according to pre-established schedules.

The most significant source of air pollution in the region is the domestic heating and the road transport. The two vehicle depots of Kozloduy NPP have buses, trucks, cranes, tractors, cars. During the peak hours of commuting to and from work at Kozloduy NPP, significant areas of influence are created, albeit for a short time - about 30 minutes - by the increased traffic flow in the near-ground air layer.

According to the municipal long-term programme for promoting the use of RES in Kozloduy municipality 2021-2023 (p. 48), in Kozloduy municipality as sources of air pollution for the municipality, mainly with dust on a local scale, can be considered the concrete production facilities of "Atomic energy building progress", "Factory constructions" and "Mechanization and Road Transport" enterprise. Dust concentrations are in the range of 0.08-16 $\mu g/m^3$ and at certain times of the day reach up to 64% of the average daily MAC (Maximum Admissible Concentration) for total suspended dust according to Ordinance No. 14/1997 on standards for maximum permissible concentrations of harmful substances in the ambient air of populated areas. The values are slightly lower in the town of Kozloduy - about 0.5 average daily MAC, and in the village of Harlets they are even lower. An additional negative influence is the poor condition of the street and road covers and the quality of sanitation in the settlements.

Concentrations of the main gaseous pollutants sulphur oxides (SO_2), carbon monoxide (CO), nitrogen oxides (NO_2), methane and non-methane hydrocarbons, ozone (O_3) and ammonia (NH_3) are generally significantly below the norms for the protection of human health. The exceptions are the episodic higher concentrations of nitrogen oxides and carbon monoxide during the hours of intense transport traffic - around 7-8 and 16-17 o'clock when going to and from work of the workers at Kozloduy NPP.

In conclusion, it can be summarized that in the area of Kozloduy Municipality the air pollution is **insignificant**, with the most significant emission source being road transport.

Greenhouse gases (GHG)

Kozloduy NPP holds Greenhouse Gas Emission Permit No. 143-H3/2020, updated by decision No 143-H3-A1/2022 for the combustion plant for electricity generation with a nominal thermal capacity of 64.453 MW, intended for emergency power supply of the safety systems of the Kozloduy NPP. Pursuant to the permit, the company monitors its own emissions of carbon dioxide (CO_2), which are released into the ambient air during the periodic testing of the safety diesel generators. Emissions are calculated quarterly and annually and reported to the National Registry for GHG Emission Allowance. The amount of verified CO_2 em. eq. from Kozloduy NPP in 2022 is 463 tonnes.[6]

Since the commissioning of Unit 1 of Kozloduy NPP until the end of 2022, the nuclear power plant has produced 683 639 087 MWh of electricity. This has prevented the release of around 809 695 thousand tonnes of CO_2 emissions into the environment. In 2022 alone, Kozloduy NPP's electricity production has saved the population and the environment from the harmful impact of over 18.15 million tonnes of carbon dioxide (CO_2), 31 thousand tonnes of sulphur dioxide (SO_2), 12 thousand tonnes of nitrogen oxides (NO_X) and 100 tonnes of dust containing natural radioactivity радиоактивност (https://www.kznpp.org/bg/za-nas/za-aec-kozloduy).

Site of the SD "PRRAW- Novi Han"

There is no air quality monitoring station located in the area of "PRRAW - Novi Han". The nearest suitable station is "Pirdop" with manual sampling and subsequent laboratory analysis, but it is not representative for the area of this nuclear facility.

[6] https://eea.government.bg/bg/r-r/r-te/verifitsirani-dokladi-22/dokumenti-22/143.pdf

The site of the PRRAW is located in the folds of the northern slopes of the Lozenska Mountain at 920 m above sea level, far from the industrial centres of the municipality of Elin Pelin. It is also located about 2800-2900 m from the village of Novi Han and the village of Krushovitsa, which also determines the lack of impact from the burning of solid fuel (wood and coal) in domestic heating systems and for cooking in households. **The latter is a prerequisite for good air quality in the area.**

4.2.3. Concentrations

Sites of existing and planned nuclear facilities

Kozloduy Municipality, on the territory of which the sites of Kozloduy NPP and NRRAW are located, and Elin Pelin Municipality, where the site of SD "PRRAW-Novi Han" is located, fall into two Areas for Assessment and Management of Ambient Air Quality (AAMAAQ), approved by Order No. RD-257/25.03.2022 of the Minister of Environment and Water, namely - Northern/Danube and Stolichen, respectively. The municipalities of Kozloduy and Elin Pelin are neither included in item 2 (list of areas for assessment and management of ambient air quality for the protection of natural ecosystems/vegetation, other than the agglomerations referred to in item 1), nor in item 3 (areas, within the RQMAs under item 1, with exceedances of the established AQOs and standards from measurements with automatic measuring stations (AMS) for 2020 and measurements with mobile automatic station (MAS) for the period 2016-2020) under this Order. Therefore, it is not necessary for them to prepare municipal programs to reduce the levels of pollutants with a view in accordance with Ordinance No. 7/1999 on the assessment and management of ambient air quality which is evidence of the **low level of air pollution for the areas of the assessed sites of RAW facilities**.

National Automated Ambient Air Quality (AQ) Control System

The National Automated Ambient Air Quality Control System measures daily the concentrations of the main air pollutants which, according to Art. 4, para. 1 of the Clean Air Act (CAA) are: particulate matter (PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen dioxide/nitrogen oxides (NO_2/NO_X), carbon monoxide (CO), ozone (O_3), lead (Pb aerosol), benzene (C_6H_6), polycyclic aromatic hydrocarbons (PAHs), heavy metals - cadmium (Cd), nickel (Ni), and mercury (Hg), arsenic (As). Additionally, according to the nature and sources of emissions in certain regions of the country's territory, the following specific indicators are monitored: ammonia, sulphuric acid aerosols, toluene, xylene, styrene, sulphur-carbon, hydrogen sulphide, methane and non-methane hydrocarbons. Meteorological parameters are also monitored: wind speed and direction, atmospheric pressure, total solar radiation, humidity and air temperature.

The following figures present the measured concentrations of the 4 main indicators characterizing the ambient air quality, registered at the monitoring stations for air quality in Bulgaria in the period 2019-2022.[9]

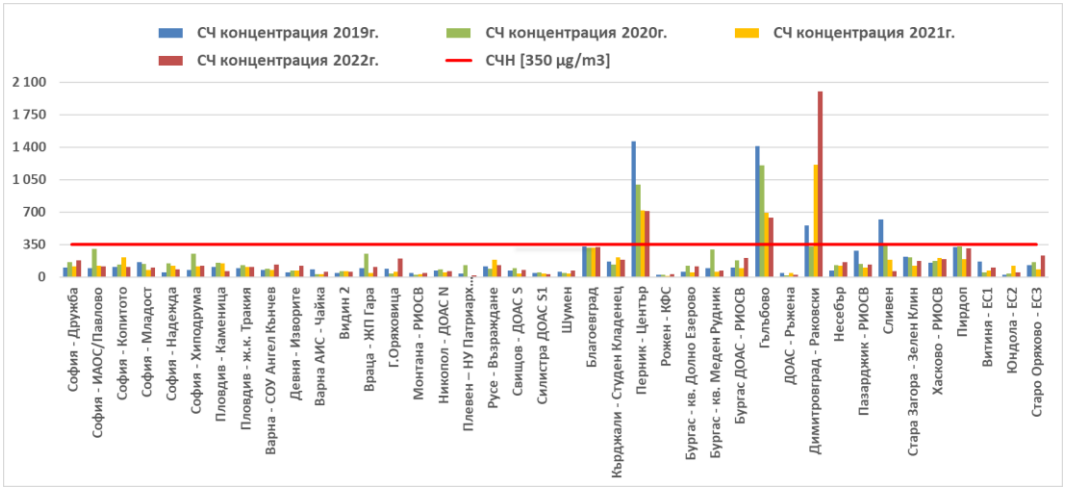


Figure 17 - Measured maximum hourly average concentrations of sulphur dioxide (SO_2) in the period 2019-2022

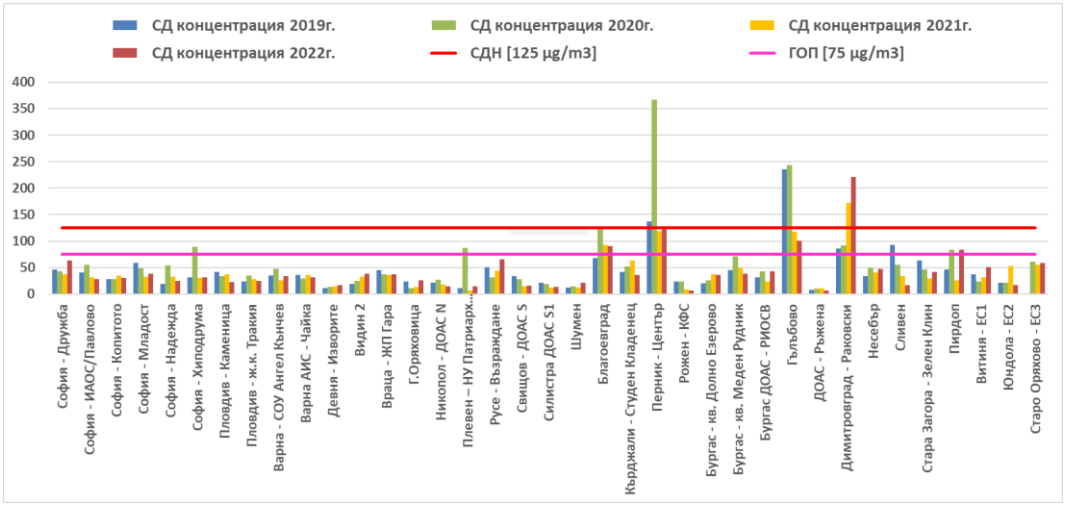


Figure 18 - Averaged maximum daily average concentrations of sulphur dioxide (SO_2) in the period 2019-2022

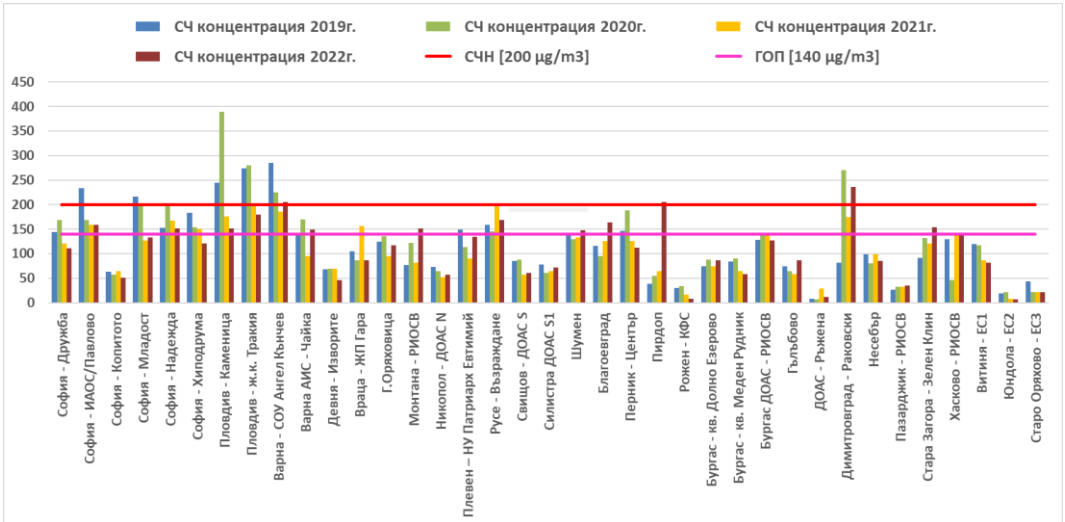


Figure 19 - Measured maximum average hourly concentrations of nitrogen dioxide (NO_2) in the period 2019-2022

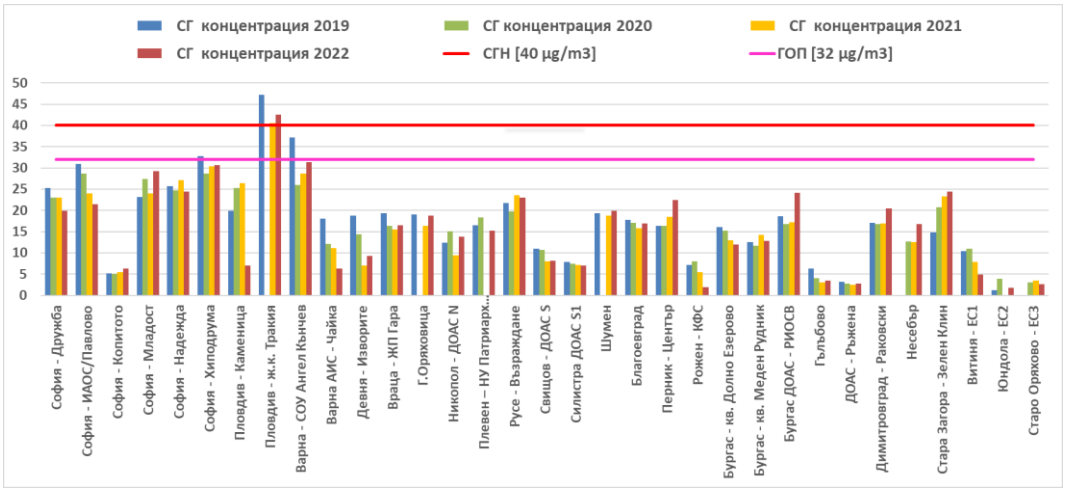


Figure 20 - Averaged annual average concentrations of nitrogen dioxide (NO_2) in the period 2019-2022

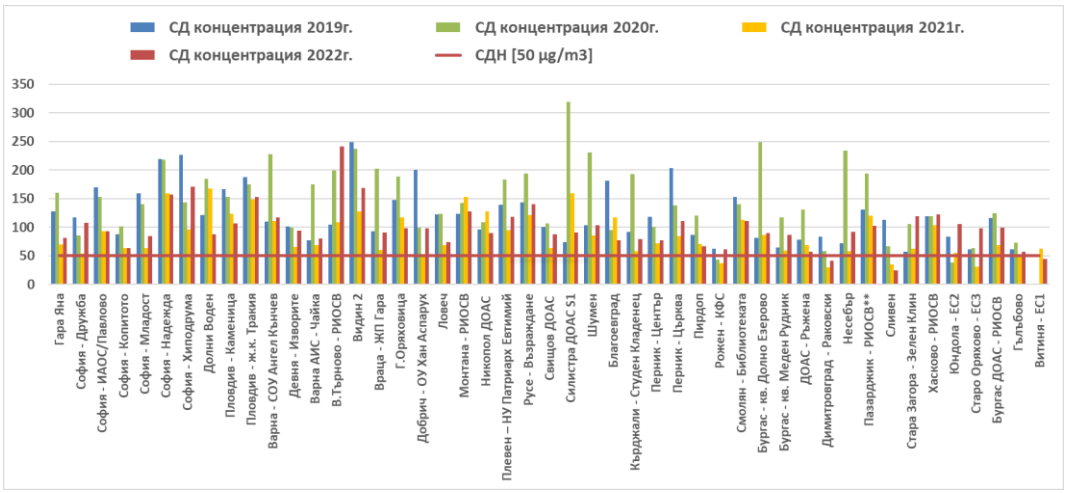


Figure 21 - Averaged maximum daily mean concentrations of PM $_{10}$ in the period 2019-2022

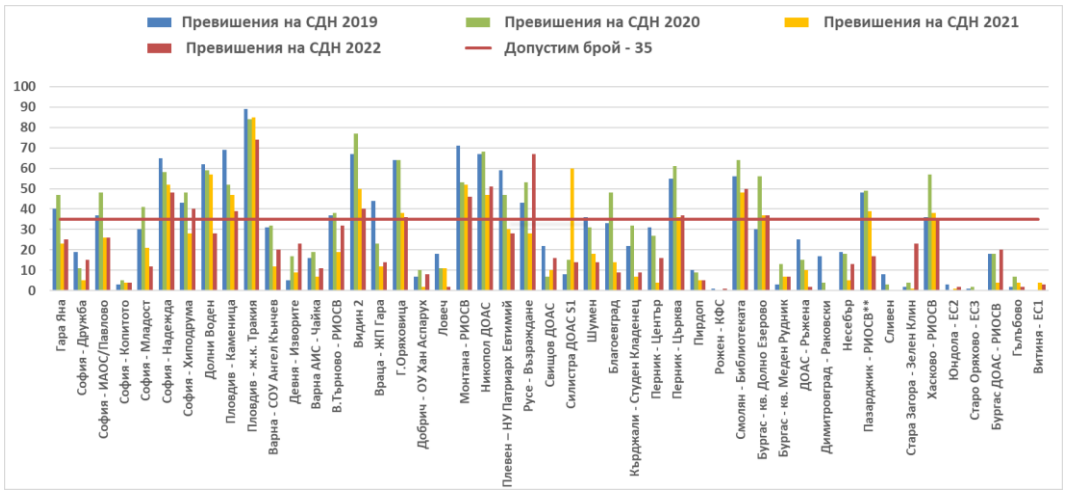


Figure 22 - Number of exceedances of the NAAQS for PM $_{10}$ in the period 2019-2022

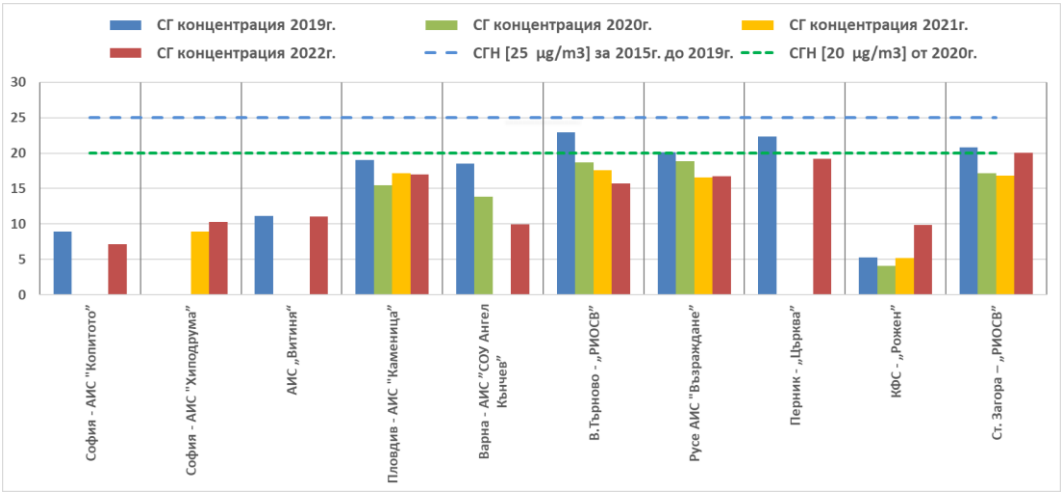


Figure 23 - Averaged annual mean concentrations of PM $_{2.5}$ over the period 2019-2022

The analysis of measured (hourly) and averaged (over 24 hours or one calendar year) concentrations recorded at the monitoring stations in the period 2019-2022 shows that:

- **Sulphur dioxide (SO_2):**
  - → Exceedance of the Average Hourly Norm (AHN) (350 µg/m^3) is not observed at sites in the areas with nuclear facilities, namely those of RIEW-Vratsa, RIEW-Montana and RIEW-Sofia.
  - → There are also no exceedances of the Average Daily Norm (ADN) (125 µg/m^3) and the Upper Assessment Threshold (UAT) (75 µg/m^3) for the areas considered.
- **Nitrogen dioxide (NO_2):**
  - → Exceedance of AHN (200 µg/m^3) and UAT (140 µg/m^3) is observed at AMS "Pavlovo" and AMS "Mladost" (Sofia Agglomeration), but they are not representative for the area of "PRRAW - Novi Han" because they are urban background sites. Exceedances at Vratsa Railway Station have also not been registered, with the exception of the UAT in 2021.
  - → Exceedance of the Average Annual Norm (AAN) (40 µg/m^3) and UAT (32 µg/m^3) is not observed at sites of RIEW-Vratsa, RIEW-Montana and RIEW-Sofia.
- **Fine particulate matter PM_{10}:**
  - → An exceedance of the ADN (50 µg/m^3) is still observed in almost all AQ monitoring stations for some years in the 2019-2022 period, with 35 exceedances above the ADN in a calendar year are recorded only for the urban sites of the RIEW-Sofia. For RIEW-Vratsa, an exceedance was registered only in 2019.
- **Fine particulate matter $PM_{2.5}$:**
  - → There is no exceedance of the AAN (25 µg/m^3) in 2019 and no exceedance of the new standard of 20 µg/m^3 for 2020, 2021 and 2022 at any of the AQ monitoring station.

4.2.4. Radioactive air pollution

Background gamma radiation

The natural background gamma radiation is a physical characteristic of the environment and represents the gamma ray field in which all living organisms on Earth reside. The quantity measured is the power of the ambient equivalent dose, H*(10) of gamma radiation and is specific to each point, area, region.

The gamma radiation dose rate data for the country are obtained in real time from 26 permanent monitoring stations of the National Automated System for Permanent Control of the Radiation Gamma Background (NASPCRGB), administered by the Executive Environment Agency (EEA).

According to the data from RIEW Vratsa and RIEW Montana - the values of the background gamma radiation recorded in 2022 in the permanent sampling points on the territory of Vratsa district and in the three LMS (local monitoring stations) - in Montana, Vidin and Valchedrum show that the equivalent dose rate is within the limits of the typical natural values for the respective points and the specific meteorological conditions.

In 2020, no values other than the natural values characteristic of the site were observed. The lowest annual average ambient equivalent dose rate was determined at the local monitoring station in the town of Valchedrum - 0.079 μSv/h, and the highest - Mt. Orelyak - 0.169 μSv/h. Figure 24 shows the annual average values of the radiation gamma background for the period 2018 - 2020 in all 26 permanent monitoring stations in the country, including the monitoring station of the "Permanent Repository for Radioactive Waste " - Novi Han, owned by the State Enterprise "Radioactive Waste". Due to the increased public interest in the impact of the radioactive waste repository on the population and the environment of the area, the station in the village of Novi Han has been installed. Novi Han monitoring station has been fully integrated into the NASCRGF.

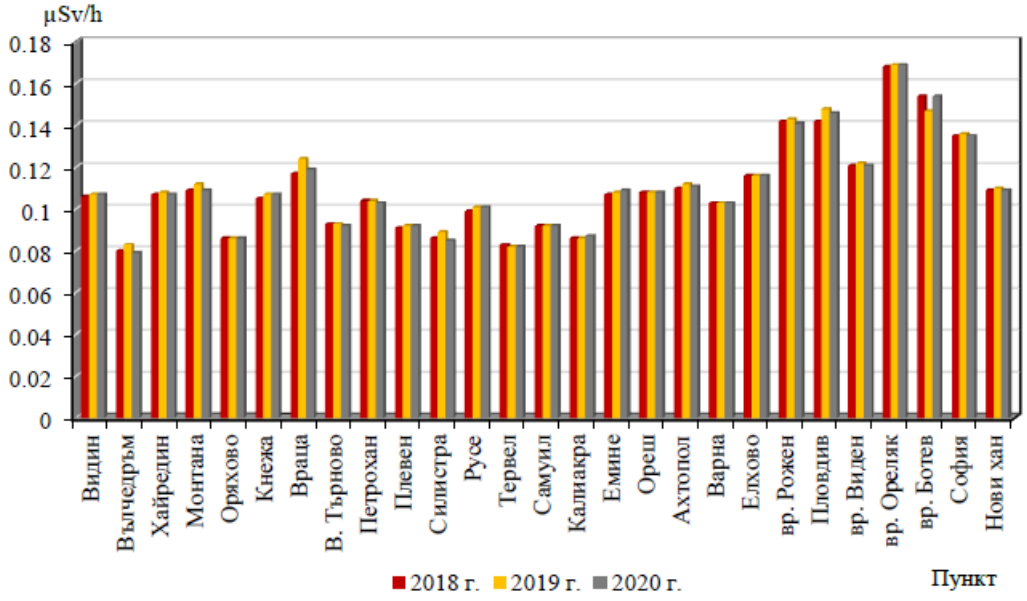


Figure 24 - Annual average values of the gamma radiation background in Bulgaria, 2018-2020, μSv/h

For the Kozloduy NPP and PRRAW sites, the radioecological monitoring area includes the industrial site of the NPP and the Bulgarian section of the 30-kilometre monitored area with comparison stations

in a 100-kilometre radius around the NPP. The automated radiation monitoring system continuously measures the radiation gamma background in 14 locations in the area, and the information is widely accessible to the public. The data is visualised on information boards placed in public places and transmitted in real time to the central station at Kozloduy NPP with transfer to the EAEU and the Nuclear Safety Agency.

In 2020, more than 1250 gamma background measurements were made, increasing to more than 1280 measurements before 2021. In both years, the results are fully comparable to previous years' data and do not deviate from typical natural gamma background levels for the area.

At Figure 25 and Figure 26 are presented graphically the dose rate variations - averaged monthly and ten-minute values at points of 30-km and 100-km zones of Kozloduy NPP for each of the quarters of 2020. The results of the observations during these periods confirm that the background gamma radiation at the monitored sites is within the limits of the characteristic natural gamma background for the site and specific meteorological conditions.

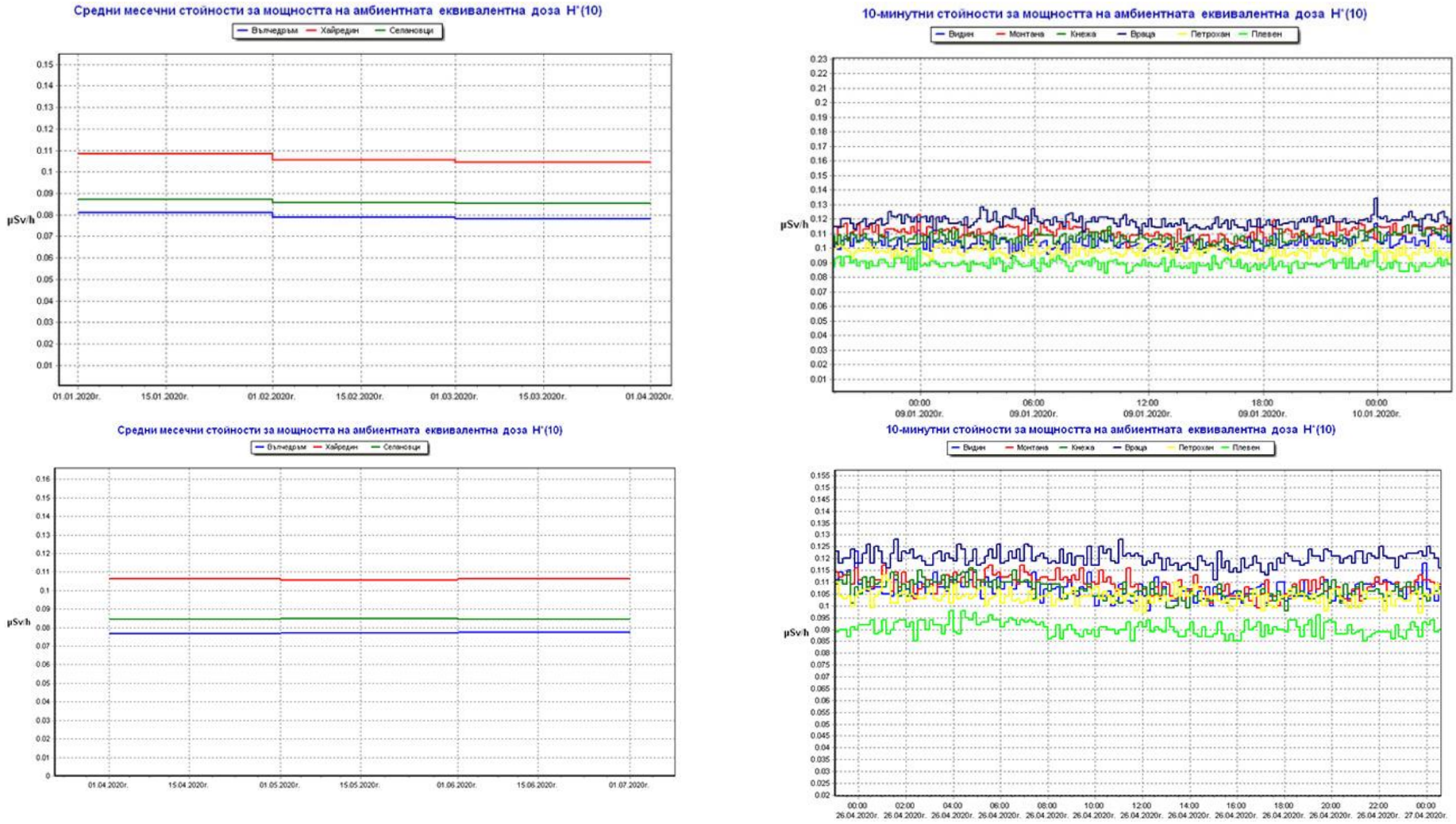


Figure 25 - Monthly average values of ambient dose equivalent rate, (μSv/h) and ten-minute average values of ambient dose equivalent rate, (μSv/h) at the monitoring stations within 30-100 km of Kozloduy NPP

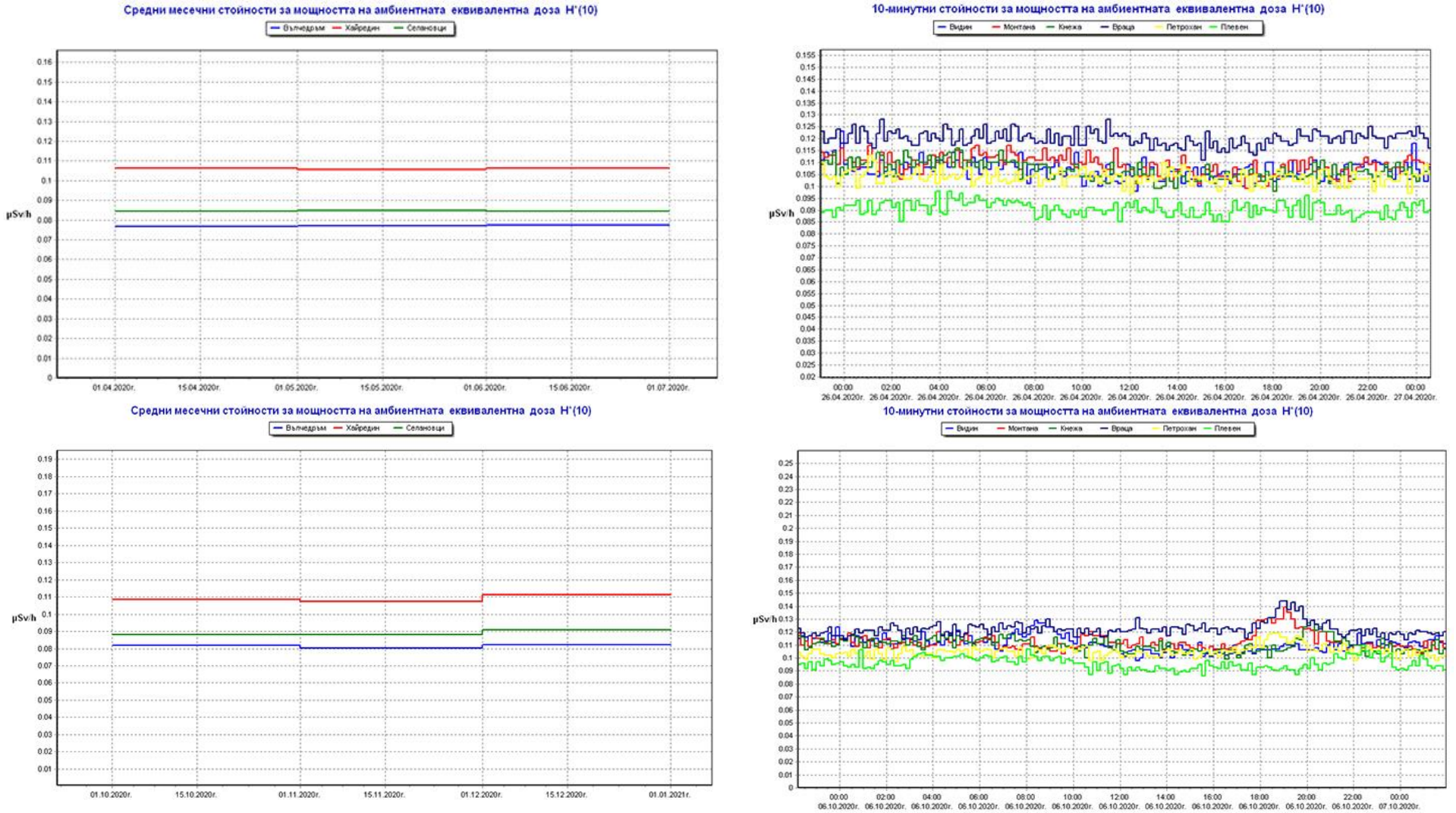


Figure 26 - Monthly average values of ambient dose equivalent rate, (μSv/h) and ten-minute average values of ambient dose equivalent rate, (μSv/h) at the monitoring stations within 30-100 km of Kozloduy NPP

Figure 27 shows the monthly average of the ambient dose equivalent rate measured during the year at six of the monitoring stations of the automated system.

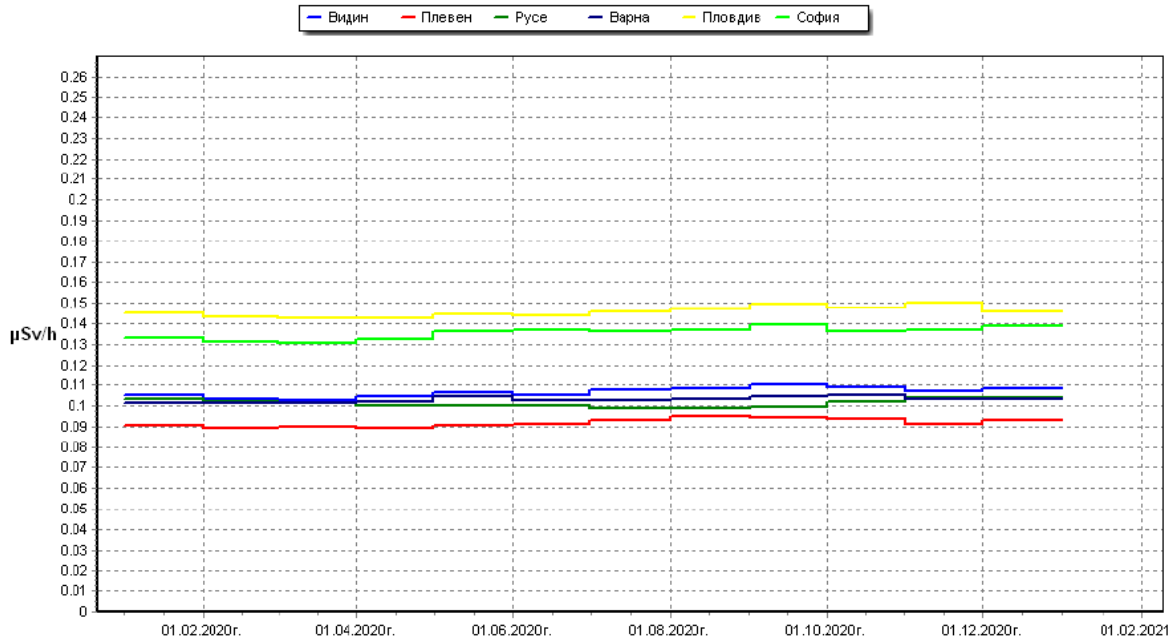


Figure 27 - Monthly average background gamma radiation values in 6 monitoring stations in 2020, μSv/h

The National Automated Continuous Radiation Background Gamma Monitoring System has gamma spectrometer probes installed at 16 of the local monitoring stations. Spectrometric gamma probes provide the capability for more detailed analysis of the background gamma radiation, as well as for the early detection of lower levels of industrial radionuclides, in particular ^{137}Cs, than dosimetric gamma probes. After the Chernobyl accident, ^{137}Cs was present in small amounts, unevenly distributed in the soil. In accordance with the sensitivity threshold of the spectrometric gamma probes and the presence of ^{137}Cs in soils, it can be said that the measured 24-hour values of ^{137}Cs, as a contribution to the total gamma background are up to 0.001 μSv/h with the exception of the station at Mt. Rozhen, where the levels of ^{137}Cs are up to 0.0071 μSv/h.

The national automated system for continuous monitoring of background gamma radiation is integrated into the European Radiological Data Exchange Platform - EURDEP, and hourly gamma radiation background data are sent from the country to EURDEP. Figure 28 shows the background gamma radiation information received from the EURDEP system.

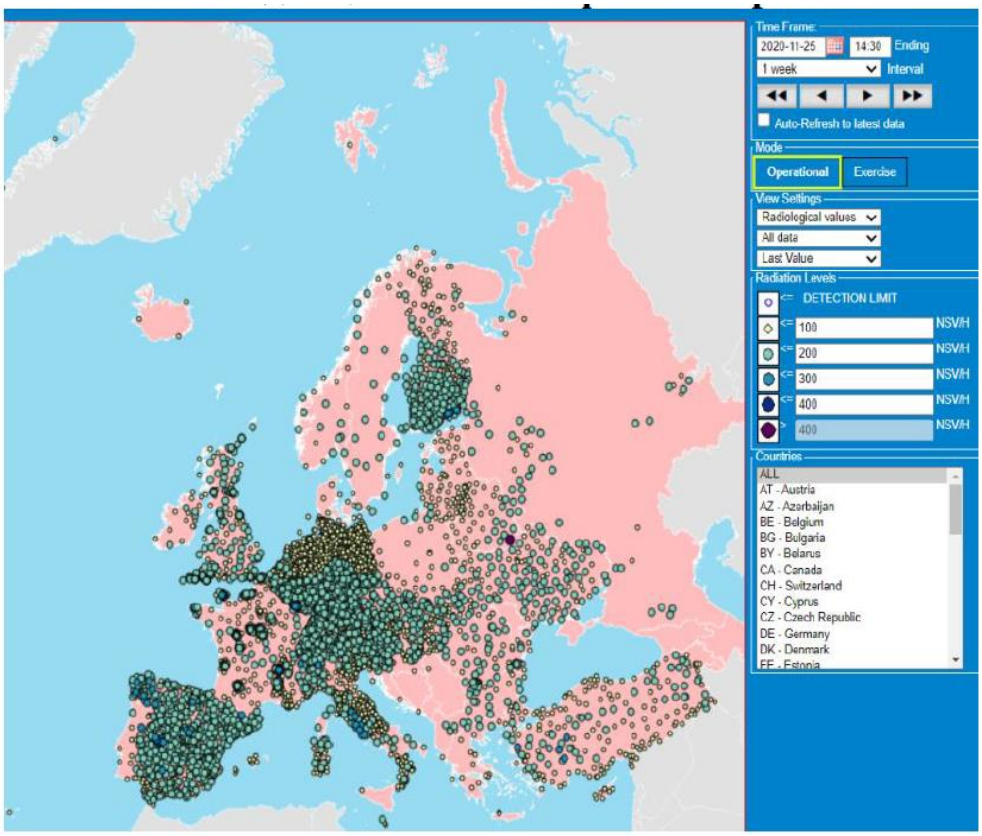


Figure 28 - Background gamma radiation in Europe

The data clearly shows that no elevated gamma background values other than those typical for the monitoring stations have been recorded in Bulgaria.

Atmospheric radioactivity

Atmospheric radioactivity studies are based on aerosol sampling with air volumes from 500 to 3000 m³ on aerosol glass-fibre filters, using stationary stations followed by gamma spectrometric analysis with low-frequency gamma spectrometric systems, to determine the specific activity by volume of natural and technogenic radionuclides.

Sampling is carried out twice a month: in Sofia (3000 m³ air volume), Vratsa, Montana, Varna, Burgas (1600 m³ air volume), once a month in Buhovo, Yana (600 m³ - 700 m³) and Svishtov (3000 m³ air volume). Aerosol filters with a volume of 2000 m³ - 10000 m³ are sampled annually with portable samplers at three sites located in Plovdiv, Smolyan, Pazardzhik and three sites located in Stara Zagora districts.

The results, from the analysed aerosol filters for 2020, show values of the isotope ^{7}Be from $0.75.10^{-3}$ to $10.2.10^{-3}$ ($Bq.m^{-3}$), which are due to its seasonal dependence and the intensity of solar radiation and cosmic radiation. The measured specific activities of the natural radionuclide ^{210}Pb range from $<0.134.10^{-3}$ minimum detectable activity (MDA) to $3.5.10^{-3}$ $Bq.m^{-3}$.

The analyses of the specific activity of natural and technogenic radionuclides in ambient air show that their values are significantly below the limit of the annual average specific activity of ambient air in dwellings and outdoors, defined for a critical population group, according to the Radiation Protection Ordinance of 20.02.2018, last amended in State Gazette issue 110 of 29.12.2020, Annex 2, Table 4 (Secondary limits of annual intake of radionuclides into the body of persons of the population for six age groups by inhalation of aerosols, soluble or chemically active gases and

vapours and of the annual average volumetric activity of ambient air in dwellings and outdoors). The permitted levels for ^{7}Be are up to $1.9.10^{3}$ Bq.m^{-3} and ^{210}Pb up to $2.2.10^{3}$ Bq.m^{-3}.

The measured total beta activity in aerosol filters ranges from $0.6.10^{-3}$ Bq.m^{-3} to $1.4.10^{-3}$ (Bq.m^{-3}). According to the EC Recommendation of 08.06.2000 (2000/473/Euroatom) - Annex III, the reporting level is above $5.0.10^{-3}$ Bq.m^{-3} for total beta activity and above $3.0.10^{-2}$ Bq.m^{-3} for ^{137}Cs.

At the **Kozloduy NPP** site and the NRRAW, gaseous radioactive emissions are released into the environment through the ventilation ducts.

In 2020, the gaseous radioactive emissions into the environment during the operation of the nuclear facilities at the Kozloduy NPP site are much lower than the limits permitted by the NRA. The following were released into the atmosphere: Radioactive noble gases - 0.679 TBq; iodine-131 - 1.77 MBq; aerosols - 0.0015 GBq; carbon-14 - 0.594 TBq; tritium - 0.641 TBq. These emissions account for 0.011%; 0.005%; 0.0009%; 1.55% and 0.25% of the permitted annual limits respectively[7] . The trend towards compliance with the permitted limits continues next year, with gaseous and liquid radioactive emissions to the environment in 2021 from Kozloduy NPP operations also well below the permitted annual activity levels under the operating licences for Units 5 and 6. The following have been released into the atmosphere:

- radioactive noble gases (RNG) - 4,42 TBq;
- Iodine-131 - 52.3 MBq;
- radioactive aerosols - 8,95 MBq;
- Carbon-14 - 0.724 TBq;
- tritium - 0,607 TBq.

Gaseous emissions account for 0.07 %; 0.15 %; 0.006 %; 1.89 % and 0.24 % of the permitted annual activity levels[8], respectively.

There are no direct gaseous and liquid discharges from SD „RAW-Kozloduy" into the environment. Their release is carried out through the relevant Kozloduy NPP facilities and is included in the plant's discharge reports. Technologically, no radioactive noble gases, aerosols and iodine-131 are discharged from the RAWPW. The share of the RAW management facility in the gaseous discharges from the site is less than 0.1% at full utilisation of the facilities at SD „RAW-Kozloduy"[9] .

In 2020, more than 4100 analyses of more than 2400 samples from different sites were performed in the Kozloduy NPP radioecological monitoring area. The results are fully comparable with data from previous years and do not deviate from typical natural gamma background levels for the area. The technogenic activity of ambient air is close to background values and is many times below the permissible levels. The observed trend continues in 2021, when more than 20% of the 2420 samples

[7] NRA Annual Report 2020

[8] NRA Annual Report 2021

[9] Seventh National Report of the Republic of Bulgaria on the implementation of the obligations under the Single Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

analysed are related to the analysis of atmospheric radioactivity in the nuclear power plant area[10].

According to the regional annual reports on the state of the environment in 2022, RIEW-Vratsa collected 25 aerosol filters from the automatic measuring station "Railway Station Vratsa", and 27 aerosol samples were collected and analyzed by RIEW-Montana for radiological monitoring of ambient air from a stationary station, and no above background exceedances of the volumetric specific activity of the investigated radionuclides were detected.

Measurement of the activity of gamma-emitters in the ambient air has been carried out at the site of **SD "PRRAW-Novi Han"** in 2019 and 2020. The sampler, Aerosol Bench AC3, is located in the Controlled Area and has a high suction flow rate, therefore the minimum detectable activity (MDA) is in the order of 10^{-6} - 10^{-7} Bq/m^3.

The results for Cs-137, which are above the MDA in both 2019 and 2020, are at the same time orders of magnitude lower than the regulatory requirements. A possible reason is the presence of the isotope in the upper layers of the soil as a residue of the Chernobyl nuclear accident. The aerosol bench is located on the soil slope in the Controlled Area and it is possible that in dry weather there is transport due to blowing winds. On the other hand, all RAW storage facilities are of the closed type and direct transfer from them is unlikely.

4.3. Water

Water management in the Republic of Bulgaria is carried out at national and basin level. The principle of basin management was introduced by the Water Act and is based on the natural location of watersheds between the water catchment areas of one or several major rivers. On this basis, the territory of the Republic of Bulgaria is divided into four water basin directorates:

- Danube Basin Directorate with management centre in Pleven;
- Black Sea Basin Directorate with management centre in Varna;
- East Aegean Basin Directorate with management centre in Plovdiv;
- West Aegean Basin Directorate with management centre in Blagoevgrad.

According to the "National Report on the State and Protection of the Environment in the Republic of Bulgaria for 2021", **in non-radiation aspect** our country is distinguished by relatively significant freshwater resources compared to other European countries, both in absolute volume and per capita.

A characteristic feature of the country is the significant quantities of water used for cooling processes in the energy sector, which account on average for 62% of freshwater withdrawals annually (2010-2019).

The Water Resource Exploitation Index shows that there is no stress on Bulgaria's water ecosystem in the period 2000 - 2019, and household water consumption in the country is relatively stable.

The number of operational municipal wastewater treatment plants increased from 78 in 2010 to 173 in 2019 and the share of the population connected to wastewater treatment plants increased from

[10] Kozloduy NPP Annual Reports for 2020 and 2021

47.8% (2010) to 64.6% (2019).

In 2019, the trend of improvement of the country's surface water quality in terms of the main physico-chemical indicators was maintained, both in the short and long term.

Over the period 2000-2019, there has been a gradual improvement in groundwater quality for most of the indicators. The percentage of monitoring points with annual mean values exceeding groundwater quality standards shows decreasing trends for all indicators except nitrates.

Freshwater withdrawals for the country's economy and households in 2019 are estimated at 5.42 billion m^3 or 0.1% less than in 2018.

Fresh and non-fresh water use by end users in the country follows the levels of abstraction. In 2019, the total amount was 1.5% less than in 2018.

Water demand for crop irrigation in 2019 is estimated at 306 million m^3 or 5% more than in 2018.

In 2019, the percentage of groundwater monitoring points with elevated annual average nitrates concentrations was 13.8% of the total number of points in the country (which is slightly higher compared to 2018 (11.5%), 2017 (12.4%) and lower than 2016 (13.9%).

Out of a total of 167 groundwater bodies monitored in the year 2019, exceedances of individual indicators were found in 63 groundwater bodies - compared to a total of 169 groundwater bodies investigated, with exceedances of individual indicators found in 62 groundwater bodies - in 2018.

About 758 monitoring points were sampled in 2018, with about 50% in excellent condition for dissolved oxygen and about 35% in excellent condition for biochemical oxygen demand. For biogenic elements (NH4-N, NO3-N, PO4-P), there is also a trend of good condition, with about 40% of the surveyed sites showing excellent condition and the rest distributed in good and moderate condition.

About 821 sites were surveyed in 2019, with about 55% in excellent condition in terms of dissolved oxygen and about 40% in excellent condition in terms of biochemical oxygen demand. In terms of biogenic elements (NH4-N, NO3-N, PO4-P) 43% are in excellent condition category.

Overall, it can be summarised that surface water quality in 2018-2019 has been steady in terms of the main indicators, with some even showing slight improvement.

In the radiation aspect, according to the "National Report on the State and Protection of the Environment in the Republic of Bulgaria for 2021", in 2019 systematic monitoring of the radiation status of surface waters was carried out at 104 points along the rivers of the monitoring network of the EEA: Yantra, Iskar, Maritza, Tundzha, Mesta, Struma, Arda and other water bodies in the country, as well as in 9 points of the river Danube. For 2019, the total beta-activity recorded for the water in The Danube and the other main rivers, lakes and reservoirs show values significantly below the established standard (Regulation No. N-4/14.09.2012) for the characterisation of surface waters by total alpha activity (0.2 Bq/l), total beta activity (0.5 Bq/l), for monitoring points outside areas of potential contaminants.

Exceedance of total alpha activity indicator, according to Regulation No. H-4/14.09.2012 was registered at point Koritarska Bara River under the bridge to the village of Belotintsi - (0,73 Bq/l), which is due to the activity of the former uranium mining site "Smolyanovtsi".

For 2019, 47 surface water and groundwater monitoring points were monitored across the country. Samples from 21 points of mine water from the areas of former uranium mining sites were examined and analysed.

The measured specific activity of the water samples for total beta activity (12,5 Bq/l) from gallery 9 of the site **"Eleshnitsa"** and the natural uranium content (1,89 mg/l) were found to be exceeded, which corresponds to exceedances of 6 times (Ordinance No 1/11.1999).

Samples of surface water, groundwater, mine water and wastewater from the areas of former uranium mining sites **"Buhovo", "Seslavtsi", "Gabra", "Sugarevo", "Struma", "Melnik"** were tested. Exceedances of total alpha and beta activities and, respectively, the content of natural uranium were found in the waters of gallery 93 of the "Buhovo" site by 4.2 times, the Kremikovska River after gallery 93 by 3 times, the waters of gallery of the "Sugarevo" site by 31 times of the norms according to (Regulation No. 1/11. 1999), which is due to the increased content of natural uranium. The content of radium-226 in the three samples is below the standards and is in the order of 50 mBq/l according to (Ordinance No. 1/11. 1999).

For the areas of the former uranium mining sites **"Byalata voda", "Proboynitsa" and "Senokos" Quarry** are measured exceedances of the total alpha activity from galleries 4 and 5 at "Proboynitsa" by 12-15 times, Luda River - Yanovsky Bridge and r. Ochushnitsa after the site "Byalata voda" - four times, which is due to the content of natural uranium.

The measured specific activities of the water from gallery 1, site "Igralishte" corresponds to exceedances of: 14 times (for total alpha activity), 2 times (for total beta activity) and 3 times (for radium-226) (Regulation No 1/11.1999).

For the area of **Sborishte Mine**: self-leaking borehole No 1, No 2 and No 3. In accordance with Regulation No. 1 of 10.10.2007 on exploration, use and protection of groundwater, Annex No. 1 to Article 10, paragraph 2, item 1, exceedances of total alpha and beta activities have been detected, which is due to the measured content of natural uranium (0.17 - 0.35 mg/l), while the limit is 0.06 mg/l.

Exceedances of total alpha and beta activities have been detected in the waters of Kiselchovska River below the bridge near the border fence and Kiselchovska River above the village of Kiselchovo, site "Vozhod" (Regulation No. H-4/14.09.2012 on the characterisation of surface waters) due to the elevated content of natural uranium. The measured specific uranium activities for Kiselchovska River are 0.17 mg/l at the bridge downstream the border fence and 0.067 mg/l upstream the village of Kiselchovo 0.067 mg/l.

Slightly impacted by the activities of the site are the waters of the river Barutinska before the inflow of Osinska River, Osinska after flowing into Barutinska River and Barutinska River downstream shaft 3 from the area of the site "Izgrev", where exceedances of total alpha activity, total beta activity, and content of natural uranium and radium-226, according to Regulation No. H-4/14.09.2012 on the characterisation of surface waters, were found.

The results of the radiological monitoring carried out in 2019, compared with the results of previous years, do not show any unfavourable trends in the radiation situation and the environmental status in the "monitored" area of Kozloduy NPP resulting from the operation of the nuclear power plant.

The area around the Kozloduy NPP, Vratsa District and the PRRAW-Novi Han, Elin Pelin Municipality, Sofia District fall entirely within the Danube Water Basin Directorate. The environmental assessment procedure coincides with the implementation of the River Basin Management Plan (RBMP) 2016-2021 and the Flood Risk Management Plan (FRMP) 2016-2021 in the Danube River Basin Management District (DRBD) and the update of both plans. Currently, activities are being carried out to update the RBMP for the third management cycle and the FRMP for the second management cycle, which will have a period of validity of 2022 - 2027. Pursuant to §6 of the Transitional and Final Provisions to the Act on Amendment and Supplement to the Water Act (SG No. 20 of 11 March 2022), the Flood Risk Management Plans for the period 2016-2021 and the River Basin Management Plans for the period 2016-2021 shall apply until the adoption of updated plans pursuant to Art. 146, para. 3 (new - SG No. 20 of 2022, in force from 01.01.2022) and Art. 159, para. 3 (new - SG No. 20 of 2022, in force from 01.01.2022) of the Water Act.

Compliance with the applicable measures set out in the RBMP and ERMP in the DRBD for the relevant planning period, including the measures from the environmental assessment of the management plans, has been addressed in the procedures carried out under the EIA for the existing nuclear facilities. For the future facilities, the assessment of compliance with the applicable measures set out in the RBMP and ERMP in the DRBD will be made as part of the processing of the relevant investment projects under the applicable environmental legislation. In any case, compliance with the applicable measures will be ensured.

As the River Basin Management Plan (RBMP) for the Danube Water Management Region for the period 2022-2027 is still in the process of preparation and official adoption, the following section uses information from the RBMP for 2016-2022 as well as information from the annual environmental reports for 2022 of RIEW-Vratsa, RIEW-Montana and RIEW-Sofia.

4.3.1. Surface water

Non-radiation aspect

The area around Kozloduy NPP is dominated by the Danube River, which flows in its northern part and into which all other rivers in the area flow. To the south and east is the basin of the river Ogosta, which about 3 km before its confluence with the Danube River merges with the Skat River. To the west is the basin of river Tsibritsa. The rivers Ogosta, Skat and Tsibritsa are right tributaries of the Danube River and flow in a general direction from south-west to north-east. Characteristic of the area are also the numerous artificial water channels built in the agricultural lands, as well as the canals leading to and from the Danube River for the needs of Kozloduy NPP.

Table 2 below provides information on the status of the above rivers as part of the official water bodies under the 2016-2022 RBMP.

Table 2 - Information on the status of rivers in the Kozloduy NPP area, according to the RBMP 2016-2022

Surface water body code	Geographical description of the surface water body	HMWB/AWB	Environmental status/potential	Chemical status
BG1OG307R1013	r. Ogosta from the confluence of r. Ribene at Beli Brod to the confluence of the r. Skat at Saraevo		**2**	**U**
BG1OG200R1113	r. Skat from the confluence of r. Burzina to the confluence of the r. Ogosta at Saraevo		**3**	**2**
BG1OG100R014	r. Ogosta from the confluence of the r. Skat at Saraevo to the confluence	HMWB	**3**	**2**
BG1WO800R1016	r. Tsibritsa from source to confluence, incl. tributary - r. Tsibar		**3**	**2**
BG1DU000R001	r. Danube from the border at Novo Selo to the border at Silistra	HMWB	**3**	**3**

Legends to the table:

Classification of ecological potential	Colour code		class
	Artificial water bodies	Highly modified water bodies	
Good and Higher	Green with light grey lines	Green with dark grey lines	1-2
Medium	Yellow with light grey lines	Yellow with dark grey lines	3
Not good	Orange with light grey lines	Orange with dark grey lines	4
Bad	Red with light grey lines	Red with dark grey lines	5
Unknown	Grey with black lines		

Ecological status	1	2	3	4	5	U
class	excellent	good	moderate	bad	very bad	Unknown

Chemical state	2	3	U
class	good	not achieving good	Unknown

Table 3 below provides information on the targets set for the environmental protection of the rivers in the Kozloduy NPP area according to the RBMP 2016-2022.

Table 3 - Information on the set environmental protection objectives for the rivers in the Kozloduy NPP area, according to the BDRB RBMP 2016-2022

Surface water body code	Geographical description of the surface water body	Target 2015	Target 2021	Target 2027	Target after 2027	Justification for the application of an exception to good status 2015	Target achieved/target not achieved
BG1OG307R1013	p. Ogosta from the confluence of r. Ribene at Beli Brod to the confluence of r. Skat at Saraevo	Achieve and maintain good ecological and chemical status	Maintaining good ecological and chemical status	Maintaining good ecological and chemical status	Maintaining good ecological and chemical status	not applicable	target achieved
BG1OG200R1113	r. Skat from the confluence of r. Barzina to the confluence of the r. Ogosta at Saraevo	Preventing environmental degradation. Protect, enhance and restore the surface water body. Prevent pollution and maintain good chemical status	Achieve EQS for BOD5, N-total, N-compounds, P-PO4, for good ecological status by 2021. Prevent deterioration of the ecological status for the remaining quality elements. Prevent pollution and maintain good chemical status.	Achieve the EQS macrozoobenthos (MZB), Fish for good ecological status by 2027. Maintain good ecological and chemical status for other indicators	Maintaining good ecological and chemical status	Article 156c of the WFD (4.4. of the WFD) until 2027 - Art. Annex 5.1.2	In exception
BG1OG100R014	r. Ogosta from the confluence of r. Skat at Saraevo to the mouth	Prevent the deterioration of ecological potential. Protect, enhance and restore the surface water body. Prevent pollution and maintain good chemical status	Maintain EQS for (MZB, phyto benthos (PB), macrophytes (MP) for moderate ecological potential until 2021 (EQS adjusted for background concentration). Prevent deterioration of ecological potential for the remaining quality elements. Maintain good chemical status.	Achievement of EQS for MZB, PB, MP for good ecological potential by 2027. Achieve the EQS for As for good ecological potential by 2027 *(EQS adjusted for background concentration).* Prevent deterioration of the ecological status of the	Maintain the As EQS for good ecological potential (*EQS adjusted for background concentration*). Maintain good ecological potential for other quality elements. Maintain good chemical status.	Art.156 (c and d) WFD (4.4 and 4.5 WFD) - Art. Annex 5.1.2	In exception

Surface water body code	Geographical description of the surface water body	Target 2015	Target 2021	Target 2027	Target after 2027	Justification for the application of an exception to good status 2015	Target achieved/target not achieved
				remaining quality elements.			
BG1WO800R1016	r. Tsibritsa from source to mouth, incl. tributary - r. Tsibar	Preventing environmental degradation. Protect, enhance and restore the surface water body. Prevent pollution and maintain good chemical status	Achieve EQS for (N-NO3, N-total, MZB, PB, Fish good ecological status by 2021. Prevent deterioration in ecological status for other quality elements. Prevent pollution and maintain good chemical status.	Maintaining good ecological and chemical status	Maintaining good ecological and chemical status	Article 156c of the WFD (4.4. of the WFD) until 2021 according to Art. Annex 5.1.2	In exception
BG1DU000R001	r. Danube from the border at Novo Selo to the border at Silistra	Prevent the deterioration of ecological potential. Protect, enhance and restore the surface water body. Prevent pollution and maintain good chemical status	Achieve the Al EQS for good ecological potential by 2021 (EQS adjusted for background concentration). Prevent deterioration in ecological potential for other quality elements. Prevent pollution and maintain good chemical status.	Achieve EQS for MZB, PB, Fish for good ecological potential by 2027. Prevent deterioration in ecological potential for other quality elements. Prevent pollution and maintain good chemical status.	Maintain the Al EQS for good ecological potential (*EQS adjusted for background concentration*). Maintain good ecological potential for the other quality elements. Maintain good chemical status.	Article 156c of the WFD (4.4. of the WFD) until 2027 - Art. Annex 5.1.2	In exception

The Kozloduy NPP generates industrial, domestic, storm non-radioactive wastewater and cooling water streams. They are collected in separate sewerage systems and treated in various treatment facilities and stations built on the territory of Kozloduy NPP. They are then finally discharged into the river Danube through the Main Drainage Canal (MDC), the Warm Drainage Canal 1 (WD-1) and the Warm Drainage Canal 2 (WD-2).

The nuclear power plant has been issued with all the necessary permits for water use and wastewater discharge under the Water Act.

In 2021, 3 planned inspections of Kozloduy NPP were carried out by RIEW-Vratsa, of which 2 in connection with control monitoring and sampling of wastewater and 1 complex inspection on environmental components and factors. The Company carries out its own non-radiation monitoring of surface water and wastewater and prepares reports, which are submitted to the Regional Inspectorate of Environmental Protection and Water Resources (RIEW-Vratsa) in due time. From the own and control monitoring performed so far, no exceedances of the individual emission limits in the permits issued to Kozloduy NPP have been found. The inspections carried out by RIEW-Vratsa confirm that the wastewater treatment complex at EP-2 operates in normal technological mode. The site sewerage system operates separately: domestic wastewater from the "clean zone" and domestic wastewater from the "controlled zone". The two effluent streams are treated separately in identical treatment facilities - reception tanks with screens and screws installed to remove coarse pollutants and mixers for agitation and homogenisation, then pumped to aerated biobasins and to secondary settling tanks. Radiochemical analysis is performed at the inlet and outlet of the WWTP on both wastewater streams. The effluent at the outlet of the WWTP is analysed periodically by the WWTP laboratory for BOD_5, COD, pH, suspended solids, nitrogen and phosphorus. The measured values are recorded in a logbook.

The area of SD "PRRAW-Novi Han" falls within the catchment area of Iskar River and more specifically in the middle parts of the catchment area of Gabra River, which is a left tributary of Lesnovska River. Other rivers in the area are Suha Gabra, Rekata, Tarnavska and Pastrilska rivers. These are small rivers and streams characterised by low runoff and a tendency to dry up in summer.

Table 4 below provides information on the status of the above rivers as part of the official water bodies under the 2016-2022 RBMP.

Table 4 - Information on the status of the water bodies in the area of SD "PRRAW-Novi Han", according to the RBMP 2016-2022

Surface water body code	Geographical description of the surface water body	HMWB/AWB	Environmental status/potential	Chemical status
BG1IS600R1416	r. Stari Iskar from the confluence of r. Makotsevska at Lesnovo to the confluence of the Eleshnitsa River at Elin Pelin	HMWB	4	U
BG1IS600R1015	r. Stari Iskar after Ognyanovo dam to the confluence of r. Makotsevska at Lesnovo		U	U

Legends to the table:

Classification of ecological potential	Colour code		class
	Artificial water bodies	Highly modified water bodies	
Good and Higher	Green with light grey lines	Green with dark grey lines	1-2
Medium	Yellow with light grey lines	Yellow with dark grey lines	3
Not good	Orange with light grey lines	Orange with dark grey lines	4
Bad	Red with light grey lines	Red with dark grey lines	5
Unknown	Grey with black lines		

Ecological status	1	2	3	4	5	U
class	excellent	good	moderate	bad	very bad	Unknown

Chemical state	2	3	U
class	good	not achieving good	Unknown

Table 5 below provides information on the targets set for the environmental protection of the rivers in the area of SD "PRRAW-Novi Han", according to the RBMP 2016-2022.

Table 5 - Information on the targets set for the environmental protection of rivers in the area of SD "PRRAW-Novi Han", according to the RBMP 2016-2022

Surface water body code	Geographical description of the surface water body	Target 2015	Target 2021	Target 2027	Target after 2027	Justification for the application of an exception to good status 2015	Target achieved/target not achieved
BG1IS600R1416	r. Stari Iskar from the confluence of r. Makotsevska at Lesnovo to the confluence of the Eleshnitsa River at Elin Pelin	Prevent the deterioration of ecological potential. Protect, enhance and restore the surface water body. Prevent pollution and maintain good chemical status	Achieve EQS for N-total, P-total, P-PO4, MP, MZB, PB, Fish for moderate ecological potential by 2021. Prevent deterioration in ecological potential for other quality elements. Prevent pollution and achieve good chemical status.	Achieve EQS for N-total, P-total, P-PO4, MP, MZB, PB, Fish for good ecological potential by 2027. Prevent deterioration in ecological potential for other quality elements. Prevent pollution and maintain good chemical status.	Maintain good ecological potential and good chemical status	Article 156c of the WFD (4.4. of the WFD) until 2027 - Art. Annex 5.1.2	In exception
BG1IS600R1015	r. Stari Iskar after Ognyanovo dam to the confluence of the r. Makotsevska at Lesnovo	Achieving good status in all indicators	Achieving good status in all indicators	Achieving good status in all indicators	Achieving good status in all indicators	not applicable	Unknown

The faecal and domestic wastewater generated by the domestic activities of the staff of SD "PRRAW-Novi Han" is collected in a separate sewer and discharged into a water-tight pit. The water is periodically pumped out of the pit and taken to the WWTP for treatment.

In 2022, RIEW-Sofia did not carry out any sampling and analysis of surface water in the area of SD "PRRAW-Novi Han".

The areas immediately surrounding Kozloduy NPP, NRRAW and SD "PRRAW-Novi Han" are not included in areas with significant potential flood risk (SPFR).

Radiation aspect

Kozloduy NPP

In the process of operation of Kozloduy NPP radioactive wastewater is generated from:

- first loop of nuclear reactors;
- spent nuclear fuel storage facilities;
- equipment decontamination facilities;
- ion exchange filter regeneration facilities;
- laundries for special clothing and sanitary passes;
- radiochemical laboratories.

These waters are processed (treated) in evaporation plants and ion exchange filter complexes in Special Corpuses - 1, -2 and -3. The treated water, referred to as 'disbalanced', is collected in intermediate collecting tanks and, after control for radioactivity, conveyed to Warm Drainage Canal 1 (WD-1) and Warm Drainage Canal 2 (WD-2) if the radioactivity is below the set control levels. Otherwise it is returned for reprocessing.

In 2022, RIEW-Vratsa has analyzed 110 water samples for the indicator of total alpha and total beta activity according to the NEMS from the territory of RL-Vratsa in the 3-100 km zone of Kozloduy NPP. No deviations from the usual values for total alpha and total beta activity were found at the monitoring points. Eight water samples were also taken for the determination of specific activity of natural and technogenic radionuclides (Cs 137) from the Danube at the harbour of the town of Kozloduy and the Danube at port Oryahovo. The samples were analysed by the LRI of the EEA. No deviations were found. In 2022, 24 samples were taken from the Danube at the port of the town of Oryahovo and wastewater from the discharge canal of Kozloduy NPP for tritium content. The samples were analysed by the Laboratory for Radiation Measurements (LRM) of the EEA and no deviations were found.

The radiological monitoring of surface waters of RIEW-Montana includes 10 points along the rivers Ogosta, Danube, Timok, Tsibritsa, Barziya, Botunya and Koritarska Bara. The monitored parameter was the total beta activity. For 2022, no deviations from the usual values of total beta activity were found.

Data from long-term monitoring in the Kozloduy NPP area show that background levels of natural radionuclides uranium, thorium and their daughter products are below the national average. The

reason for this is that the geological conditions in the area are mainly formed by the sedimentary deposits of the River Danube. The monitoring results also show that the activities of Kozloduy NPP, and in particular the discharged wastewater, do not have a significant impact on the aquatic ecosystems in the area.

SD "PRRAW-Novi Han"

Process wastewater is generated from SD "PRRAW-Novi Han" only periodically in case of receipt of radioactive waste with contaminated surfaces, emergencies with transport equipment, and from washing of laboratory equipment. The quantity of these waters is small and they are collected in buffer tanks where they remain until their activity levels drop to the set control levels. They are then conveyed to the tanks for liquid radioactive waste.

4.3.2. Groundwater

Non-radiation aspect

The area around Kozloduy NPP falls within the Lom Artesian Basin in the western part of the Mizian hydrogeological region. The upper subsurface zone of the Lom artesian basin in the area includes parts of groundwater bodies "Porous water in the Quaternary - between the Lom and Iskar rivers" with code BG1G0000QPL023, "Groundwater in the Neogene - Lomsko-Plevenska Depression" with code BG1G00000N2034 and "Groundwater in the Quaternary - Kozloduy Lowland" with code BG1G0000QAL005. The above groundwater bodies are underlain by powerful and regionally spread water impermeable layers (mainly clays of the Smirna Formation). These preclude a hydraulic connection between the groundwater bodies in the upper near-surface zone of the subsoil and the deeper aquifers, making infiltration of non-radiation contaminants and radionuclides into the deep groundwater impossible.

Table 6 below provides information on the status of the above groundwater bodies according to the RBMP 2016-2022.

Table 7 below provides information on the targets set for the environmental protection of the groundwater bodies in the Kozloduy NPP area according to the RBMP 2016-2022.

Table 6 - Information on the status of groundwater bodies (GWB) in the Kozloduy NPP area, according to the RMP 2016-2022

GWB code	name of the GWB	test: overall assessment of the chemical status of the GWB */good/poor/*	test: intrusion of saline or contaminated water */not applicable/good/bad/*	test: significant deterioration in the ecological or chemical status of surface water bodies caused by the transport of pollutants from the GWB */not applicable/good/poor/*	test: significant deterioration of groundwater-dependent terrestrial ecosystems due to the transport of pollutants from GWB */not applicable/good/poor/*	test: deterioration of groundwater quality for drinking water supply */not applicable/good/poor/*	general assessment of the chemical status of the GWB	Presence of a trend for improvement */yes/no/*
BG1G0000QPL023	Porous water in the Quaternary - between the Lom and Iskar rivers	good	none	good	good	good	good	no
BG1G00000N2034	Groundwater in the Neogene - Lomsko-Plevenska Depression	bad	none	no hydraulic connection to surface water	Not applicable	good	bad	no
BG1G0000QAL005	Groundwater in the Quaternary - Kozloduy Lowland	good	none	good	good	good	good	no

Table 7 - Information on the targets set for the environmental protection of the groundwater bodies in the Kozloduy NPP area according to the RBMP 2016-2022

Groundwater body code	Geographical description of the groundwater body	Target 2015	Target 2021	Target 2027	Target after 2027	Target 2015 achieved	Grounds for exemptions from good chemical status
BG1G0000QPL023	Groundwater in the Quaternary - between the rivers Lom and Iskar	Achieve and maintain good quantitative and chemical status	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Yes	-
BG1G00000N2034	Groundwater in the Neogene - Lomsko-Plevenska Depression	1.Achieve and maintain good quantitative status; 2. Prevent deterioration of chemical status	1. Maintain good quantitative status; 2. Prevent the deterioration of the chemical status of the NO3 indicator; 3.	1. Maintain good quantitative status; 2. Achieve and maintain good chemical status;	1. Maintain good quantitative and chemical condition;	exception (chemical state)	Article 156c of the Water Act until 2027.
BG1G0000QAL005	Groundwater in the Quaternary - Kozloduy Lowland	Achieve and maintain good quantitative and chemical status	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Yes	-

In 2022 RIEW-Vratsa has carried out regular monitoring of groundwater in connection with the own monitoring of Kozloduy NPP, Non-Radioactive Waste Disposal Landfill and State Enterprise "Radioactive Waste - Kozloduy Site". The companies regularly carry out their own non-radiation environmental monitoring, including groundwater monitoring, and prepare quarterly and annual reports, which are submitted to RIEW-Vratsa. There are no negative trends in groundwater quality resulting from the operation of the nuclear power plant.

In 2022, 6 groundwater samples were collected from monitoring points in the area of the NPP by RIEW-Vratsa. No deviations were found.

A characteristic feature of the area of SD "PRRAW-Novi Han" is that it is very poor in groundwater. Lithological and structural features do not create preconditions for the formation and permanent retention of groundwater aquifers. The area falls within the periphery of the groundwater bodies “Porous water in the Neogene-Quaternary - Sofia Valley” with code BG1G00000NQ030 and “Porous water in the Neogene - Sofia Valley” with code BG1G000000N033. Deeper below these groundwater bodies is the groundwater body "Fissure waters in the area of Erma and Iskar Rivers" with code BG1G00000K2038.

Table 8 below provides information on the status of the above groundwater bodies according to the RBMP 2016-2022.

Table 9 below provides information on the targets set for the environmental protection of the groundwater bodies in SD "PRRAW-Novi Han" area according to the RBMP 2016-2022.

Table 8 - Information on the status of groundwater bodies (GWBs) in the area of SD "PRRAW-Novi Han", according to the RMP 2016-2022

GWB code	name of the GWB	test: overall assessment of the chemical status of the GWB */good/poor/*	test: intrusion of saline or contaminated water */not applicable/good/bad/*	test: significant deterioration in the ecological or chemical status of surface water bodies caused by the transport of pollutants from the GWB */not applicable/good/poor/*	test: significant deterioration of groundwater-dependent terrestrial ecosystems due to the transport of pollutants from GWB */not applicable/good/poor/*	test: deterioration of groundwater quality for drinking water supply */not applicable/good/poor/*	general assessment of the chemical status of the GWB	Presence of a trend for improvement */yes/no/*
BG1G00000NQ030	Porous water in the Neogene-Quaternary - Sofia Valley	bad	none	no hydraulic connection to surface water	good	bad	bad	yes
BG1G000000N033	Porous water in the Neogene - Sofia Valley	bad	none	no hydraulic connection to surface water	Not applicable	good	bad	no
BG1G00000K2038	Fissure waters in the area of Erma and Iskar Rivers	good	none	no hydraulic connection to surface water	Not applicable	good	good	no

Table 9 - Information on the targets set for the environmental protection of the groundwater bodies in SD "PRRAW-Novi Han" area according to the RBMP 2016-2022

Groundwater body code	Geographical description of the groundwater body	Target 2015	Target 2021	Target 2027	Target after 2027	Target 2015 achieved	Grounds for exemptions from good chemical status
BG1G00000NQ030	Porous water in the Neogene-Quaternary - Sofia Valley	1.Achieve and maintain good quantitative status; 2. Prevent deterioration of chemical status; 3 . Reversing the upward trend;	1. Maintain good quantitative status; 2. Prevent deterioration in chemical status	1. Maintain good quantitative status; 2. Achieve the EQS for Fe and Mn for good chemical status by 2027 (EQS adjusted for background concentration) 3. Prevent deterioration in the chemical status of the other indicators	1.Maintaining good quantitative status 2. Maintain to EQS for Fe and Mn (less stringent target); 3.Maintain good chemical status for all other indicators	exception (chemical state)	Article 156c of the Water Act until 2027.
BG1G000000N033	Porous water in the Neogene - Sofia Valley	1.Achieve and maintain good quantitative status; 2. Prevent deterioration of chemical status	1. Maintain good quantitative status; 2. Prevent deterioration in chemical status	1. Maintain good quantitative status; 2. Achieve the EQS for Fe and Mn for good chemical status by 2027 (EQS adjusted for background concentration) 3. Prevent deterioration in the chemical status of the other indicators	1.Maintaining good quantitative status 2. Maintain to EQS for Fe and Mn (less stringent target); 3.Maintain good chemical status for all other indicators	exception (chemical state)	Article 156c of the Water Act until 2027.
BG1G00000K2038	Fissure waters in the area of Erma and Iskar Rivers	Achieve and maintain good quantitative and chemical status	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Maintain good quantitative and chemical condition	Yes	-

No groundwater sampling and analyses were carried out by RIEW-Sofia in 2022 in the area of SD "PRRAW-Novi Han".

The technologies and design solutions applied at Kozloduy NPP and SD "PRRAW-Novi Han" do not allow the input of radionuclides into the groundwater. This is confirmed by the results of the radiation monitoring of the groundwater around the two facilities.

Radiation aspect

There is no direct or indirect discharge of radionuclides to groundwater from Kozloduy NPP and SD "PRRAW-Novi Han". The monitoring carried out so far does not indicate any contamination of groundwater with radionuclides.

4.4. Geology

Kozloduy NPP

In tectonic terms, the Kozloduy NPP area is situated in the Mizian Platform. It is almost entirely covered by Quaternary sedimentary formations, which are of different genesis. The area itself has been extremely well studied and boreholes have identified the presence of sands, clays, marls, marls of Neogene age, clays and marls of Eocene age, Palaeocene limestones, dolomites of Jurassic age, Triassic brecciated conglomerates, limestones, dolomitised limestones, dolomites, sandstones, siltstones and argillites. The following lithostratigraphic units have been delineated, covering Palaeozoic, Mesozoic and Neozoic systems.

Geomorphologically, the area around the Kozloduy NPP falls in the western part of the Danube Highlands. The area comprises part of the interfluve of the Tsibritsa and Ogosta rivers and contains the following geomorphological forms - loess plateau (old burrows) cut by the tributary valleys of the Danube, Tsibritsa and Ogosta rivers, and river terraces.

The loess plateau has a flat topography and is genetically related to the so-called old accumulation-abrasion level. This level is cut into Pliocene (Lower Roman) clays. Its section is exposed along the high right bank of Tsibritsa River at the villages of Zlatiya, Valchedrum and Madan. Lake-river sediments, represented by basal gravel-sand and overlying gravel-clay complex, were deposited on the eroded Lower Roman clays. The top of the alluvium has an absolute elevation of 125-130 m and slopes towards the Danube. Above them is the loess complex represented by six loess horizons separated by buried soils. The loess plateau is cut by relatively small tributary valleys, two of which are tributaries of the Danube River, and the others are tributaries of Ogosta River, south of the village of Glozhene, at the villages of Butan, Kriva Bara, Bazovets, Gorna Gnoynitsa, etc. The tributary valleys were formed during the Pleistocene. They accumulate redeposited loess, which is less thick than at the plateau. From the plateau to the modern river bed of the rivers Tsibritsa, Ogosta and Danube, a spectrum of river terraces formed during the glacial Pleistocene and Holocene is found.

With regards to geology, the Kozloduy NPP area falls in the northwestern part of the Mizian Platform, respectively in the eastern periphery of the Lom Depression, which is a second order tectonic structural unit. The 1:50 000 scale geological map shows the distribution of Quaternary and Neogene

rocks exposed at the surface in the area. Deeper geological at a depth of up to about 5000 m is composed of sedimentary rocks of Palaeozoic, Mesozoic and Neozoic age.

SD "PRRAW-Novi Han"

The area belongs to the northeastern parts of the Lozenets Mountain. To the north it borders on the Sofia valley and to the south on the western parts of Ihtimanska Sredna Gora.

In tectonic terms, the area falls within the reach of the Srednogorskaya transition zone - Ihtimanski block and entirely within the reach of the northern parts of the Maritsa zone.

Paleozoic rocks make up a significant part of the area:

Ordovician - Represented by the Association of phyllitoid schists and phyllites. The association has a wide distribution in the area. It is exposed as an east-west trending belt, included between the rocks of the Gabrenska and Ravulianska Formations. The association is composed of phyllites, phyllitoid schists, chlorite schists, quartz-sericite and quartz-sericite-biotite schists. They are interbedded with varying thicknesses (1-80 cm) of mostly quartz. The foundations of SD "PRRAW-Novi Han" are placed in the rocks of this association.

Upper Carboniferous - In the subject area, the Upper Carboniferous is represented by the Baynevishka and Chervenigradska Formations:

- Baynevishka Formation - The Formation is composed of alternations of conglomerates, sandstones, siltstones and less commonly argillites, in grey, grey-green and grey-black colours. Rocks of this formation are exposed in the southern parts of the subject area. The maximum thickness of the formation is in the magnitude of 60-75 m.
- Chervenigradska Formation - The Formation is composed of alternation of disseminated conglomerates and sandstones, less commonly siltstones and argillites, characteristically coloured in brownish red, dark red and greyish red colours. In the area, the formation has a wide areal distribution mainly in its southern parts. Its thickness varies from 700 to 1300 m.

Upper Carbon-Perm:

- Gabrenska Formation - The Formation is mainly composed of siltstones (up to 45%), conglomerates and gravels (up to 5%), some argillites and occasional limestones. It is characterized by increased carbonation, expressed by the frequent presence of calcareous jointing or the presence of carbonate concretions and the aforementioned thin interbeds of impure limestone. Outcrops of the formation occur immediately south of SD "PRRAW-Novi Han". The thickness of the formation ranges from 380 to 550 m.

Permian - In the subject area, the Permian is represented by the Tarnavska and Ravulianska Formations:

- Tarnavska Formation - The Formation is composed of massive brecciated conglomerates (less commonly breccias), gravelsites and coarse-grained sandstones. The Formation has a local, banded distribution in the northwestern parts of the area. Its thickness varies from 160 to 200 m.

- Ravulianska Formation - The Formation is composed primarily of red, pinkish-red and brick-red sandstones with interbeds of siltstones, lenses of gravelsites and occasional argillites. The rocks are located parallel to the northern boundary of the Ordovician rocks (in which SD "PRRAW-Novi Han" is placed). The maximum thickness of the formation in the area reaches 150-250 m.

4.5. Soils and land use

In soil-geographical terms, the soil cover of Bulgaria represents a complex of soil types, combining representative elements for different parts of the continent. The widespread types with a mid-European nature are Luvusols and Planosols; with a steppe/forest nature are Chernozems and Phaeozems; with a boreal nature - brown mountain forest soils.

Spatially and geographically, the land cover is characterised by the formation of horizontal (latitudinal) zones and altitudinal belts in the mountains, related to the regular changes of climatic conditions and vegetation, and also to the specific exchange and balance of substances.

Kozloduy NPP

Kozloduy NPP is located in the Middle Danube soil province (after Ninov, 97). This province covers almost half of the chernozems in Bulgaria. Carbonate and typical chernozems dominate, but gley and loess soils are also found. Also characteristic is the occurrence of fayose soils (dark grey forest soils and podzolic chernozems). The main soil-forming rocks, on which mainly sandy loam and sandy clay loam soils are located, are carbonate materials, conglomerates and sandstones.

Carbonate chernozems - occupy a 10-25 km wide strip along the Danube river bank. The sum of the fractions of particles smaller than 0.01 mm varies from 9.0 to 24.0%. The humus content ranges from 0.17 to 4.43 t/ha, they are poorly to well stocked with nitrogen and phosphorus, and the soil reaction is slightly alkaline. The mechanical composition in the vicinity of the Danube is light to medium sandy loam and gradually becomes heavy sandy loam with the distance from the river. Carbonates are present throughout the soil profile, increasing in depth. These soils are characterised by good permeability, but their water regime is not very good due to prolonged droughts in summer and significant unproductive moisture evaporation.

Typical chernozems - There are relatively fewer typical chernozems in the area, located to the south of the carbonate chernozems and due to the hilly topography, some of these are also eroded. For this reason, the thickness of the humus horizon and the soil profile are quite varied - 50 - 60 cm and 90 - 110 cm for the uneroded and slightly eroded ones and 10 - 20 cm and 20 - 50 cm for the moderately and severely eroded ones, respectively. The transition between the different horizons is gradual. A characteristic feature is that the carbonates are transported to a certain depth, but always within the humus-accumulate horizon. The carbonate mycelium is deposited in them at a depth of 45-100 cm. There are isolated stands of natural oak and acacia.

Rich alluvial soils are found on the floodplain terraces of the rivers in the area (Ogosta and Skat). They are formed on alluvial deposits under the influence of meadow vegetation and nearby groundwater. The soil profile is poorly formed. The thickness of the humus horizon ranges from 10 to 70 cm and has a grainy-crumbly, unstable structure. River alluvial materials then follows with an abrupt transition. The soil reaction is slightly acidic to alkaline. The soils are loose, with good aeration, low stickiness and low surface evaporation.

As a consequence of the periodic flooding of the Danube and the development of moisture-loving vegetation, which helps to retain soil moisture, marshy and peaty-marshy soils develop in low areas. These soils have a strong peat horizon and formed gley horizons. They have a large amount of clay particles - the sum of fractions smaller than 0.01 mm is 22.21% to 46.10%. The reaction is alkaline - 7.15 to 7.30 pH. The humus content is 1.48 t/ha and the nitrogen content is 0.134 t/ha. These are soils of high potential fertility.

The soils in the area are fertile and used mainly for agricultural purposes, with cereal cultivation predominating.

In terms of erosion, the lands and soils in the monitored area around Kozloduy NPP fall into the groups of uneroded, slightly eroded and moderately eroded soils. Due to the openness of the terrain and the characteristic north-easterly and north-westerly winds, soils in the area, mainly agricultural soils used for annual crops, are subject to deflation mainly in winter when they are without vegetation cover.

There is no evidence of acidified soils in the area. The genetic soil types present are naturally alkaline, slightly alkaline or neutral.

No secondary waterlogging or siltation of the genetic soil types was observed due to their good filtration capacity. Although they are actively used for agricultural purposes, there is no noticeable overcompaction leading to a deterioration in their density and filtration properties. On a small part of the soils in the vicinity of the Danube are observed waterlogged and marshy soils contaminated with construction waste. Siltation here is caused by natural processes influenced by the river. Danube and its tributaries.

SD "PRRAW-Novi Han"

SD "PRRAW-Novi Han" is located in the Sofia-Kraishtenska soil province. The province is characterized by its diverse topography, which determines the significant differences in the soil cover. The low plain parts are covered with tarns and the numerous river courses with their floodplain terraces imply the development of alluvial soils of different type and composition. Cinnamic and silty soils are also present, but in more limited areas in the slightly higher parts near the mountain slopes.

The higher foothill and mountain parts are mainly covered with shallow soils - ranchers, ranges. Brown forest soils are also widespread.

Soils in the Sofia field are mainly used for agricultural purposes - tar, Cinnamic and alluvial soils. The soils on the slopes are considerably poorer and unsuitable for agricultural purposes, the vegetation cover is mainly forest.

The area of the repository is characterised by glaciated cinnamic soils and light brown forest soils.

Cinnamic soils, lentic subtype - characterized by their division into two subtypes: cinnamic and cinnamic (lentic) according to the FAO classification. Their humus-accumulating horizon is 25-30 cm thick, with a strong crumbly-grainy structure, moderate humus content, and a neutral reaction in the near-surface horizon.

Brown mountain-forest soils, subtype light and common brown forest soils - developed in a moderately cool and humid climate, formed under oak-beech forests. They are characterised by a profile depth of 40-60 cm, low humus horizon, weak acid reaction, low humus reserves.

4.5.1. Non-radiation aspect

Kozloduy NPP

In terms of degradation processes, the most important is wind erosion, which occurs most often on arable land where annual crops are grown and during a significant part of the year, the soils have no permanent vegetation cover. Water erosion is not very pronounced due to the flat nature of the terrain, but it exists nonetheless and is again characteristic of agricultural areas. Its main manifestations are during periods of heavy rainfall combined with young or absent vegetation cover.

According to the annual reports on the state of the environment of the EEA and RIEW Vratsa and RIEW Montana there is no evidence of soil contamination with heavy metals and petroleum products.

SD "PRRAW-Novi Han"

Some of the soils in the Sofia-Kraisthenska province are under pressure from various industrial sources, the largest of which is the now decommissioned metallurgical complex Kremikovtzi. The long-standing activities of this enterprise have led to excessive concentrations of heavy metals in certain areas of the Sofia field. In the area of the village of Novi Han, where SD "PRRAW-Novi Han" is located, there are no large industrial enterprises in operation, but there are both active and closed mining sites of the ore mining industry, including the uranium mine near the village of Gabra.

4.5.2. Radiation aspect

Radioactive contamination of soils can occur, in addition to direct contamination, through contact with contaminated water and through direct precipitation of radionuclides from the atmosphere.

Kozloduy NPP

RIEW Vratsa

In 2022, 62 soil samples and 15 sediment samples were collected from the monitoring points of the NEMS in the 3-100 km zone of Kozloduy NPP by RIEW Vratsa. The gamma-spectrometric analysis of the samples shows that there are no deviations in the measured specific activity of radionuclides compared to those typical for the region.

In 2022, 110 water samples were analysed for total alpha and total beta activity by RIEW Vratsa from the territory of RL-Vratsa in the 3-100 km zone of Kozloduy NPP. No deviations from the usual values for total alpha and total beta activity were found at the monitoring points. Eight water samples were taken for the determination of specific activity of natural and man-made radionuclides (Cs^{137}) from the Danube at the harbour of Kozloduy and from the river Danube at the harbour of Oryahovo, as well as 6 groundwater samples from the monitoring points around Kozloduy NPP. The samples were analysed by the LRI of the EEA. No deviations were found.

In 2022, 24 samples were taken from the Danube at the harbour of Oryahovo, wastewater from the outlet canal of Kozloduy NPP, as well as 6 groundwater samples from the monitoring points around

Kozloduy NPP for tritium content. The samples were analysed by the LRI of the EEA. No deviations were found.

Regarding the air for the purpose of monitoring the presence of radionuclides in 2022, RIEW Vratsa collected 25 aerosol filters from the automatic measuring station "Railway Station Vratsa". No exceedances of the background volumetric specific activity of the investigated radionuclides were found.

RIEW Montana

Radiological monitoring of uncultivated soils includes: radiological monitoring in areas with potential environmental contaminants with radioactivity - includes 10 points in 3-30km zone of Kozloduy NPP, and radiological monitoring of sediments includes 5 points along the rivers Ogosta, Danube, Timok, and Koritarska Bara. No change in the point-specific values of natural and technogenic radionuclides is detected in the samples analysed in 2022.

The radiological monitoring of surface waters includes 10 points along the rivers Ogosta, Danube, Timok, Tsibritsa, Burziya, Botunia and Koritarska Bara. The monitored parameter is the total beta activity. For 2022 it is in the range 0.098 - 0.277 Bq/l.

The values of the gamma radiation background registered in 2022 in the three LMS (local monitoring stations) - in Montana, Vidin and Valchedram do not differ from the typical ones for the region.

In 2022, 27 aerosol samples were collected and analysed for radiological monitoring of ambient air with a fixed station. No excess concentrations of natural and technogenic radionuclides were recorded.

The results of the radiological environmental monitoring in 2022 show that the gamma radiation background is within the typical background values for the country. No increases in the specific activities of the investigated natural and technogenic radionuclides in ambient air, water and soil were observed at the monitoring points within the scope of RIEW Vratsa and RIEW Montana. The values do not differ from those recorded in previous years.

According to the data above from water and air analyses in the area, there is no contamination of soils with radionuclides entering through contaminated water or by direct atmospheric deposition.

SD "PRRAW-Novi Han"

No exceedances due to the operation of the repository have been detected in the area of SD "PRRAW-Novi Han".

4.6. Landscape

Landscape is a key element in the process of achieving sustainable development based on balance and harmony between social needs, economic activity and the environment. The visual assessment of the landscape identifies natural habitats, as habitats largely define the landscape of an area. Habitat assessment is thus a determining factor in the assessment of natural landscapes. Additionally, anthropogenic elements and the extent to which they disturb the naturalness of the landscape amenity are assessed. The system of classification and typology of landscapes in Bulgaria developed by A. Velchev, N. Todorov, R. Penin and M. Konteva is used.

The formation of the systemic integrity of landscapes is justified by the interaction and functional dependencies between its constituent geo-components - rocks, air, water, plants, animals, soils.

Kozloduy NPP

Kozloduy Municipality is located in the Pridunav-Dobrudzhan landscape area, Kozloduy District, where steppe and forest-steppe complexes predominate, represented by two main landscape types - plain and hilly temperate semihumid and plain temperate semiarid. Along the Danube and its tributaries are distributed azonal type of hydromorphic and subhydromorphic landscapes. There is a gradual transition in the horizontal structure of these types, the contours being linear with many curves and striations. Often their homogeneity is broken by different types of azonal landscapes. There have been significant changes in the structure caused by anthropogenic activity. Landslides and landscapes artificially afforested with deciduous and coniferous vegetation have a limited distribution. In general, the complexity of the horizontal structures is not very significant and, for this reason, individual landscape types and their morphological parts occupy large areas.

Vertically, the structure of the plain semihumid landscapes shows increased power. Typically, it consists of 2 to 4 subsurface geohorizons and 4 to 6 aboveground ones. Meadow and steppe natural-territorial complexes have a simpler structure, with the aboveground geohorizons.

SD "PRRAW-Novi Han"

Elin Pelin Municipality is located in the Middle Bulgarian Landscape Area, Kraishtensko-Ihtimanski District, where a number of specific landscape types are characteristic. Horizontally, the district is influenced by geomorphological conditions, geological structure and the change of climatic conditions from north to south. Of particular importance for the complexity of the structure are also hypsometric differences and the different direction of the mountain ranges and valleys. The landscapes in the PRRAW area are of the lowland, erosional-sedimentary type with oak woodland (Q. frainetto and Q. cerris) and shingle.

According to the preliminary draft of the Master Plan of Elin Pelin municipality, the forests on the territory of the municipality is 16888 ha of which 2805 ha are in the Novi Han municipality. The forest vegetation is represented by coniferous and deciduous tree species and shrubs. Of the conifers there are white and black pine, fir, etc., and of the broadleaves - winter oak and beech, and in the lower parts - oak, blaugun, hornbeam, acacia, silver lime, etc. Of the woody species, beech, winter oak, blackthorn, sycamore, red oak, black pine, white pine, acacia, etc., predominate.

4.7. Biodiversity

Biodiversity is considered in radiation and non-radiation aspects

4.7.1. Flora

Non-radiation aspect

General characteristics of flora and vegetation in Bulgaria

Flora

Bulgaria belongs to the Holarctic floristic space. The complex geological history of the country, the mountains with highly dissected topography, the river valleys and basin fields, the influence of the sea basins from the east and south determine a diverse climate, create conditions for diverse vegetation and rich flora. The territory of the country is included in three vegetation-geographical regions: the European Broadleaf Forest Region, the Eurasian Steppe and Forest Steppe Region and the Mediterranean Sclerophyll Forest Region (Red Data Book of the Republic of Bulgaria, 2011). For the purposes of floristic studies, Bulgaria is divided into 20 floristic regions and 14 sub-regions, whose boundaries roughly follow their geographical and phytogeographical limits: Black Sea coast (North, South), Northeastern Bulgaria, Danube Plain, Pre-Balkan, Balkan Mountains (East, Middle, West), Sofia region, Znepol region, Vitosha region (Vitosha and Plana), Western Border Mountains, Struma Valley (North, South), Belasitsa, Slavyanka, the valley of the river Mesta, Pirin (Southern, Northern), Rila, Sredna Gora (Western, Eastern), Rhodopes (Western, Middle, Eastern), Thracian Lowland, Tundzhan Hills Plain, Strandzha (Yordanov, 1966).

According to Petrova et al. (2018), 4064 species of ferns and seed plants occur in Bulgaria. Depending on their morphological proximity and relationships, these species belong to 921 genera and 159 families.

The majority of the species in our flora (3330 according to the Red Book of the Republic of Bulgaria, 2011), are spontaneously distributed in the plains and mountains of the country in more or less natural or human-altered habitats. They form the group of autochthonous plants. More than 500 species ot 93 families, mainly perennial herbaceous plants, shrubs and trees of this group, are dominant and subdominant in plant communities. These are mainly representatives of the families of cereals, acid grasses, legumes, complex flowering plants, rosaceae, etc.

More than 500 species of trees, shrubs and herbaceous plants are restricted in the Bulgarian flora. Some of them are Bulgarian or Balkan endemics, others are rare plants, remnants of ancient floras, or species whose main ranges are outside Bulgaria. In Bulgaria they have few populations, sometimes in single localities, often in the border floristic regions of the country or in the high mountains. Many of these species are included in the Red Data Book of the Republic of Bulgaria (2011) and protected by the Biodiversity Act.

About 560 species are weeds and ruderals, most widespread in places altered by human activity. Some of them (Avena fatua (wild oat), Capsella bursa -pastoris (shepherd's purse), Caucalis platycarpos (babinets), Galium aparine (patch), Papaver rhoeas (seed poppy), etc.) have been in their present habitats for millennia, linked to the development of human culture since the early settlement of Bulgarian lands. Others (Datura stramonium, Galinsoga parviflora, Oxalis dillenii, etc.) came later. They also include the so-called invasive species which disperse rapidly and occupy vacant habitats or displace native species.

The biological spectrum of the Bulgarian flora is dominated by herbaceous perennial and annual plants, about 3540 species in total. Trees (88 species), shrubs (236 species) and semi-shrubs (35 species) form the group of phanerophytes.

Relict and endemic plants occupy a special place in the floristic diversity of the country. Preglacial (tertiary) relict species are ancient representatives of arctothertiary flora, preserved in our lands since more than two million years ago. The specificity of the Bulgarian flora is largely determined by Bulgarian and Balkan endemic plants. These are 498 species or 12.8% of the country's species richness. Bulgarian endemics are 186 species, Balkan - 312.

The Red Book of the Republic of Bulgaria, Volume I includes a total of 808 species, distributed as

follows: algae - 6 species (critically endangered - 5, endangered - 1); mosses - 102 species (liverworts: critically endangered - 10, endangered - 17, vulnerable - 6; leaf mosses: Critically Endangered: 17, Endangered: 25, Vulnerable: 27); ferns: 8 species (Regionally Extinct: 1, Critically Endangered: 6, Vulnerable: 1); gymnosperms: 4 species (Critically Endangered: 2, Vulnerable: 2); cover plants - 539 species (extinct - 1, regionally extinct - 11, critically endangered - 197, endangered - 292, vulnerable - 38 selected species - Bulgarian and Balkan endemics included in Annex 3 of the Biodiversity Act and the Habitats Directive). The object of protection (included in Annex 3 of the Biodiversity Act) are 574 species of vascular plants. 21 species of vascular plants and mosses are protected in protected areas (listed in Annex 2 of the Biodiversity Act).

The List of Medicinal Plants covered by the provisions of the Medicinal Plants Act (MPA) (Annex to Article 1(2) of the MPA) includes 785 species. The MPA regulates the management of the conservation and sustainable use of medicinal plants, including the collection and purchase of the herbs obtained from them. Each year, by order of the Minister of the Environment and Water, individual species of wild medicinal plants are placed under a special regime of conservation and use when their biodiversity or resources show a persistent downward trend or are in danger of such a trend.

Vegetation

According to the Red Book of the Republic of Bulgaria (2011), from a vegetation-geographical point of view, the vegetation cover of Bulgaria is a complex of communities of boreal, mid-European (most widespread), steppe (second most widespread), arctic, alpine, Balkan (including Mediterranean) and local character. The vegetation consists of representatives of all ecological groups in relation to the water factor. Species vary widely in terms of thermal factor and edaphic conditions. The acidity of bedrock and soils is in some cases among the primary conditions for the development of one or other plant species and determines the structure of phytocenoses.

In the mountains of Bulgaria are developed all the belts distinguished in Central Europe, except the Nivalian. There is an excellent alpine belt in the Rila Mountains. In Pirin it is more limited, and elsewhere it occurs only fragmentarily. The grass and shrub vegetation of the alpine and subalpine belts is dominated by not a few Balkan endemics and also some local endemics.

Kozloduy NPP

Primary forest-steppe vegetation in general in the Danube Plain, as well as in the Kozloduy NPP area, is highly modified and preserved only along river banks, on slopes of heights and plateaus or in places where conditions do not allow the use of soils for agricultural purposes. The preserved forest communities are composed of swamp oak, oak, virgilia, summer oak and pedunculate oak. Less frequent are stands of hemlock, Norway and Tartarian maple, elm and linden. Along the rivers, and especially on the Danube islands, riparian communities are preserved, mainly involving various species of poplars and willows. The Kozloduy NPP area is dominated by arable land (82.7%). Grassland occupies about 4.7%, grassland and woodland about 2% each (Corine Land Cover, 2018). Details of the land cover are given in Table 10.

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Table 10 - Land cover in the Kozloduy NPP area (CLC, 2018)

Land cover type	Area (ha)	Area (%)
Uncultivated arable land	127246.45	74.18
Agricultural land with significant areas of natural vegetation	10494.37	6.12
Settlements with free development	9255.76	5.40
Grasslands	8021.10	4.68
Complexes of fragmented agricultural land	3562.71	2.08
Deciduous forests	3442.74	2.01
Water currents	3304.53	1.93
Transitional tree and shrub vegetation	3115.92	1.82
Industrial or commercial sites	1484.43	0.87
Vineyards	538.65	0.31
Inner marshes	495.02	0.29
Water areas	245.13	0.14
Fruit and berry plantations	147.00	0.09
Quarries and open-pit mines	104.70	0.06
Beaches, dunes, sands	37.26	0.02
Places for sport and recreation	35.52	0.02
Total	**171531.30**	**100.00**

According to Bondev (1991), the area is dominated by agricultural areas created in place of mixed forests of Acer, Virgilian Oak, Field Elm and Field Ash. Outside of the cultivated areas, mesic-mesic grassland formations and stands of Robinia pseudoacacia are most common. The few remaining woodlands are of black alder, willows and poplars, sycamore, blackthorn and honeysuckle. Data for the area are summarised in Table 11.

Table 11 - Vegetation in the Kozloduy NPP area (Bondev, 1991)

Vegetation	Area (ha)	Area (%)
Agricultural areas on the site of mixed forests of oak (Q.cerris) and virgilia oak	124563.06	73.88
Agricultural areas in place of forests of field elm (Ulmus minor Mill.), field ash	20592.47	12.21
Mesocerothermic grass formations with bulbous meadow grass (Poaeta bulbosae), grassland ryegrass	9194.52	5.45
Artificial plantations of Acacia (Salcum) (Robinia pseudoacacia l.)	5067.90	3.01
Forests of black alder (Alneta glutinosae), willows (Saliceta albae, Saliceta fragilis) and poplars (Populeta nigrae, P.albae)	2272.78	1.35
Swamp and wetland hygrophytic (in places also hydrophytic) vegetation	1606.34	0.95
Mixed forests of Quercus cerris L., Q. pubescens W i l l d. and Q. virgiliana	1392.21	0.83
Xerothermic grass formations with predominance of Dichantieta ischaemii, bulbous meadow grass	1330.26	0.79
Agricultural areas on the site of mixed forests of hornbeam (Q. cerris) and blackthorn (Q. frainetto)	1127.33	0.67
Mixed forests of Quercus cerris L. and Q. frainetto	645.77	0.38
Mixed forests of Quercus cerris L. and Fraxinus ornus L.	485.18	0.29
Mixed forests of Fraser fir (Fraxinus ornus L.), silverleaf linden, elm and maple in places	315.61	0.19
Total	**168593.42**	**100.00**

There are 17 types of natural habitats of European importance, listed in Annex 1 of the BDA. They cover a total of 6433.36 ha, or about 3.8% of the area under consideration. Natural dystrophic lakes and rivers with muddy banks with Chenopodion rubri and Bidention p.p. are the most extensive. Of the forests, the most widespread are alluvial forests with Alnus glutinosa and Fraxinus excelsior. Data for the area are summarised in Table 12.

Table 12 - Natural habitats in the Kozloduy NPP area (MoEW, 2013)

Type	Area (ha)	Area (%)
3260 Natural dystrophic lakes	1554.75	24.17
3270 Rivers with mud banks with Chenopodion rubri and Bidention p.p	1324.54	20.59
91E0 *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	937.94	14.58
6250 * Pannonian loess steppe grasslands	929.69	14.45
3150 Natural eutrophic lakes with vegetation type Magnopotamion or Hydrocharition	595.44	9.26
6510 Lowland hay meadows	318.29	4.95
2340 *Pannonian inland dunes	251.38	3.91
1530 * Pannonian salt steppes and salt marshes	153.4	2.38
91I0 *Euro-cu6upcku steppe forests with Quercus spp	134.07	2.08
6430 Hydrophilous communities of tall grasses in the plains and in the mountain to alpine belt	120.72	1.88
91M0 Balkan-Pannonian ceric-juniper forests	42.44	0.66
91F0 Riparian mixed forests om Quercus robur, Ulmus laevis and Fraxinus excelsior or Fraxinus angustifolia along large rivers (Ulmenion minoris)	32.34	0.5
91Z0 Mississippian forests of silverleaf lime	14.49	0.23
92D0 Southern riparian galleries and scrub (Nerio-Tamaricetea and Securinegion tinctoriae)	13.63	0.21
9180 *Mixed forests of the Tilio-Acerion alliance on sipes and steep slopes	5.18	0.08
91G0 *Pano forests with Quercus petraea and Carpinus betulus	3.24	0.05
91H0 *Pano forests with Quercus pubescens	1.83	0.03
Total	**6433.36**	**100.00**

The area falls within the Danube Plain floristic region. According to Angelova et al. (2008), a total of 1560 species of vascular plants (excluding mosses) belonging to 553 genera, 118 families and 5 divisions have been reported to be distributed in this floristic region so far. The higher flora of the Danube Plain includes representatives of 76.6% of the families in Bulgaria, 61.5% of the genera and 40.5% of the species diversity in the country. The largest proportion (98.6%) is represented by cover plants (Magnoliophyta), with 106 families, 538 genera and 1538 species.

There are 7 species of protected plants in the Kozloduy NPP area (Red Book of the Republic of Bulgaria (2011). The species and their conservation status are given in Table 13.

Table 13 - Red Book plants occurring in the area of Kozloduy NPP

Type	Conservation status
Aloe vera stratiotes *Stratiotes aloides L.*	Critically Endangered [CR A1c; B2ab(i)]. BDA.
Water rose, water lily, mermaid *Nymphaea alba L.*	Endangered [EN B2ab(i,ii,iii,iv)]. BDA.
Wavy wedge *Astragalus dasyanthus Pall.*	Critically Endangered [CR A4c; B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv); C1]. IUCN(R), BDA.
Elderberry *Galanthus elwesii Hook.*	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii); C2a(i)]. BDA.
Yellow water rose, bird's-foot trefoil *Nuphar lutea (L.) Sm.*	Endangered [EN B2ab(i,ii,iii,iv)]. BDA.
Rumelian cornflower *Centaurea rumelica Boiss.*	Endangered [EN B1ab(iii)+2ab(iii)]. BDA. Balkan endemic.
Red Viper *Echium russicum J.F. Gmel.*	Vulnerable [VU B2ab(iii)]. DH.

According to the data collected under the project "Mapping and identification of the conservation status of natural habitats and species - Phase I" (MoEW), one plant species of Directive 92/34/EEC occurs in the area (the aim of the project is to map and identify the conservation status of natural habitats and species under Directive 92/34/EEC). This is red viper's-bit (Echium russicum).

There are no ancient trees from Kozloduy municipality included in the register of ancient trees of EEA.

SD "PRRAW-Novi Han"

The area of SD "PRRAW-Novi Han" falls within the territory of the floristic region Western Sredna Gora. The 5 km buffer is dominated by forest areas (60%), transitional tree-shrub communities occupy about 7%. Arable areas cover about 16% of the area, grassland habitats about 8% (Corine Land Cover 2018). Land cover details are given in Table 14.

Table 14 - Land cover in the area of the SD "PRRAW-Novi Han" (CLC, 2018)

Land cover type	Area (ha)	Area (%)
Deciduous forest	4050.00	48.42
Grasslands	698.27	8.35
Agricultural land with significant areas of natural vegetation	693.37	8.29
Transitional tree and shrub vegetation	614.29	7.34
Uncultivated arable land	609.69	7.29
Mixed forests	584.81	6.99
Coniferous forests	348.72	4.17
Settlements with free development	326.16	3.90
Quarries and open-pit mines	315.68	3.77
Industrial or commercial sites	69.36	0.83
Natural lawns	33.44	0.40
Water bodies	10.47	0.13
Complexes of fragmented agricultural land	7.59	0.09
Fruit and berry plantations	1.72	0.02
Total	**8363.58**	**100.00**

According to Bondev (1991), the forests in the area are dominated by gorun and blaugun. Together they occupy about 4081.28 ha (nearly 50%) of the territory. Of the herbaceous cenoses, xerothermic grass formations dominate with a predominance of belisma (Dichantieta ischaemii) occupying 1583.41 ha (19%). The data for the area are summarised in Table 15.

Table 15 - Vegetation in the area of SD "PRRAW-Novi Han" (Bondev, 1991)

Vegetation	Area (ha)	Area (%)
Blaugurn (Querceta frainetti) L.)	2961.96	35.38
Xerothermic grassland formations dominated by Dichantieta ischaemii	1583.41	18.91
Gorse (Querceta dalechampii)	1119.32	13.37
Agricultural areas in place of swamp forests (Q. frainetto Tep.)	966.88	11.55
Mixed forests of Quercus cerris L., Q. frainetto T e n and Carpinus orientalis M i l l.	634.61	7.58
Forests of common beech (Fageta sylvaticae) in the Balkan Mountains in places with laurel trees	583.35	6.97
Hornbeam forests (Querceto-Carpineta betuli)	221.14	2.64
Pineta sylvestris forests	190.54	2.28
Artificial plantations of black pine (Pinus nigra A r n.)	65.05	0.78
Agricultural areas in place of forests of field elm (Ulmus minor M i l l.), field ash	35.61	0.43
Xeromesophytic and xerothermic grass formations (Festuceta vallesiacae, Festuceta stojanovii)	11.07	0.13
Total	**8372.94**	**100**

The area contains 6 types of natural habitats of European importance, listed in Annex 1 of the BDA. They cover a total of 2536.47 ha, or about 32% of the area under consideration. The largest area is represented by oak-hickory forests of the Galio Carpinetum type. The remaining habitat types are represented by limited areas (Table 16).

Table 16 - Natural habitats in the area of SD "PRRAW-Novi Han" (MoEW, 2013)

Type	Area (ha)	Area (%)
9170 Oak and hornbeam forests of the Galio Carpinetum type	2483.34	97.91
9130 Beech forests of Asperulo-Fagetum type	22.00	0.87
9150 Thermophilous beech forests (Cephalanthero-Fagion)	17.88	0.70
91E0 *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	10.99	0.43
6110 Open calciphilous or basophilous grassland communities of Alysso-Sedion albi	1.19	0.05
91H0 *Pano forests with Quercus pubescens	1.01	0.04
Total	**2536.4**	**100.00**

In the UTM quadrats (10x10 km), falling within the area of the SD "PRRAW-Novi Han" and its surroundings, potentially occur 34 species of protected plants (Red Book of the Republic of Bulgaria (2011). The species and their conservation status are given in Table 17.

Table 17 - Plants from the Red Book of the Republic of Bulgaria, occurring in the area of SD "PRRAW-Novi Han"

Type	Conservation status
Austrian Pleurosperm *Pleurospermum austriacum (L.) Hoffm.*	Critically Endangered [CR A2ce; B2ab(i,ii,iii,iv,v)]. BDA.
Aromatic hydneleum *Hydnellum suaveolens (Scop.: Fr.) P. Karst.*	Endangered [EN B1ab(i,iii,iv)].
Balkan Vespers *Hesperis theophrasti Borbás*	Vulnerable [VU B 1ab(ii,iii)+2ab(ii,iii)]. BDA. Balkan endemic.
White-faced cleaner *Stachys leucoglossa Griseb.*	Endangered [EN B2ab(ii); C2a(i)]. Balkan endemic.
Garvanova gradonia *Graddonia coracina (Bres.) Dennis*	Endangered [EN B2ab(i,ii,iv)].
Small bubble *Utricularia minor L.*	Endangered [EN B2ab(ii,iii,iv,v)]. BDA.
Elderberry *Galanthus elwesii Hook.*	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii); C2a(i)]. BDA.
Greenish plushberry *Silene chlorantha (Willd.) Ehrh.*	Critically Endangered [CR B1ab(ii)].
Calopsis palm root *Dactylorhiza calopissii E. Nelson*	Critically Endangered [CR B1ab(iii)+2ab(iii)]. IUCN(R), DH, BDA, CITES(2). Balk.
Carpathian Tozia *Tozzia alpina subsp. carpathica Dostál*	Vulnerable [VU B 1ab(iii)+2ab(iii)]. BDA, DH(II).
Buttercup lesson *Bupleurum ranunculoides L.*	Critically Endangered [CR B1ac(i,v)+2ac(i,v)]. BDA.
Small hedgehog head *Sparganium Minimum Fries*	Critically Endangered [CR A1c; B2ab(i)]. BDA.
Milan's cleaner *Stachys milanii Petrovic*	Endangered [EN A3c; B2ab(ii); C2a(i)]. Balkan endemic.
Mesquite *Dactylorhiza incarnata (L.) Soó*	Endangered [EN B2b(ii,v)c(iv)]. BDA, CITES(2).
Perennial cricket *Swertia perennis L.*	Endangered [EN B2ab(ii,iii,iv)]. Main relict.
Low violet *Viola pumila Chaix*	Endangered [EN A4c; B2ab(iv)]. BDA.
Common Yew *Taxus baccata L.*	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v); C2a(i)]. BDA.
Five-pointed willow *Salix pentandra L.*	Critically Endangered [CR B1ab(ii); C2a(ii); D]. BDA. Relict.
Spotted gentian *Gentiana punctata L.*	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii); C2a(i)]. BDA.
Mountain plover *Valeriana montana L.*	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v); C2a(i)]. BDA.
Mountain sycamore, mountain ash *Acer heldreichii Orph.*	Vulnerable [VU B 2ab (ii)]. BDA. Balkan endemic.
Vertebrate overwater *Elatine alsinastrum L.*	Critically Endangered [CR A1c; B2ab(i)]. BDA.
Purple napkin *Epipactis purpurata Sm.*	Endangered [EN B2ab(ii,iv)]. BDA, CITES(2).
Bee Beetle *Ophrys apifera L.*	Endangered [EN C2a(i);D]. BDA, CITES(2).
Perchovka *Himantoglossum caprinum Spreng.*	Vulnerable [VU B2b(ii,iv)c(iv)]. BDA, DX(IIb), BC, CITES(2).
Pink (self-watering) peony *Paeonia mascula (L.) Mill.*	Endangered [EN B2ab(v)]. BDA. Relict.
Ruby clover *Trifolium rubens L.*	Critically Endangered [CR A3c; B1ab(iii)+2ab(i);C2a(ii)]. BDA.
Snow snowdrop	Endangered [EN B1ab(ii,iii,iv,v)+2ab(ii); C2a(i)]. BDA.

Type	Conservation status
Galanthus nivalis L.	
Leaf-covered strepthopus *Streptopus amplexifolius (L.) DC.*	Endangered [EN B1ab(iii)+2ab(iii)].
Tinea pertussis *Carex limosa L.*	Endangered [EN B1ab(i,ii,iv,v)+2ab(i,ii,iv,v)]. BDA
Transylvanian chime *Campanula transsilvanica Andrae*	Endangered [EN B1ab(ii,iii)+2ab(ii,iii)]. IUCN(R), BDA.
Traunsteiner *Traunsteinera globosa (L.) Rchb.*	Critically Endangered [CR B2ab(iv); C2a(i)]. BDA, CITES(2).
Red Viper *Echium russicum J.F. Gmel.*	Vulnerable [VU B2ab(iii)]. DH.
Chess bucket, small bucket *Fritillaria meleagroides Patrin ex Sch. fil.*	Critically Endangered [CR A4c; C2a(ii)]. BDA.

According to the data collected under the project "Mapping and identification of the conservation status of natural habitats and species - phase I" (MoEW), 5 plant species of Directive 92/34/EEC occur in the area (the aim of the project is to map and identify the conservation status of natural habitats and species under Directive 92/34/EEC). These are Goosegrass (Fritillaria gussichiae), Ruscus aculeatus, Himantoglossum caprinum, Echium russicum, Dactylorhiza calopissii.

In the Register of Ancient Trees of Bulgaria (EEA) for the territory of Elin Pelin municipality is included one tree - an ancient willow (Salix spp.), from m. Salix spp. Elin Pelin (order RD-1301/5.5.1974).

Radiation aspect

Kozloduy NPP

The results of the radiological environmental monitoring (RIEW-Vratsa and RIEW-Montana, 2022) show that the gamma radiation background in Vratsa and Montana Districts is within the country-specific background values. No elevations of the specific activities of the investigated natural and man-made radionuclides in ambient air, water and soil have been observed in the monitoring sites within the scope of RIEW-Vratsa and RIEW-Montana. The values do not differ from those recorded in previous years. An analysis of soil and water contaminants at the NEMS points in the 3-100 km area of Kozloduy NPP shows that there are no deviations in values from those typical for the region.

SD "PRRAW-Novi Han"

No exceedances of the regulatory requirements have been detected in the area of SD "PRRAW-Novi Han".

4.7.2. Fauna - Invertebrates

About 29 000 species of invertebrates are known in Bulgaria so far, the most numerous being the insect group with about 20 500 species. The presence of endemics is one of the important and fundamental criteria for international and national biodiversity conservation strategy and priorities. The cave and subterranean invertebrate fauna in Bulgaria is particularly rich and unique, as about 23% of the country is covered by carst. So far, over 780 species of cave animals of different taxonomic

groups have been identified in Bulgaria, of which over 150 species are representatives of aquatic invertebrates. The most numerous are the lower crustaceans (68 species), followed by the higher ones (48 species).

Kozloduy NPP

The Western Danube Plain, in which the Kozloduy NPP area falls, is among the least studied areas in terms of invertebrate fauna. Single data exist for dragonflies, damselflies (beetles), etc., which do not give an idea of the overall picture of biodiversity in the area. The most representative groups in terms of biomass in food chains, presence in international and national conventions and laws on biodiversity conservation - runner beetles, butterflies, ants, grasshoppers (straight-winged), dragonflies, molluscs - were selected as sites for assessment of invertebrate biodiversity in the affected area. The main information on the invertebrate fauna in the 30 km range was obtained as a result of the activities under the project "Mapping and determination of the conservation status of natural habitats and species - Phase I", Lot 1. "Mapping and determination of the conservation status of invertebrates" (https://natura2000.egov.bg/EsriBg.Natura.Public.Web.App/Home/Documents). Optimal habitats for the following species exist in the affected area: Cenagrion (brook stickleback) (*Coenagrion ornatum*), green-throated fiddler (*Ophiogomphus cecilia*), unicorn bolbelasmus (*Bolbelasmus unicornis*), greater sage-grouse (*Cerambyx cerdo*), cuckoo (*Cucujus cinnaberinus*), horned beetle (*Lucanus cervus*), beech sagebrush (*Morimus asper funereus*), Osmoderma (*Osmoderma eremita*) (also included in the Bern Convention - Annex II, IUCN and the Bulgarian Red Book as endangered), four-spotted sword butterfly (*Euplagia quadripunctaria*), *Lycaena dispar* (*Lycaena dispar*) included in Annex II of the Habitats Directive. The species Alpine Rosalia (*Rosalia alpina*) was previously reported for the area from indirect data, but new data do not confirm its occurrence in the 30 km zone. Numerous terrestrial invertebrates with no defined conservation status occur in the Western Danube Plain, including the Kozloduy NPP area. They belong to the following taxonomic groups: molluscs, dragonflies, damselflies, right-wings, runner beetles, ants, butterflies.

In the water basins in the area of the Kozloduy NPP - the Danube River, the lower reaches and mouths of the Tsibritsa and Ogosta rivers, the Shishmanov Val dam, etc., 4 species of protected aquatic invertebrates have been established. *Theodoxus* transversalis used to be dominant in the Bulgarian sector of the Danube (96 individuals/m^2 and 26 g/m^2) and Danube tributaries, but is now rare. It is found in the area of Dolni Tsiber. The oval river mussel (*Unio crassus*) was also common in the river in the past with an average abundance of 1-3 specimens/m^2. Contemporary records of the presence of the species refer to the stretch of the Danube near Kozloduy Island, at Dolni Tsibar (718th river km) and in the stretch between Mizia and Oryahovo. The False Marsh Mussel (*Pseudanodonta complanata*) occurs in the Danube with relatively low numbers. The lake crab (*Astacus leptodactylus)* is relatively common throughout the Danube both in the past and currently.

The following alien aquatic invertebrate species with potential negative impacts on local species and ecosystems have also been identified in the Kozloduy NPP area:

- Chinese marsh mussel (*Anodonta woodiana*) - the natural range of the species is Southeast Asia. In Bulgaria the species was found for the first time in 2005 in the Danube. The species was first recorded in Bulgaria in 2005. It is now found in almost the entire stretch of the river, encroaching upstream of the Danube tributaries.

- Mussels of the genus *Dreissena* - zebra mussel (*Dreissena polymorpha*) and Bug mussel (*Dreissena bugensis*) - zebra mussel is a native species of the river Dreissena. It is a native species of the Danube, and in the last 15 years it has become widespread in inland waters of the country. The natural range of the Bug Dreissena includes the Dnieper-Bug estuary. In Bulgaria it was found for the first time in 2005 in the Danube. The species is found almost everywhere in the Danube.
- Asian corbicula *(Corbicula fluminea)* - native to Central and Southeast Asia. In Bulgaria the first specimens were found in 2001 in the Danube. Currently the species is found throughout the Bulgarian section of the river, in places with extremely high numbers. It is spreading rapidly upstream of the Danube tributaries.

SD "PRRAW-Novi Han"

The composition of the invertebrate fauna in the area of SD "PRRAW-Novi Han" is almost entirely determined by the prevailing ecological characteristics of the area, namely: altitude of about 600 - 1000 m, dominant deciduous mesophyll forest habitats, determining the microclimatic conditions, as well as the soil formation process. The main groups of terrestrial invertebrates associated with the two trophic levels of the ecosystem, the reducers and consumers, are composed of common or less common species without special conservation status.

Soil-dwelling pedobionts - shellfish amoebae (group Testacea), roundworms of the class Nematoda, primary wingless insects of the order Collembola, vertebrate worms (class Oligochaeta, fam. Lumbricidae), millipedes (class Myriapoda, order Diplopoda and order Hylopoda) (*Glomeris hexasticha*, *Glomeris marginata*, insect larvae of saprophagous species and some molluscs are common for the trophic level of the reductants in the area of SD "PRRAW-Novi Han".

The trophic level of consumers in the area includes arachnid zoophages with high species abundance in forest habitats - spiders (Arachnida) and hay beetles (Opiliones: *Anelasmocephalus cambridgei*, *Trogulus tricarinatus)*; beetles (Insecta: Coleoptera), with a particularly high species abundance characterized by predatory runner beetles of the Fam. Insecta: Hymenoptera; some butterflies (Insecta: Lepidoptera), as well as numerous mesophilic and moisture-loving forest species of two-winged insects (Insecta: Diptera).

Characteristic species of conservation significance here are *Bolbelasmus unicornis, Cerambyx cerdo* and *Lucanus* cervus, Beech Beetle (*Morimus asper funereus*), Osmoderma (*Osmoderma eremita*), Four-pointed Swordtail Butterfly (*Euplagia quadripunctaria*), *Lycaena dispar* (*Lycaena dispar*), Cenagrion (*Coenagrion ornatum*), etc.

4.7.3. Fauna - Fish

Ichthyofauna in Bulgaria is relatively rich and well-studied - it includes more than 200 species of fish. The number of species in different types of ponds varies greatly and depends on a number of factors: abiotic characteristics of the aquatic environment, hydromorphology, water quantity, ecological and chemical condition of the pond. In order to conserve diversity, a large number of species have been assigned conservation status and various forms of protection have been applied (at European and national level). Approximately ¼ of them are listed in the Bulgarian Red Book (item 2 Animals) in

the categories Regionally Extinct (EX) - four species; Critically Endangered (CR EN) - 13 species; Endangered (EN) - twelve species and Vulnerable (VU) - nineteen fish species.

The following types of surface water bodies have been identified within the territorial extent of the sites under consideration and in their vicinity:

Kozloduy NPP

- large tributaries of the Danube (river type R7, lower reaches of r. Ogosta) - characteristic populations of the eel (Alburnus alburnus), barbel (Barbus barbus), scabbardfish (Chondrostoma nasus), morunash (Vimba vimba), barbel (Abramis bjoerkna), pike (Esox lucius), catfish (Silurus glanis), carp (Aspius aspius) and other species characteristic of the Danube and its large tributaries;
- small and medium Danubian rivers (river type R8, Tsibritsa and Skat rivers) - towards their mouths they acquire a fauna conditioned by Danubian species. River chub (Squalius) and some of the nets (Barbus) are usually dominant, but sensitive and migratory species such as scobara (Chondrostoma) and bovidae (Alburnoides) are also among the dominant species.
- Slow flowing rivers, Danube marshes and other stillwaters - characteristic populations of the Baboon (*Rutilus rutilus*), species of the genus *Carassius* and a number of species introduced by stocking in freshwater stillwaters, subject to sport fishing.

SD "PRRAW-Novi Han"

- Semi-mountainous rivers in the Pontic province (R4 - tributary system of the Lesnovska River, right tributary of the Iskar River) - indicator species is the cattle eel (Alburnoides), represented in large numbers and all age groups. Accompanying species in the Danube sub-ecoregion are black barbel (Barbus petenyi), Balkan pinfish (Sabanejewia balcanica), guillemot (Barbatula barbatula), lesser crocodile (Romanogobio uranoscopus). Depending on the size of the rivers, there may be many other species in common with the lowland type (R8): the river chub (Squalius) and some of the nets (Barbus), but sensitive and migratory species such as the scobara (Chondrostoma) are also among the dominant species.

In the 5-km monitored area, several natural lakes in the "Sua Gabra" locality (seven in number) are interconnected by a small stream. The lakes are naturally swampy due to the small amount of incoming water. They are fed by a stream flowing from the foot of Mount Popov Del (the highest peak in Lozenets Mountain (1190.2 m)) and drain into the beginning of the Lesnovska River. The lakes have a natural population of maple, pike and catfish.

There are a number of factors that negatively impact freshwater fish populations: Changes in the hydrological regime (low flow) in the rivers or variable use (draining) of the dams lack natural conditions for the development of stable fish communities; intensive stocking is another factor with a pronounced impact and influence on the dam ichthyofauna; impacts on fish communities are also caused by poaching with nets; hydrotechnical activities related to cross-barring of rivers lead to degradation and/or loss of habitats; pollution of waters, past catches. Last but not least among the negative factors is the introduction of invasive and alien fish species, which are competing with native

populations and causing significant economic losses. Among fish species, these include the Chinese pompano (*Perccottus glenii*), the *pseudorasbora parva* and the sunfish *Lepomis gibbosus*.

According to the available information, the widespread "traditional" invasive fish species in the Danube River Basin Management Area (DRBMA) are Lepomis gibbosus (sunfish), Pseudorasbora parva (pseudorasbora) and Carassius gibelio (silver bream), but the Danube River is a corridor for the spread of new invasive fish species, such as Perccottus glennii (Chinese pompano), which has recently appeared in Bulgarian waters. For now, however, these two species are distributed only in the Danube and neighbouring water bodies.

The last joint study on the status of the Danube in 2019 (JDS4) shows an increase in the number of invasive species in the lower stretch of the Danube and some of the larger tributaries compared to previous surveys. However, indices of "biological pollution" in the Lower Danube region report medium to low levels. Taking into account the overall pressure of invasive species on the environment, it can be concluded that they are not currently considered a significant problem in the DRBMA.

Radiation aspect

Kozloduy NPP

According to the data from the Regional Environmental Status Report 2022 (RIEW - Vratsa), within the framework of regular radiological monitoring, samples from the Danube River near the town of Oryahovo-port and waste water from the drainage channel of the Kozloduy NPP were examined for determination of tritium content. No deviations were found, and the measured values were within the limits of the country's characteristic background. No increases in the specific activities of the studied natural and man-made radionuclides were observed in the waters at the monitoring points within the scope of RIOSV-Vratsa. The values do not differ from those registered in previous years.

In 2022, 110 water samples were analyzed for total alpha and total beta activity by RIEW Vratsa from the territory of RL-Vratsa in the 3-100 km zone of Kozloduy NPP. No deviations from the usual values for total alpha and total beta activity were found at the monitoring points. Eight water samples were taken for the determination of specific activity of natural and man-made radionuclides (Cs^{137}) from the Danube at the harbour of Kozloduy and from the river Danube at the harbour of Oryahovo, as well as 6 groundwater samples from the monitoring points around Kozloduy NPP. No deviations were found.

SD "PRRAW-Novi Han"

According to the radioecological monitoring data in 2021 in the monitored 5-km radius area from the site of SD "PRRAW-Novi Han", the amount of total alpha- and beta-activity in water samples in some of the monitoring points exceeds the regulatory limit (e.g. lake near the village of Krushovitsa and the spring "Shavaritsa"), the analysis of which suggests a major contribution from natural Th-232, U-238 and their daughter products in the area. All of the RAW storage facilities at this site are of the closed type, therefore the analysis of the results leads to the conclusion that direct transfer from them is unlikely. For some of the investigated sites/samples the measured values are below the minimum detectable activity (MDA).

4.7.4. Fauna - Amphibians and reptiles

Bulgaria is inhabited by 20 species of amphibians and 35 species of reptiles, most of which are represented by stable populations, thus ranking among the richest in herpetological fauna European countries. Many of the species found here can only be seen in this part of the continent. Currently, almost all species in the country are protected by law in various forms - listed in the appendices to the Bulgarian Red Book in the categories Vulnerable (VU) (four species of amphibians and reptiles), Endangered (EN) (six species of reptiles), Critically Endangered (CR) (one species of snake) and Extinct (EX) (two species of reptiles); DIRECTIVE 92/43 on the conservation of natural habitats and of wild fauna and flora; Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats); IUCN - International Union for Conservation of Nature and Natural Resources; CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora. Some of them have a wide ecological plasticity, which defines them as highly adaptable. However, among the factors negatively affecting amphibians are drainage of many Danube marshes and spills in the past past; estuarine adjustments of some of the Bulgarian Danube tributaries; destruction of the shoreline and vegetation of inhabited water bodies; pollution by industrial and municipal waste, petroleum products, pesticides for control of pests and mosquitoes; and stocking by fish species that feed on the larvae and adults of newts. Negative factors for reptiles are: intensive forms of agriculture, construction of roads, gas transmission networks, etc., forest fires, collection for food or by collectors, replacement of deciduous forests by coniferous forests.

On the territory of the two municipalities (Kozloduy and Elin Pelin), presumed localities would have species with a wide distribution, according to the specific characteristics of their habitats.

Kozloduy NPP

Amphibians in the 30-km zone are probably 9-10 species. Species such as the common garlic frog, the green frog, but also the more closely water-associated Danube newt, the red-bellied booby and the green water frog are characteristic of the area. Populations of common garlic frog in natural and semi-natural habitats are relatively high in density. The monitored area is dominated by agroecosystems where the species is usually recorded at relatively low population densities.

Reptiles in the area have not been the subject of special studies. Three species of tortoises, five species of lizards and seven species of snakes are characteristic of the Danube Plain. In the 30-km zone, the ubiquitous Crimean and green lizards can be mentioned, as well as the wall lizard, which also occurs in synanthropic landscapes. The common bog turtle has been recorded in wetlands around the rivers of Tsibritsa, Ogosta and Danube. Two species of grass snakes can be observed in the area - the greater shooter grass snake and the mouse-eating grass snake.

SD "PRRAW-Novi Han"

The area where the SD "PRRAW-Novi Han"site is located belongs to the north-eastern parts of the Lozenska Mountain. It is bordered to the north by the Sofia Valley and to the south by the western parts of the Ihtimanska Sredna Gora. Species with a wide distribution, according to specific habitat characteristics, as well as those characteristic of mountainous and forest terrains, would be expected to occur here. Potential habitats in the area include the southern crested newt (Triturus karelinii), the yellow-bellied booby (Bombina variegata) and the common bog turtle (Emys orbicularis). Also

important from a conservation point of view are the short-legged lizard (Ablepharus kitaibelii), green toad (Bufo viridis), honeycreeper (Coronella austriaca), Mouse-eating grass snake (Elaphe longissima), tree lizard (Hyla arborea), meadow lizard (Lacerta agilis), green lizard (Lacerta viridis), long-legged wood frog (Rana dalmatina), viper (Vipera ammodytes).

Radiation aspect

Kozloduy NPP

According to the data from the Regional Environmental Status Report 2022 (RIEW - Vratsa), within the framework of the regular radiological monitoring, samples from the Danube were examined at the harbour of Oryahovo and wastewater from the outlet of Kozloduy NPP for tritium content. No deviations were found and the measured values were within the country-specific background. No elevations of the specific activities of the investigated natural and man-made radionuclides in water were observed at the monitoring sites within the scope of RIEW - Vratsa. The values do not differ from those recorded in previous years.

In 2022, 110 water samples were analyzed for total alpha and total beta activity in accordance with the NEMS from the territory of the Vratsa Regional Laboratory in the 3-100 km zone of Kozloduy NPP. No deviations from the usual values for total alpha and total beta activity were found for the monitoring points. Eight water samples were taken for determination of specific activity of natural and technogenic radionuclides (Cs 137) from the Danube at the port of Kozloduy and the Danube river at Oryahovo port. No deviations were found.

SD "PRRAW-Novi Han"

According to the data for the radioecological monitoring carried out in 2021 in the monitored 5-km zone around SD "PRRAW-Novi Han", the tritium activity in environmental water samples (groundwater, surface water, drinking water, rainwater) does not exceed the regulatory requirement for the respective sample type. The amount of total alpha and beta activity in water samples at some of the monitoring points exceeded the regulatory limit (e.g. lake near Krushovitsa village and Shavaritsa spring), the analysis of which suggests a major contribution from natural Th-232, U-238 and their daughter products in the area. The gamma-emitter activity study in some cases shows elevated values for Cs-137, which are above the MDA, at the same time orders of magnitude lower than the regulatory requirements. A possible reason is the presence of the isotope in the upper layers of the soil, as a residue of the Chernobyl nuclear accident. All of the RAW storage facilities at this site are of the closed type, so analysis of the results leads to the conclusion that direct transfer from them is unlikely. For some of the investigated sites/samples the measured values are below the MDA.

4.7.5. Fauna - Mammals

The mammalian fauna of Bulgaria is represented by about 100 species, including introduced and self-dispersed species such as the raccoon dog, the muskrat, the nutria and the ground hare. The list of mammal species in the country cannot be considered definitive, as some of the introduced species may quickly become extinct if their populations are not reestablished (i.e. the alpine ibex, mouflon, yak, etc.), and those considered extinct may return to natural ecosystems (e.g. the beaver). From a systematic point of view, mammals in Bulgaria are divided into the following orders: Insectivora

(Insectivores), Chiroptera (Bats), Lagomorpha (lagomorphs), Rodentia (Rodents), Cetacea (Cetaceans), Carnivora (Carnivores), Pinnipedia (Pinnipeds) and Artiodactyla (Artiodactyla).

Based on the ecological preferences and modern distribution of mammals, they are assigned to the following major fauna types (Peshev et al., 2004):

1) Forest mesophyll type;

2) Forest thermoxerophyll type and

3) Continental xerophyll type.

Kozloduy NPP

Zoogeographically, the Kozloduy NPP area falls within the Western Danube Plain sub-region. The presence of the characteristic species here is determined by the presence of extensive arable agricultural areas, stepped areas and river valleys. The woodlands are of limited extent. Species with a wide ecological plasticity are mainly found, inhabiting all possible mesophilic and moist lower habitats in drier and more continental climates, such as the yellow-backed wood mouse (*Apodemus flavicollis)* and the common wood mouse (*Apodemus sylvaticus).* Mosaically, the white-toothed blind dog (*Nannospalax leucodon)* and the steppe house mouse (*Mus spicilegus*) occur throughout the area in steppe grasslands, pastures and in croplands. Common species include hedgehog (*Erinaceus europaeus*), mole (*Talpa europaea),* red squirrel (*Sciurus vulgaris),* common dormouse (*Glis glis*), Dobrudzha hamster (*Mesocricetus newtoni*), common hamster (*Cricetus cricetus*), weasel (*Mustela nivalis*), roe deer (*Capreolus capreolus*), badger (*Meles meles*) and black ferret (*Mustela putorius*). Of the species with high conservation status, included in Annex 2 of the Bern Convention, otters (*Lutra lutra*) have a proven presence in the area - at the inflow of the "warm channel" of the Kozloduy NPP at the coastal pumping station and in almost all sections of the Danube with well-preserved coastal natural woody vegetation, and the souslik (*Spermophilus citellus*), whose colonies are located in steppe and grassland areas east of the river. Ogosta in the area of the village of. Hurlets.

The analysis of the available data on the composition of the bat fauna in the Kozloduy NPP area shows that 19 bat species are present here - four species of the family Rhinolophidae and 15 species of the family Vespertilionidae: Brown bat (*Pipistrellus pipistrellus*), Nathusian bat (*Pipistrellus nathusii*), Midnight bat (*Eptesicus serotinus*), Rusty evening bat (*Nyctalus noctula*), small noctule (*Nyctalus leisleri*), Savi's bat (*Hypsugo savii*), two-flowered noctule (*Vespertilio murinus*), large horseshoe bat (*Rhinolophus ferrumequinum*), small horseshoe bat (*Rhinolophus hipposideros*), Mehely's horseshoe bat (*Rhinolophus mehelyi*), southern horseshoe bat (*Rhinolophus euryale*), grey long-eared bat (*Plecotus austriacus*), long-winged bat (*Miniopterus schreibersii*), great noctule (*Myotis myotis*), sharp-eared nightjar (*Myotis blythii*), long-billed nightjar (*Myotis capaccinii*), mustached nightjar (*Myotis mystacinus*), tri-coloured nightjar (*Myotis emarginatus*) and buck-billed nightjar (*Myotis alcathoe*).

The majority of the area is of limited importance as a hunting habitat as it represents agricultural land with relatively low insect abundance. An additional negative factor is the treatment of agricultural crops with insecticides. These are also the main reasons for the extremely low flying activity of bats over the open farmland - an average of only two flights per hour at the monitoring points during the active summer period. Dominant here are 5 species that are characteristic faunistic elements for

lowland areas throughout northern Bulgaria, namely: brown bat *(Pipistrellus pipistrellus),* Nathusian bat (*Pipistrellus nathusii),* midnight bat (*Eptesicus serotinus),* little evening bat (*Nyctalus leisleri)* and rusty evening bat (*Nyctalus noctula).* The main abundance of bats in the affected area is concentrated in the valleys of the rivers Ogosta, Skat and Tsibritsa, as well as in the immediate vicinity of the dam. "Shishmanov Val". Of particular importance as a migration corridor is also the Danube valley, where the adjacent moisture-loving vegetation and riparian forests not only provide numerous daily refuges for migrating populations, but also create the necessary conditions for their feeding. Dominant species during migration periods here are the Nathusian bat (*Pipistrellus nathusii)* and the rusty evening primrose (*Nyctalus noctula).*

The bat community in the Kozloduy NPP area is also enriched by the presence of cave-dwelling and petrophilous species. This is due to the presence of karst landscapes and caves in the Ogosta River valley, as well as the existence of significant bat colonies in caves located in the Pre-Balkan. Some individuals of these colonies move tens of kilometres away from their daily roost during hunting and the affected area is part of their foraging territory.

SD "PRRAW-Novi Han"

The area of SD "PRRAW-Novi Han" occupies mainly forest deciduous massifs in Sredna Gora and to a lesser extent arable and urban areas in the lands of Novi Han and Elin Pelin, which determines the dominant composition of the mammalian fauna. Here are found mainly widespread species such as mole (*Talpa europaea),* squirrel (*Sciurus vulgaris*), weasel (*Mustela nivalis*), roe deer (*Capreolus capreolus*), badger (*Meles meles*), black ferret (*Mustela putorius*). There are no species of conservation concern listed in Annex 2 of the Bern Convention. The composition of the bat community is poorly understood and there is a complete absence of evidence of bats in the affected area in the literature. Habitat conditions in the Sredna Gora Forest are a prerequisite for the existence of favourable potential habitats for forest bat species of the genera *Nyctalus*, *Pipistrellus*, *Eptesicus*, *Myotis* and *Barbastella*. The urbanised areas of Novi Han can enrich the bat fauna with species showing different degrees of synanthropy (horseshoe bats - Rhinolophidae, species of the genera *Myotis*, *Plecotus*, *Eptesicus*, etc.).

4.7.6. Fauna - Birds

Non-radiation aspect

General characteristics of the avifauna in Bulgaria

In Bulgaria there are 409 bird species from 19 orders, 62 families, 192 genera (BUNARCO, 2009). As of 2005, 286 autochthonous species, of which 257 are secure breeders, occur in the country with varying degrees of reliability. Species richness in the country varies between 6 and 163 species per UTM square (10 x 10 km) or an average of 72 species/100 km^2 (Yankov, 2007).

According to the EEA data for the period 2005-2020, the indicator "index of common bird species" shows a stable trend. Of the 74 bird species assessed in 2020, those with a decreasing trend in abundance are 19%, those with an increasing trend are 26%, those with a stable trend are 24%, and those with an indeterminate trend category are 31%. The farmland bird index is based on 19 bird

species and declined by 34% between 2005 and 2020. Among the farmland species, the most significant negative trends were the Sow Crow (-96%) and the Common Pipit (-99%); also trending negatively were Quail, Pintail, Grey Plover, Yellowhammer and Country Swallow. Black Kestrel, Turtle Dove, Hooded Lark and Black-headed Bunting have a stable trend. Only the Great White-throated Warbler (+373%) has a strong increase in abundance, with a slight increase in the Field Sparrow. The woodland bird index is based on 12 species. Of these, the most clearly positive population trends are the Fir Warbler, the Great Black-headed Warbler and the Grebe. Four species with a stable trend are blackbird, jay, common finch and great spotted woodpecker. The only woodland species in strong decline is the Woodchat (-89%). In the third category of species inhabiting "other" habitat types (19 species), only the pheasant (+411%) is strongly increasing in numbers. Five other species, such as the Red-breasted Swallow, Hawfinch, Southern Nightingale, Lesser White-breasted Warbler and Great Tit, are moderately increasing in numbers. With stable trends, are six species - House Sparrow, House Wren, Magpie, Tree Swallow, Tree Swallow and Green Swallow. The heron, common cuckoo, gray crow, common buzzard, and Syrian woodpecker are on a moderately declining trend (EEA, 2021).

The territory of Bulgaria occupies an important biogeographic position on the Balkan Peninsula, Europe and the Western Palearctic. It plays a significant role in the migration of soaring birds from the eastern parts of Europe to wintering areas in Africa (Mishev et al. 2012). Migratory birds can be observed over the whole country. Known intensive migration routes are in the eastern part of the country (Via Pontica), in the western part along the Struma River (Via Aristotelis) and along the Maritza and Tundzha rivers (Mateeva et al. 2013).

In winter, different concentrations of waterbirds have been recorded in the larger wetlands of Bulgaria. As a result of the Midwinter Census of Wintering Waterbirds, 276,658 individuals of 89 species (and six taxa defined to genus and subfamily) belonging to 13 orders of wintering waterbirds were recorded in 2020, which is approximately an intermediate value compared to fluctuations in the previous three years (2019 - 367,264 individuals, 2018 - 131,493 individuals, 2017 - 670,236 individuals). Fluctuations in waterbird abundance, reported over a narrow time interval, are closely correlated with a complex of abiotic, biotic, and anthropogenic factors (EEA, 2021). The most abundant order recorded in 2020 was the Anseriformes, with 152,240 individuals, followed by the Suliformes, with the Great Cormorant (*Phalacrocorax carbo*) as the most abundant representative (58% of the order total), and the Gruiformes, the coot (*Fulica atra),* with 99.3% of the order in total.

Kozloduy NPP

According to the EEA (Article 12 Reporting under the Birds Directive), 154 bird species (out of 242 reportable species) breed in the Kozloduy NPP area. Of the predatory species, *Accipiter brevipes, Accipiter gentilis, Accipiter nisus, Aquila pomarina, Athene noctua, Bubo bubo, Buteo buteo, Buteo rufinus, Circus pygargus, Falco subbuteo, Falco tinnunculus, Pernis apivorus, Tyto alba, etc.* occur here. Waterfowl include *Alcedo atthis, Anas crecca, Anas platyrhynchos, Anas querquedula, Ardea cinerea, Ardea purpurea, Aythya nyroca, Fulica atra, Gallinula chloropus, Porzana porzana, Larus michahellis, Larus ridibundus*, etc. A complete list of species is given in Table 18.

Table 18 - Birds breeding in the Kozloduy NPP area (source: Article 12 reporting of the Birds Directive)

No	Code	Type	No	Code	Type	No	Code	Type
1	A402	Accipiter brevipes	53	A122	Crex crex	105	A214	Otus scops
2	A619	Accipiter gentilis gentilis	54	A212	Cuculus canorus	106	A329	Parus caeruleus
3	A633	Accipiter nisus nisus	55	A738	Delichon urbicum	107	A330	Parus major
4	A298	Acrocephalus arundinaceus	56	A658	Dendrocopos major	108	A620	Passer domesticus
5	A296	Acrocephalus palustris	57	A238	Dendrocopos medius	109	A771	Passer hispaniolensis all others
6	A295	A. schoenobaenus	58	A240	Dendrocopos minor	110	A356	Passer montanus
7	A297	Acrocephalus scirpaceus	59	A429	Dendrocopos syriacus	111	A020	Pelecanus crispus
8	A168	Actitis hypoleucos	60	A236	Dryocopus martius	112	A644	Perdix perdix all others
9	A324	Aegithalos caudatus	61	A698	Casmerodius albus albus	113	A072	Pernis apivorus
10	A247	Alauda arvensis	62	A697	Egretta garzetta garzetta	114	A391	Phalacrocorax carbo sinensis
11	A229	Alcedo atthis	63	A377	Emberiza cirlus	115	A115-X	Phasianus colchicus
12	A704	Anas crecca crecca	64	A376	Emberiza citrinella	116	A273	Phoenicurus ochruros
13	A705	Anas platyrhynchos	65	A379	Emberiza hortulana	117	A274	Phoenicurus phoenicurus
14	A055	Anas querquedula	66	A382	Emberiza melanocephala	118	A315	Phylloscopus collybita
15	A703	Anas strepera strepera	67	A381	Emberiza schoeniclus	119	A343	Pizza pizza
16	A255	Anthus campestris	68	A269	Erithacus rubecula	120	A234	Picus canus
17	A226	Apus apus	69	A099	Falco subbuteo	121	A235	Picus viridis
18	A089	Aquila pomarina	70	A096	Falco tinnunculus	122	A607-B	Platalea leucorodia leucorodia
19	A699	Ardea cinerea cinerea	71	A657	Fringilla coelebs	123	A691	Podiceps cristatus cristatus
20	A634-B	Ardea purpurea purpurea	72	A723	Fulica atra atra	124	A692	Podiceps nigricollis nigricollis
21	A635	Ardeola ralloides ralloides	73	A244	Galerida cristata	125	A719	Porzana parva parva
22	A221	Asio otus	74	A721	Gallinula chloropus	126	A119	Porzana porzana
23	A218	Athene noctua	75	A342	Garrulus glandarius	127	A720	Porzana pusilla intermedia
24	A059	Aythya ferina	76	A130	Haematopus ostralegus	128	A718	Rallus aquaticus aquaticus
25	A060-B	Aythya nyroca	77	A131	Himantopus himantopus	129	A336	Remiz pendulinus
26	A688-B	Botaurus stellaris stellaris	78	A299	Hippolais icterina	130	A249	Riparia riparia
27	A215	Bubo bubo	79	A740	Hippolais pallida	131	A275	Saxicola rubetra
28	A133	Burhinus oedicnemus	80	A252	Hirundo daurica	132	A276	Saxicola torquatus
29	A087	Buteo buteo	81	A251	Hirundo rustica	133	A332	Sitta europaea
30	A403	Buteo rufinus	82	A617-B	Ixobrychus minutus	134	A631-B	Sterna albifrons albifrons

No	Code	Type	No	Code	Type	No	Code	Type
31	A243	Calandrella brachydactyla	83	A233	Jynx torquilla	135	A193	Sterna hirundo
32	A224	Caprimulgus europaeus	84	A338	Lanius collurio	136	A209	Streptopelia decaocto
33	A364	Carduelis carduelis	85	A339	Lanius minor	137	A210	Streptopelia turtur
34	A745	Carduelis chloris	86	A341	Lanius senator	138	A219	Strix aluco
35	A637	Certhia brachydactyla	87	A604	Larus michahellis	139	A351	Sturnus vulgaris
36	A334	Certhia familiaris	88	A179	Larus ridibundus	140	A311	Sylvia atricapilla
37	A726	Charadrius dubius	89	A291	Locustella fluviatilis	141	A310	Sylvia borin
38	A734	Chlidonias hybrida	90	A292	Locustella luscinioides	142	A309	Sylvia communis
39	A667-B	Ciconia ciconia ciconia	91	A246	Lullula arborea	143	A308	Sylvia curruca
40	A030-B	Ciconia nigra	92	A270	Luscinia luscinia	144	A306	Sylvia hortensis
41	A080	Circaetus gallicus	93	A271	Luscinia megarhynchos	145	A307	Sylvia nisoria
42	A081	Circus aeruginosus	94	A242	Melanocorypha calandra	146	A690	Tachybaptus ruficollis ruficollis
43	A084	Circus pygargus	95	A230	Merops apiaster	147	A165	Tringa ochropus
44	A373	Coccothraustes coccothraustes	96	A746	Miliaria calandra	148	A676	Troglodytes troglodytes
45	A206	Columba livia	97	A073	Milvus migrans	149	A283	Turdus merula
46	A687	Columba palumbus	98	A262	Motacilla alba	150	A285	Turdus philomelos
47	A231	Coracias garrulus	99	A260	Motacilla flava	151	A213	These albums
48	A350	Corvus corax	100	A319	Muscicapa striata	152	A232	Upupa epops
49	A742	Corvus corone cornix	101	A610-A	Nycticorax nycticorax	153	A142	Vanellus vanellus
50	A348	Corvus frugilegus	102	A278	Oenanthe hispanica	154	A323	Panurus biarmicus
51	A347	Corvus monedula	103	A277	Oenanthe oenanthe			
52	A113	Coturnix coturnix	104	A337	Oriolus oriolus			

In the area of the UTM squares (10 km x10 km) in the area of Kozloduy NPP occur 42 bird species from the Red Book of the Republic of Bulgaria (2011). Information on the species and their conservation status is given in Table 19.

Table 19 - Species of birds from the Red Book of the Republic of Bulgaria occurring in the area of Kozloduy NPP

No	Type	Status	No	Type	Status
1	Accipiter brevipes	VU	22	Falco vespertinus	CR
2	Accipiter gentilis	EN	23	Haematopus ostralegus	CR
3	Anas querquedula	VU	24	Haliaeetus albicilla	VU
4	Anas strepera	CR	25	Hippolais icterina	VU
5	Aquila pomarina	VU	26	Larus ridibundus	EN
6	Ardea cinerea	VU	27	Melanocorhypha calandra	
7	Ardeola ralloides	EN	28	Otis tarda	CR
8	Aythya ferina	VU	29	Pandion haliaetus	CR
9	Aythya nyroca	VU	30	Panurus biarmicus	EN
10	Buteo rufinus		31	Phalacrocorax pygmaeus	EN
11	Calandrella brachydacyla	VU	32	Phoenicurus phoenicurus	VU
12	Charadrius dubius	VU	33	Picus canus	EN
13	Ciconia ciconia	VU	34	Platalea leucorodia	CR
14	Ciconia nigra	VU	35	Plegadis falcinellus	CR
15	Circaetus gallicus	VU	36	Podiceps cristatus	VU
16	Circus aeruginosus	EN	37	Porzana parva	EN
17	Crex crex	VU	38	Porzana porzana	EN
18	Dryocopus martius	VU	39	Remiz pendulinus	VU
19	Falco cherrug	CR	40	Sterna albifrons	EN
20	Falco naumanni	CR	41	Sterna hirundo	EN
21	Falco subbuteo	VU	42	Sylvia borin	EN

SD "PRRAW-Novi Han"

According to the data of the EEA (Reporting under Article 12 of the Birds Directive), 118 bird species (out of 242 species subject to reporting) breed in the area of SD "PRRAW-Novi Han". Of the predatory species, Accipiter *gentilis, Accipiter nisus, Athene noctua, Bubo bubo, Buteo buteo, Buteo rufinus, Otus scops, Tyto alba*, etc. occur here. A list of species is given in Table 20.

Table 20 - Birds breeding in the area of the SD "PRRAW-Novi Han" (source: Reporting under Article 12 of the Birds Directive)

No	Code	Type	No	Code	Type	No	Code	Type
1	A619	Accipiter gentilis gentilis	41	A738	Delichon urbicum	80	A329	Parus caeruleus
2	A633	Accipiter nisus nisus	42	A658	Dendrocopos major	81	A327	Parus cristatus
3	A298	Acrocephalus arundinaceus	43	A238	Dendrocopos medius	82	A443	Parus lugubris
4	A296	Acrocephalus palustris	44	A240	Dendrocopos minor	83	A330	Parus major
5	A168	Actitis hypoleucos	45	A429	Dendrocopos syriacus	84	A325	Parus palustris
6	A324	Aegithalos caudatus	46	A236	Dryocopus martius	85	A620	Passer domesticus
7	A247	Alauda arvensis	47	A698	Casmerodius albus albus	86	A771	Passer hispaniolensis
8	A229	Alcedo atthis	48	A378	Emberiza cia	87	A356	Passer montanus
9	A705	Anas platyrhynchos	49	A377	Emberiza cirlus	88	A644	Perdix perdix all others
10	A256	Anthus trivialis	50	A376	Emberiza citrinella	89	A072	Pernis apivorus
11	A226	Apus apus	51	A379	Emberiza hortulana	90	A273	Phoenicurus ochruros
12	A228	Tachymarptis melba	52	A382	Emberiza melanocephala	91	A315	Phylloscopus collybita
13	A227	Apus pallidus	53	A269	Erithacus rubecula	92	A314	Phylloscopus sibilatrix
14	A089	Aquila pomarina	54	A096	Falco tinnunculus	93	A343	Pizza pizza
15	A699	Ardea cinerea cinerea	55	A657	Fringilla coelebs	94	A234	Picus canus
16	A221	Asio otus	56	A723	Fulica atra atra	95	A235	Picus viridis
17	A218	Athene noctua	57	A244	Galerida cristata	96	A737	Hirundo rupestris
18	A104	Bonasa bonasia	58	A721	Gallinula chloropus	97	A336	Remiz pendulinus
19	A215	Bubo bubo	59	A342	Garrulus glandarius	98	A275	Saxicola rubetra
20	A087	Buteo buteo	60	A740	Hippolais pallida	99	A276	Saxicola torquatus
21	A224	Caprimulgus europaeus	61	A252	Hirundo daurica	100	A332	Sitta europaea
22	A366	Carduelis cannabina	62	A251	Hirundo rustica	101	A209	Streptopelia decaocto
23	A364	Carduelis carduelis	63	A233	Jynx torquilla	102	A210	Streptopelia turtur
24	A745	Carduelis chloris	64	A338	Lanius collurio	103	A219	Strix aluco
25	A637	Certhia brachydactyla	65	A339	Lanius minor	104	A351	Sturnus vulgaris
26	A334	Certhia familiaris	66	A369	Loxia curvirostra	105	A311	Sylvia atricapilla
27	A726	Charadrius dubius curonicus	67	A246	Lullula arborea	106	A310	Sylvia borin
28	A667-B	Ciconia ciconia ciconia	68	A271	Luscinia megarhynchos	107	A309	Sylvia communis
29	A030-B	Ciconia nigra	69	A242	Melanocorypha calandra	108	A308	Sylvia curruca
30	A264	Cinclus cinclus	70	A230	Merops apiaster	109	A307	Sylvia nisoria

No	Code	Type	No	Code	Type	No	Code	Type
31	A373	Coccothraustes coccothraustes	71	A746	Miliaria calandra	110	A690	Tachybaptus ruficollis
32	A206	Columba livia	72	A262	Motacilla alba	111	A676	Troglodytes troglodytes
33	A687	Columba palumbus	73	A261	Motacilla cinerea	112	A283	Turdus merula
34	A350	Corvus corax	74	A260	Motacilla flava	113	A285	Turdus philomelos
35	A742	Corvus corone cornix	75	A319	Muscicapa striata	114	A287	Turdus viscivorus
36	A348	Corvus frugilegus	76	A277	Oenanthe oenanthe	115	A213	These albums
37	A347	Corvus monedula	77	A337	Oriolus oriolus	116	A232	Upupa epops
38	A113	Coturnix coturnix	78	A214	Otus scops	117	A142	Vanellus vanellus
39	A122	Crex crex	79	A656	Parus ater all others	118	A323	Panurus biarmicus
40	A212	*Cuculus canorus*						

In the area of the SD "PRRAW-Novi Han" occur 24 species of birds from the Red Book of the Republic of Bulgaria (2011). Information on the species and their conservation status is given in Table 21.

Table 21 - Species of birds from the Red Book of the Republic of Bulgaria, occurring in the area of SD "PRRAW-Novi Han"

No	Type	Status	No	Type	Status
1	Accipiter gentilis	EN	13	Anas querquedula	VU
2	Bonasa bonasia	EN	14	Ardea cinerea	VU
3	Ciconia nigra	VU	15	Bubo bubo	VU
4	Tetrao urogallus	EN	16	Ciconia ciconia	VU
5	Charadrius dubius	VU	17	Crex crex	VU
6	Neophron percnopterus	EN	18	Dryocopus martius	VU
7	Alectoris graeca	EN	19	Falco vespertinus	CR
8	Pernis apivorus	VU	20	Grus grus	EX
9	Porzana parva	EN	21	Picus canus	EN
10	Porzana porzana	EN	22	Scolopax rusticola	EN
11	Porzana pusilla	CR	23	Tringa ochropus	EN
12	Accipiter nisus	EN	24	These albums	VU

Radiation aspect

Kozloduy NPP

The results of the radiological environmental monitoring (RIEW-Vratsa, 2021) show that the gamma radiation background in Vratsa District is within the country-specific background values. No elevations of the specific activities of the investigated natural and technogenic radionuclides in ambient air, water and soil were observed at the monitoring sites within the scope of RIEW-Vratsa and RIEW-Montana. The values do not differ from those recorded in previous years. An analysis of soil and water samples at the NEMS points in the 3-100 km area of Kozloduy NPP shows that there are no deviations in values from those typical for the region.

SD "PRRAW-Novi Han"

No exceedances of the regulatory requirements have been detected in the area of SD "PRRAW-Novi Han".

4.7.7. Protected territories and Protected areas

Under the requirements of the Biodiversity Act, a National Ecological Network (NEN) has been established in Bulgaria, covering protected areas (PAs) as part of the European ecological network NATURA 2000. Priority sites include CORINE sites, Ramsar sites, important plant and ornithological sites, protected areas, World Natural Heritage sites. All these sites aim at nature conservation and sustainable development.

According to the definitions in the Protected Territories Act (PTA), protected territories (PTs) are designated for the conservation of biodiversity in ecosystems and the natural processes occurring within them, as well as characteristic or

notable non-living nature sites and landscapes. Many nature and national parks include reserves and maintained reserves, and some also include protected areas and natural landmarks. Protected territories are managed according to their category, the order designating them and the management plan for the territories (if any).

Currently there are 1040 PTs in Bulgaria in the following categories: *reserve*, *maintained reserve*, *protected area*, *natural landmark*, *nature park*, *national park*. A total of 341 protected areas are included in the NATURA 2000 National Ecological Network (NEN). According to the National Report on the State and Protection of the Environment in the Republic of Bulgaria, at the end of 2019 the number of PAs under the Birds Directive was 120 with a total area of 2 616 528 ha (23.1% of the total territory of the country), and those under the Habitats Directive - 234 with a total area of 3 611 860 ha (30.3% of the total territory of the country).

Specific regimes and prohibitions for the territory of the PA, in order to protect and restore the favourable conservation status of the habitats and species subject to conservation in them, shall be regulated by orders after their designation. This implies the coordination of activities for the conservation of biological, geological and landscape diversity in the long term and is a prerequisite for limiting the negative anthropogenic impact on protected areas.

Kozloduy NPP

The following Protected Areas fall partially within the 30-km Monitoring Zone (MZ) around Kozloduy NPP:

Under Directive 2009/147/EC on the conservation of wild birds:

- PA "Zlatiyata" BG0002009; In the updated form (2015) 65 bird species are listed as subject of conservation in this area.

Under Directive 92/43/EEC on the conservation of habitats and of wild fauna and flora:

- Kozloduy Islands PA BG0000533 with the subject of conservation: 4 types of natural habitats and the habitats of 16 species of animals (invertebrates, fish, amphibians, reptiles and mammals);

- PA "Tsibar" BG0000199: according to the Standard Form for the area, nine types of natural habitats and 22 species of the fauna of Bulgaria are subject to conservation, as the representatives of the ichthyofauna predominate;

- PA "Ogosta River" BG0000614 with the subject of conservation: six types of natural habitats and the habitats of 33 species of animals (invertebrates, fish, amphibians, reptiles and mammals).

- PA ”River Skat” BG0000508 with subject of conservation: six types of natural habitats and the habitats of 16 species of animals (invertebrates, fish, amphibians, reptiles and mammals).

- PA ”Kozloduy” BG0000527 with the subject of conservation: Natural habitat 6250 Semi-natural dry grass and shrub communities on limestone (Festuco-rometalia) (*important orchid habitats) and 1 species of grass snake (*E. sauromates*).

- PA "Zlatiya" BG0000336 with the subject of conservation: two types of natural habitats and the habitats of 15 species of animals (invertebrates, fish, amphibians, reptiles and mammals).

In addition to the above-mentioned PAs, the following protected localities (PL) and protected territories (PT) fall within the monitored zone within a radius of 30 km from Kozloduy NPP: PT "Kozloduy", PL "Daneva Mogila", PL "Koritata", PL "Tsibar Island", Natural Reserve "Ibisha", PL "Kalugerski Grad-Topolite", PL "Kochumna" and PL "Gola Bara".

For the PL, prohibitive regimes apply to damaging trees, felling (except for maintenance and sanitation), tearing or uprooting plants, grazing livestock, disturbing wild animals, taking their young or eggs, and destroying their nests and dens, the opening of quarries, the chiselling of stones, the removal of sand and other inert materials, any construction except where provided for in the development plan of the PL, the dumping of cinders and industrial waste, and any action which would disturb their natural appearance.

SD "PRRAW-Novi Han"

The detailed review of the Map of Protected Areas under the Birds Directive and Habitats Directive, as well as the Protected Areas on the territory of the Republic of Bulgaria (under the PTA) shows that there are no protected areas and protected territories under the PTA and the BDA in the 5-km Monitoring Area around SD "PRRAW-Novi Han".

Radiation aspect

Kozloduy NPP

According to the Annual Environmental Status Report 2022 (RIEW-Vratsa and RIEW-Montana), the results of the radiological monitoring carried out annually in the Kozloduy NPP area show that the gamma radiation background is within the country-specific background values. No elevations of the specific activities of the investigated natural and man-made radionuclides in ambient air, water and soil have been observed at the monitoring points within the scope of RIEW-Vratsa and RIEW-Montana. The values do not differ from those recorded in previous years. The location of the monitoring points provides a basis for an objective assessment of the status of habitats and species subject to conservation in the PA and PT.

SD "PRRAW-Novi Han"

As outlined above, there are no protected areas or protected zones within the 5-km Monitoring Zone around SD "PRRAW-Novi Han".

4.8. Cultural Heritage

The cultural heritage is an integral part of the environment and can be defined as the anthropogenic environment, therefore the environmental assessment will include brief information on the existing condition of the cultural heritage sites, including architectural and archaeological heritage.

Kozloduy NPP - Kozloduy Municipality

In the Register of Immovable Cultural Properties (ICP) at the National Institute for Immovable Cultural Heritage (NIICH) are included 2 historical (Kozloduy Beach and Mateev Geran) and 2

archaeological sites (ancient fortress Auguste in Chetate locality and ancient fortress Regiana, in Magura Pyatra locality). The Automated Archaeological Map of Bulgaria (AIS-ACB) system has registration cards for 18 sites within the municipality. Most of them are in the land of the village of Harlets, located east of the mouth of the Ogosta River and are connected with the Roman camp and the town of Auguste (Augustae).

The data for archaeological sites in the land of Kozloduy are, as follows:

- Chetate locality - a late antique (IV-VI c.) fortress. It is located about 6 km west of the modern settlement. Declared an architectural and structural monument of antiquity and the Middle Ages with 'local' significance;
- Regiana (Regianum), a road station and town (fortified settlement) in the province of Dacian Ripensis (Coastal Dacia) - town of Kozloduy, located 2 km east of the modern settlement in the locality of Magura Pyatria (Stone Mound). The site was part of the fortified Danube frontier and Danube road of the Roman Empire;
- Locality of Kilera (Mitre Vineyards), 1.5 km west of the port - prehistoric (Early Bronze Age - "Kotzofeni" culture), ancient and medieval settlement;
- Chukata locality (500 m south of Kilera) - evidence of an ancient settlement;
- Kalifera locality, immediately west of Chukata - large ancient and medieval settlement, evidence of medieval necropolis with corpse burying;
- Vrachanska funia locality - east of Kalifera; Characteristic break in the high overbank terrace: evidence of a Late Antique necropolis with corpse burial;
- Chetate locality - a late antique (4th-6th century) fortress. It is located about 6 km west of the modern settlement;
- The town of Kozloduy - the centre (approx. 200 m south-west of the bus station) - site from the Late Bronze Age (Orsoya-Balei Culture);
- The town of Kozloduy - House of Energetics - late-Roman (IV c.) necropolis,
- The town of Kozloduy (west of the House of Energetics, former courtyard of the Baliev family) - necropolis with corpse burning from the early Middle Ages (7th-8th c.)
- The town of Kozloduy, locality Uhoto-Kazana. Settlement from the Early Bronze Age - Kotsofeni Culture and the Early Middle Ages.

SD "PRRAW-Novi Han" - Elin Pelin Municipality

Throughout the centuries, the Sofia region has been the centre of various peoples and cultures, as important routes connecting Asia with Western Europe passed through it. Numerous traces of ancient settlements and fortresses can be found along these roads. Through the territory of Elin Pelin municipality runs the so-called Trajan's Road, which dates back to the 2nd century.

The settlement of Novi Han is mentioned for the first time in the historical annals around the middle of the 15th century and is associated with the construction of a large and stone-walled roadside inn by order of Ahmed Pasha. The remains of the medieval Ottoman inn (caravanserai) are currently

located in the yard of the elementary school St. Cyril and Methodius".

There are remains of Thracian, Roman and medieval settlements on the territory of the present Novi Han land, which indicates that the area has been inhabited since ancient times. An example of this is the Thracian fortress in Gradishte locality, situated 2.73 km south of the centre of the village of Novi Han. The fortification occupies the relatively flat ridge of the hill, with the fortress wall following the configuration of the terrain. It consists of an inner and an outer fortress. Another example is a Thracian, fortified sanctuary and a medieval, fortified monastery or fortress, Garvan Kamak/St. Petka, located in the area of the same name, 2.83 km south-west of the centre of the village of Novi Han. The fortress is erected on a naturally fortified hill, with steep slopes to the south and steep slopes on the other sides and has an irregular shape, with the fortress wall following the configuration of the terrain.

Other sites related to the Antiquity period are a settlement located west of the village of Novi Han. An ancient sanctuary is located 2.5 km south of the village in the area of Garvan Kamak. There are also remains of an old medieval church in the same locality. Burial mounds have been found south of the village and in the Umata locality. The Thracian settlements and burial mounds and the finds in them testify to a high spiritual and material culture. Roman and Byzantine culture also left significant traces.

In the land of Novi Han are also two Renaissance churches - Church "St. Trinity" built around 1864 and "St. Nicholas".

Some settlements on the territory of the municipality of Elin Pelin have existed in almost the same place from the time of the Second Bulgarian State until today. The church of St. Nicholas the Wonderworker in the village of Stolnik is preserved from this period. Near the village of Eleshnitsa there was a Bulgarian fortress destroyed during the invasion of the Ottomans. 4 km from the same village is the Eleshnitsa Monastery, which is one of the monasteries of the so-called Sofia Mala Sveta Gora, built in the 14th century. In the 16th-18th centuries it was a lively literary centre. In its church "St. Mary" valuable frescoes from the 16th and 19th centuries have been preserved. In the 18th century, a Catholic school was opened there. In the village of Doganovo is the oldest Catholic school in the region (from 1835).

4.9. Waste

The European waste management policy is fully transposed into Bulgarian legislation. The Waste Management Act (WMA), regulations and decrees are in full compliance with Directive 2008/98/EC of the European Parliament and of the Council on waste, which sets out measures to protect the environment and human health by preventing or reducing the harmful effects of the generation and management of waste, and by reducing the overall impact of resource use and increasing the efficiency of that use.

The following waste hierarchy is applied as a priority in waste prevention and management legislation and policy:

- prevention;
- preparation for re-use;
- Recycling;

- other recovery, such as recovery for energy production; and
- Disposal.

A National Waste Management Plan (NWMP) is developed for effective and efficient waste management in Bulgaria. In addition, each municipality and each enterprise whose activities generate waste shall develop a Programme for the management of waste generated by its activities.

The Waste Management Act does not apply to Radioactive Waste (RAW).

Non-radioactive waste

Kozloduy NPP

According to the Environmental Status Report 2022 prepared by the Regional Environmental Inspectorate - Vratsa, there is still no adopted Waste Management Programme for the period 2021-2028 for the territory of Kozloduy Municipality, as required by Article 52 and Article 53 of the Waste Management Act. The programme is in the process of discussion, coordination and approval. Ordinance No 5 on the maintenance and protection of cleanliness and waste management on the territory of the Kozloduy Municipality and Ordinance No 14 on the construction and protection of the green system on the territory of the Kozloduy Municipality are in force on the territory of the municipality. The municipality has concluded a contract with Mas Trade Sped Ltd, a subcontractor of Bulekopak AD for the recovery of separately collected packaging waste. According to the provisions of Art. 19, par. 3(11) of the Waste Management Act, Kozloduy Municipality has concluded contracts with legal entities holding the necessary permits under Article 35 of the same Act for the free transfer of separately collected household waste. This includes bulky waste, end-of-life electronic and electrical equipment, end-of-life motor vehicles, end-of-life batteries and accumulators, end-of-life tyres, ferrous and non-ferrous metal waste, packaging waste, etc. The settlements in Kozloduy municipality are covered by 100% of the system for waste collection and disposal of generated municipal waste. The collection, transportation and disposal by landfilling of waste generated by the population is ensured on a regional basis through a Regional Waste Management Association. Non-hazardous waste generated on the territory of Kozloduy Municipality is disposed of at the Regional Non-Hazardous Waste Landfill Oryahovo.

On the territory of Kozloduy NPP EAD there is a system for management of non-radioactive waste. The collection and removal of non-radioactive waste depends on its type, quantity and place of generation. Temporary storage of waste is carried out at the place of generation or at temporary storage sites, in accordance with the requirements of the legislation. Most of the waste generated at Kozloduy NPP is handed over to external organisations for recovery, recycling or subsequent safe treatment. Only the unrecovered non-hazardous waste is disposed of by landfilling in the company's own landfill for non-radioactive domestic and non-recyclable production waste (LNRW), in accordance with the conditions of the permit issued by the Regional Environmental Protection Agency (RIEW-Vratsa) under Article 35 of the Waste Management Act.

The area around Kozloduy NPP - 30 km monitoring zone covers besides Kozloduy municipality also the municipalities of Hayredin, Miziya, Byala Slatina, Oryahovo, Krivodol and Borovan on the territory of Vratsa region and the municipalities of Valchedrum, Lom and Boychinovtsi on the territory of Montana region.

Within the scope of RIEW-Vratsa for the territory of municipalities Hayredin, Miziya, Byala Slatina, Oryahovo and Borovan there are adopted waste management programs for the period 2021 - 2028,

as per the requirements of Article 52 and Article 53 of the Waste Management Act. For the municipality of Krivodol the Waste Management Programme is under discussion, coordination and approval. Each of the municipalities in the 30 km monitoring area around the Kozloduy NPP has signed contracts with organisations for the recovery of separately collected packaging waste. Systems for garbage collection and disposal of the generated municipal waste are established and operational on their territory. 100 % of the settlements in the municipalities are covered by such functioning waste collection systems. The collection, transportation and disposal by landfilling of the waste generated by the population of each municipality (with the exception of the municipality of Krivodol) is ensured on a regional basis through the formation of the Regional Non-Hazardous Waste Landfill Oryahovo - for the municipalities of Oryahovo, Kozloduy, Byala Slatina, Hayredin, Miziya and Borovan of the Vratsa region and the municipality of Knezha of the Pleven region. The landfill has been in operation since 20 September 2005. There is no municipal waste separation plant at the site and therefore all packaging waste, biodegradable waste and construction waste with the total municipal waste stream are disposed of in the operating Cell 1. The Municipality of Krivodol transports the generated municipal waste to the Regional Non-Hazardous Waste Landfill Montana, which has been in operation since 12 January 2006.

The municipalities of Valchedrum, Lom and Boychinovtsi, located in a 30 km monitoring area around Kozloduy NPP, fall within the scope of RIEW-Montana. For each of the municipalities a Waste Management Programme has been developed and adopted for the period 2021-2028. Organised waste collection and disposal is in place in the municipalities, and all settlements are included in the organised system. The municipalities are members of the "Regional Waste Management Association - Montana" including the municipalities of Montana, Berkovitsa, Boychinovtsi, Brusartsi, Valchedrum, Varshets, Georgi Damyanovo, Lom, Medkovets, Krivodol, Chiprovtsi and Yakimovo. It has its seat in the municipality of Montana, which is the owner of the land on which the waste treatment facility is built, in accordance with Art. 25, par. 3 of the Waste Management Act. The main objective of the association is to build a sustainable waste management system that will provide the necessary infrastructure for the treatment, recovery and environmentally sound disposal of municipal waste, including biodegradable, hazardous household and construction waste generated in the region. The regional association is served by the constructed Regional Non-Hazardous Waste Landfill in the locality of Nedelishte, put into operation in January 2006. The waste separation pre-treatment plant has been operational since 2012. It has the capacity to handle the entire volume of municipal waste. The constructed cells of the landfill provide capacity for the disposal of residual non-hazardous waste until at least 2025 and, together with the land for the planned fourth cell, for at least another 17 years.

SD "PRRAW-Novi Han"

SD "PRRAW-Novi Han" and 5 km monitoring area around it are located on the territory of the municipality of Novi Han. At present, there is no waste management programme for the period 2021-2028 adopted for the territory of Elin Pelin municipality. A draft "Regional Waste Management Programme for the Gorna Malina Region, including the municipalities of Gorna Malina and Elin Pelin for the period 2021-2028" is under discussion, coordination and approval. According to the report on the state of the environment in 2021, prepared by the RIEW-Sofia, the territory of the municipality of Elin Pelin is covered by a system of organized waste collection and waste disposal of municipal waste. The waste is disposed of at the Regional Non-Hazardous Waste Landfill for the

municipalities of Gorna Malina and Elin Pelin. The collection of packaging waste in the municipality of Elin Pelin is carried out through a separate packaging waste collection system organised by packaging waste recovery organisations.

A system for the management of non-radioactive waste is in place on the territory of SD "PRRAW-Novi Han". Generated domestic, industrial, construction and hazardous wastes are temporarily stored at the place of their generation or at temporary storage sites, in accordance with the requirements of the legislation, and then handed over to companies holding a permit or a complex permit under Article 35 of the WMA for activities with them.

Radioactive waste

The updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste in Bulgaria - National Programme in accordance with Directive 2011/70/EWRATOM contains a detailed analysis of the status and management of radioactive waste in the Republic of Bulgaria. The information provided is considered to be relevant and will therefore not be corrected or duplicated in this section of the Environmental Assessment Report.

4.10. Harmful physical factors

4.10.1. Noise

Kozloduy NPP

Sources of noise in the Kozloduy NPP area are: vehicles on the II-11 road and on the access road to the NPP, and activities at the plant site.

The majority of the facilities are located indoors in the existing buildings on the Kozloduy NPP site - power units, special units, RAW workshop, chemical workshops, circulating pump stations, nitrous oxide, compressor and diesel generator stations, maintenance workshops, etc., while the transformer stations, ventilation, pumps and internal plant transport are located outdoors.

In accordance with Article 16, item 2 of the Environmental Noise Protection Act, Kozloduy NPP conducts periodic monitoring and provides information to the RIEW-Vratsa on the noise emitted into the environment. The measured levels are significantly lower than the legally defined norms and it has been proved that the production activity at the Kozloduy NPP site is not a source of noise for the territory of the nearest settlement - the town of Kozloduy, located approximately 2.6 km away.

SD "PRRAW-Novi Han"

Sources of noise in the area are: the vehicles on the municipal road SFO 2235 Novi Han - Gabra, serving SD "PRRAW-Novi Han" and the activities of the production site. The ventilation and air-conditioning units are a source of insignificant noise levels on the territory of SD "PRRAW-Novi Han", but these are related to the working environment rather than the environment.

The noise levels are in accordance with the hygiene standards for permissible noise levels in

residential and public buildings. SD "PRRAW-Novi Han" is not a source of excessive noise levels outside the boundaries of the production site.

4.10.2. Vibrations

Vibrations refer to the factors with very high biological activity. The nature, depth and direction of physiological and pathological changes in the organism depend mainly on the intensity and spectral composition of vibrations.

Kozloduy NPP

There is no presence of process vibrations in the environment from Kozloduy NPP. Vehicles on the roads of the Republican road network class II (road II-11) are not sources of vibrations in the environment, since the road alignments (earth bed and road surface) are adapted to the category of vehicular traffic, whereby vibrations from the vehicles decay quickly in the earth base around the road.

SD "PRRAW-Novi Han"

There is no presence of process vibrations in the environment from SD "PRRAW-Novi Han". Vehicles on the access road are not sources of vibrations in the environment.

4.10.3. Non-Ionizing Radiation

Non-ionising factors include the permanent and ultra-low frequency electric and magnetic fields (EMF) created by the operation of power systems in the 50 Hz frequency range, radio frequency electro-magnetic fields, microwaves, and optical and laser radiation. The most important ones for the people and environment are electromagnetic fields of industrial frequency, such as substations and high-voltage power lines, generators and powerful electric motors with high electric current consumption.

Kozloduy NPP

The parameters of the electromagnetic fields at Kozloduy NPP do not exceed the permissible hygiene standards. The requirements for hygiene protection zones around substations and high voltage power lines are met.

SD "PRRAW-Novi Han"

There are no substations, transmission lines and powerful electric motors on the territory of SD "PRRAW-Novi Han" and in the vicinity of the site, therefore there is no risk of impact for the personnel and the environment.

4.10.4. Ionising radiation

Ionising radiations emitted from radionuclides generated during the operation of Kozloduy NPP or contained in the radioactive sources stored at SD "PRRAW-Novi Han" are an important factor in the environmental assessment of these two sites.

Ionising radiation can affect the major components of the environment - ambient air, water, soil, flora, fauna and the general population.

In order to prevent an increase in the radiation background, continuous radiation monitoring is carried out around the facilities and some of the detectors are included in the National Automated System for Continuous Monitoring of the Radiation Gamma Background of the Republic of Bulgaria.

An indicator of the dose exposure to the population in the country is the estimated annual effective dose for each person. The limit for the annual effective dose for each person in the population in accordance with the Radiation Protection Ordinance (SG 16 of 20.02.2018) is 1 mSv.

The estimate of the annual effective dose to the population for 2020 resulting from transboundary contamination in the territory of the country due to the Chernobyl accident is below 0.01 mSv. No radionuclide content above the levels for reporting to the European Commission established by Recommendation 2000/473/Euratom was recorded in any of the food samples tested.

According to the National Report on the State and Protection of the Environment in the Republic of Bulgaria for 2020, adopted at a meeting of the Council of Ministers on 15 June 2022, section "Radiation characteristics of the environment":

- In 2020, the National Automated Continuous Radiation Gamma Background Monitoring System did not record any gamma background values other than natural background;
- There is no observed trend of increasing specific activity of natural and man-made radionuclides in ambient air;
- In the monitoring of the radiation state from background monitoring:
    - In uncultivated soils, no changes above the area-specific activity values of natural and technogenic radionuclides were detected;
    - No contamination with natural and technogenic radionuclides has been detected in surface water bodies and sediments in the country;
    - No expansion of the areas affected by the previous activity has been identified in the areas of potential contaminants.

Radioecological monitoring is carried out at Kozloduy NPP and at SD "PRRAW-Novi Han".

Kozloduy NPP

The radiation impact of Kozloduy NPP's activities on the environment has been the subject of systematic studies since the plant's commissioning. To assess this impact, Kozloduy NPP conducts radiological monitoring according to regulated long-term programmes, coordinated with the control authorities in the country, including the Ministry of Environment and Water.

The radioecological monitoring of Kozloduy NPP includes:

- Systematic laboratory radiation monitoring of major environmental components;
- Calculation of the additional dose load to the population in the 30-km zone resulting from the operation of Kozloduy NPP;
- Continuous automated monitoring of gamma-background in settlements of the Kozloduy NPP Monitoring Area. Since 2009, an automated information system for radiation monitoring (AISRM) has been established for settlements within the 30-kilometer monitored area of the plant;
- Monitoring in emergency situations by mobile laboratory;
- Radiation monitoring at the industrial site.

The results obtained during the radioecological monitoring of the environment of Kozloduy NPP are published and disseminated to the control and supervisory authorities in the country (NRA, MoEW and MoH). The results of the monitoring of the environmental emissions and the dose to the population are also provided to EURATOM at the European Commission, where they are published in data reports for all nuclear power plants in the European Union. Information on the radioecological status of the Kozloduy NPP area is also available to the general public. A monthly bulletin with up-to-date information on radioactivity levels in the main environmental components is produced and distributed to the municipalities of Kozloduy, Mizia and Oryahovo. The analysed and summarised results for each year are published in the NPP Annual Report.

State regulation for the safe use of nuclear energy is carried out by the Nuclear Regulatory Agency. The Ministries of Environment and Water, Health, and Interior exercise specialised control over Kozloduy NPP.

The Executive Environmental Agency (EEA) carries out radiological monitoring in the "monitored" (2-30 km) area of Kozloduy NPP, which consists in continuous and periodic monitoring of the following indicators:

- radiation gamma background;
- radiological indicators in surface waters from (2-30 km) Kozloduy NPP area and debalanced waters from the plant;
- atmospheric radioactivity;
- technogenic radionuclide content in uncultivated soils from sites in the "monitored" (2-30 km) area;
- content of technogenic radionuclides in sediments from the Danube;

According to the latest adopted National Report on the State and Protection of the Environment in the Republic of Bulgaria for 2020, the radiological aspect of the impact of Kozloduy NPP on the environment in the "monitored" area is as follows:

- The results of the radiological monitoring carried out in 2020, compared with the results of the past years, do not show any adverse trends in the radiation situation and the environmental status in the "monitored" area of Kozloduy NPP resulting from the operation of the nuclear power plant.

According to the same National Report, the estimate of the annual effective background dose to the population from the activities of Kozloduy NPP, based on the results of the radiation monitoring carried out in 2020 in the NPP area, is below 0.01 mSv, the limit below which no additional measures are needed to optimise the radiation protection of the population.

SD "PRRAW-Novi Han"

Radioecological monitoring is carried out to locate and assess the potential impact of SD "PRRAW-Novi Han" on the environment and the population in accordance with the approved programmes of the current operating licences issued by the Nuclear Regulatory Agency. The programmes define two monitoring areas:

- Operational Area - a 1 km radius area around the Repository (centred on point A2 (KS1);
- Monitored area - territory with a radius of 5 km around the repository, in which three settlements are located - the villages of Novi Han, Krushovitsa and Gabra.

The own radioecological monitoring of the environment in the area of SD "PRRAW-Novi Han" includes: analyses of water samples, plant samples - activity of gamma-emitters in vegetation, in agricultural products. No change in the values of natural radionuclides characteristic for individual points in the analysed samples was found.

According to the latest adopted National Report on the State and Protection of the Environment in the Republic of Bulgaria for 2020, the assessment of the annual effective background radiation dose to the population from the activities of SD "PRRAW-Novi Han", based on the results of the radiation monitoring in the area of SD "PRRAW-Novi Han" and in the nearby settlements (the villages of Novi Han, Krushovitsa and Gabra), shows no deviation from the normal radiation status typical for the country. The estimated annual effective dose is below 0.01 mSv, the limit below which no further measures are needed to optimise the radiation protection of the population.

4.11. Material Assets

On the territory of Kozloduy Municipality (around Kozloduy NPP) and Elin Pelin Municipality (around SD "PRRAW-Novi Han") there are physical assets which are part of the road infrastructure of the Republic of Bulgaria, railway network, water supply and sewerage infrastructure, gas transmission network, electricity supply network and nuclear facilities.

Kozloduy NPP (Kozloduy Municipality)

Road infrastructure

There are two main groups of roads on the territory of Kozloduy municipality: roads of the republican road network and streets.

The municipality is crossed by the second-class national road II-11, as well as the following municipal roads, part of the national road network:

- VRC 1053 Class IV Municipal Road from State Route II-11 to the Port;
- Municipal road IV class VRC 3054 from national road II-11 to the fortress "Augusta"

Railway infrastructure

There are no elements of the national railway network on the territory of Kozloduy municipality.

Nuclear facilities

The nuclear facilities on the territory of Kozloduy Municipality are described in section 2.1.2.

Water supply and sewerage

The urban water supply network of the town of Kozloduy is old, with frequent faults and significant losses of drinking water. Their repair leads to disruption of the normal operation of the water supply network and interruption of water supply to consumers. Replacement of all building conections to the properties adjacent to the respective streets is required, as well as reconstruction, upgrading or construction of water main facilities.

The existing sewerage network in Kozloduy serves about 65% of the population and is concentrated mainly in the central part of the town and in residential complexes with high-rise construction. The network is of a mixed type - domestic and storm water network, with some of the secondary branches designed for domestic wastewater only. The villages within the municipality are without a sewerage network. Work is underway to design the construction of sewerage networks and WWTPs in the villages.

A drinking water pipeline, owned by Vratsa Water and Sewerage Company Ltd., passes through the territory of the Radiana site where the NRRAW is being constructed. During the construction of stage 1 of the NRRAW it was relocated.

Gas transmission network

Currently there are no elements of the Bulgarian gas transmission network on the territory of the municipality. It is planned to build a gas pipeline to the town of Kozloduy.

Power grid

The municipality has an electricity transmission and distribution network and a pipeline system for heat supply from the Kozloduy NPP.

A section of the overhead power line ELBA 20 kV, owned by CEZ Distribution Bulgaria AD, passes through the territory of the Radiana site. It was relocated during the construction of stage 1 of the NRRAW.

There are also communication cables owned by BTC AD (Vivacom) running through the Radiana site, which have also been relocated.

SD "PRRAW-Novi Han" (Elin Pelin Municipality)

Road infrastructure

The following roads of the republican road network pass through the territory of Elin Pelin municipality:

- Republican Road I-1;
- Republican road I-6 (Sub-Balkan road);
- Republican Road I-8;
- Republic road III-6002;
- Republic Road III-105.

Railway infrastructure

On the territory of Elin Pelin municipality passes Railway line No. 1 Kalotina - Svilengrad in sections Sofia - Elin Pelin and Elin Pelin - Kostenets.

Nuclear facilities

Currently, the Permanent Repository for Radioactive Waste is located on the territory of the municipality of Elin Pelin. It is located in the land of the village of Novi Han. It processes and stores the radioactive waste from about 2300 industrial, medical, agricultural and scientific research facilities.

Water supply and sewerage

The total length of water pipelines in the municipality is 260 km, and in some of the settlements of the municipality the water pipelines are old and largely depreciated. Water from tube and shaft wells and from the river water source is pumped by pumps and fed into the mains, and from captured springs mainly by gravity.

There is only one drinking water treatment plant in the municipality - the Gabra DWTP, which serves the population of the villages of Gabra, Vakarel and Krushovitsa.

The sewerage system of the town of Elin Pelin is a gravity sewer of mixed type - it conducts domestic and storm water. At present, the degree of completion of the sewerage network is 94% and the rate of connection to the system is 77%.

Power grid

Elin Pelin Municipality receives its electricity supply from the national electricity system of the country through a 4-part nodal substation in the town of Elin Pelin with voltage transformation 110/20 kV. All settlements of the municipality are supplied with electricity.

Gas transmission network

In the municipality of Elin Pelin there are facilities from the gas transmission network of the Republic of Bulgaria. The main gas pipeline of the country passes through the territory of the municipality.

4.12. Population, human health

4.12.1. Demographic characteristics of the region

Kozloduy NPP - The area under consideration around Kozloduy NPP comprises a 30 km monitored area including:

- Kozloduy municipality, Hairedin, Miziya, part of the settlements in Byala Slatina municipality, Oryahovo, Borovan and Krivodol in Vratsa region;
- Valchedrum municipality, part of the settlements in Boychinovtsi municipality and Lom in Montana region.

SD "PRRAW-Novi Han" - The considered area around SD "PRRAW-Novi Han" covers a 5 km monitored area, encompassing the villages of Novi Han, Gabra and Krushovitsa in Elin Pelin municipality, Sofia region.

Kozloduy NPP

The nearest settlements are: Kozloduy, 2.6 km to the south-west, village of Harlets 3.5 km southeast, the village of Glozhene, 4.0 km southwest, the village of Miziya, 6.0 km southeast, the village of Butan, 8.4 km south, the town of Oryahovo is 8.4 km east of the site.

In the 2-km zone there are no sites with specific sanitary protection status, no recreational areas, hospitals, sanatoriums, schools, protected areas, sanitary protection zones around water sources and drinking water facilities and it is not used for agricultural purposes. There are no established oil and gas pipeline routes. There are no civil aviation corridors in the airspace above the site.

SD "PRRAW-Novi Han"

The nearest settlements are: the village of Novi Han, 3.15 km north, Krushovitsa, 2.9 km east, and Gabra 3.45 km south-southeast.

There are no sites with specific sanitary protection status in the 2-km zone. There are no recreation areas, hospitals, sanatoriums, schools, protected areas, sanitary protection zones around water sources and drinking water facilities in the area. The area is not used for agricultural purposes. There are no established oil and gas pipeline routes. The topography is hilly, rugged, with the Gabra uranium mine approximately 1,8 km to the south-east and the Chukurovo mine 2,2 km to the south.

Table 22 shows the settlements and population in the 30 km zone around Kozloduy NPP and the 5 km zone around PRRAW-Novi Han.

Table 22 - Population and number of inhabitants in 30 km observation area around Kozloduy NPP and 5 km observation area around PRRAW-Novi Han

	Location	Number of inhabitants (December 2021)	Density (p/km²)		Location	Number of inhabitants (December 2021)	Density (p/km²)
Kozloduy Municipality - Vratsa Region					*From Byala Slatina Municipality - Vratsa region*		
1.	twn. Kozloduy	11072	129.08		vill. Altimir	932	24.40
2.	vill. Butan	2551	46.39		vill. Bardarski geran	564	14.91
3.	vill. Glozhene	2345	54.38		vill. Galiche	1349	35.22
4.	vill. Kriva Bara	359	26.64		vill. Turnava	2058	22.81
5.	vill. Hurlec	1688	44.06		*Total:*	*4 903*	*24.62*
	Total:	*18 015*	*76.95*				
Valchedrum Municipality - Montana Region					*From Oryahovo Municipality- Vratsa Region*		
	twn. Valchedrum	49	11.58		twn. Oryahovo	3 868	14.8
	vill. Botevo	57	9.81		vill. Galovo	160	6.65
	vill. Bazovets	2895	29.58		vill. Leskovets	431	4.12
	vill. Gorni Tsiber	100	4.59		vill. Ostrov	999	13.22

	Location	Number of inhabitants (December 2021)	Density (p/km²)		Location	Number of inhabitants (December 2021)	Density (p/km²)
	vill. Dolni Tsiber	1408	101.91		vill. Selanovtsi	2 792	23.10
	vill. Zlatia	583	15.83		*Total:*	*8 250*	*12.37*
	vill. Ignatovo	200	16.69				
	vill. Mokresh	636	11.79		*From Borovan Municipality - Vratsa Region*		
	vill. Razgrad	506	15.23		vill. Dobrolevo	772	25.01
	vill. Septemvriytsi	893	23.78		vill. Malorad	1648	32.52
	vill. Cherni vrah	371	22.59		vill. Sirakovo	167	28.58
	Total:	*7 698*	*22.12*		*Total:*	*2 587*	*28.70*
Hairedin Municipality - Vratsa Region							
	vill. Hairedin	1129	12.56		*From Boychinovtsi Municipality - Montana Region*		
	vill. Botevo	56	9.08		vill. Beli brod	170	14.03
	vill. Barzina	171	17.81		vill. Lehchevo	1 506	34.28
	vill. Manastirishte	814	23.03		*Total:*	*1 676*	*24.15*
	vill. Mihailovo	892	13.82				
	vill. Rogozen	839	23.64		*From Krivodol Municipality - Vratsa Region*		
	Total:	*3 901*	*14.84*		vill. Furen	154	11.8
Miziya Municipality - Vratsa Region					*Total:*	*154*	*11.8*
	twn. Miziya	196	29.94				
	vill. Voivodovo	1292	31.53				
	vill. Krushovitsa	627	28.14		*From Lom Municipality - Montana Region*		
	vill. Lipnitsa	2455	49.54		vill. Stanevo	236	13.14
	vill. Saraevo	17	38.87		*Total:*	*236*	*13.14*
	vill. Sofronievo	1105	22.35				
	Total:	*5 692*	*33.68*				
Total number of settlements			***43***	***Total affected population - 53 112***			
Elin Pelin Municipality - Sofia Region							
2.	vill. Novi Han	3 114	65.47				
3.	vill. Gabra	818	13.26				
4.	vill. Krushovitsa	165	11.4				
	Total:	*2 461*	*30.04*				

Data - NSI, 2021.

Data on population dynamics in the analysed districts and municipalities over the last 3 years is also presented below (Table 23).

Table 23 - Population dynamics 2019-2021

Districts and municipalities	2019			2020			2021		
	Total	In the towns	In the villages	Total	In the towns	In the villages	Total	In the towns	In the villages
Vratsa Region	**159 470**	**93 905**	**65 565**	**157 637**	**92 639**	**64998**	**153 700**	**90 634**	**63 066**
Borovan Municipality	5120	-	5120	5039	-	5039	4930	-	4930
Byala Slatina Municipality	21 018	9644	11 374	20 662	9 495	11 167	20 206	9 277	10 929
Kozloduy Municipality	18 757	11 666	7 091	18 546	11 552	6 994	18 196	11 331	6 865
Krivodol Municipality	8 324	2 583	5 741	8 170	2 544	5 626	7 934	2 502	5 432
Miziya Municipality	5 970	2 564	3 406	5 861	2 504	3 357	5 666	2 468	3 198

Districts and municipalities	2019			2020			2021		
	Total	In the towns	In the villages	Total	In the towns	In the villages	Total	In the towns	In the villages
Oryahovo Municipality	9 336	4 204	5 132	9 138	4 118	5 020	8 813	3 976	4 837
Hairedin Municipality	4 095	-	4 095	4 049	-	4 049	3 888	-	3 888
Montana Region	**127 001**	**81 689**	**45 312**	**125 395**	**79 817**	**45 578**	**122 179**	**78 143**	**44 036**
Boychinovtsi Municipality	8 090	1 253	6 837	7 966	1 246	6 720	7 750	1 232	6 518
Valchedrum Municipality	8 286	3 016	5 270	8 206	2 978	5 228	7 990	2 890	5 100
Lom Municipality	23 967	19 361	4 606	23 528	19 033	4 495	22 916	18 593	4 323
Sofia Region	**226671**	**139 560**	**87 111**	**238 476**	**140 641**	**97 835**	**233607**	**138 547**	**95 060**
Elin Pelin Municipality	21 882	6 802	15 080	23 570	6 869	16 701	23 181	6 755	16 426

Data - NSI

The data in the table shows that:

- For the last 3 years in the district of Vratsa, Montana region, there has been a steady decline in population. This trend is associated with the negative growth from the decrease in the birth rate and the increase in the death rate, as well as migration to other settlements in Bulgaria and abroad;
- In Sofia region and Elin Pelin Municipality there is no clear trend - in 2020 the population increases significantly compared to 2019, but then decreases in 2021 compared to 2020;
- The comparison between Kozloduy Municipality and Elin Pelin Municipality (the municipalities in which Kozloduy NPP and SD "PRRAW-Novi Han" are located) shows that they follow the trends of the respective districts: In Kozloduy Municipality the population decreases in each of the analysed years, while in Elin Pelin Municipality there is a clear increase in population in 2020 compared to 2019 and a subsequent slight decrease in 2021, although the number of inhabitants in the municipality remains significantly higher compared to 2019.

It should be noted that in 2020 and 2021, in relation to the coronavirus pandemic, population dynamics in different regions are associated with new factors, such as increased mortality from COVID-19, the relocation of many people from large cities to smaller settlements, remote work, etc., which may bias the data away from a particular trend and make interpretation somewhat more difficult.

Table 24 presents data from the NSI on the distribution of the working age population in the affected districts and municipalities.

Table 24 - Population distribution by working age (2019 - 2021)

Districts and municipalities	Ages	Number by years		
		2019	2020	2021
Vratsa Region	**Under working age**	**23 512**	**23 353**	**23 080**
	In working age	**91 405**	**90 535**	**88 555**
	Over working age	**44 553**	**43 749**	**42 065**
Borovan Municipality	Under working age	945	934	912
	In working age	2 687	2 662	2 652
	Over working age	1 488	1 443	1 366
Byala Slatina Municipality	Under working age	3 534	3 457	3 408
	In working age	11 686	11 553	11 373
	Over working age	5 798	5 652	5 425
Kozloduy Municipality	Under working age	3 039	3 048	3 055
	In working age	12 061	11 905	11 640
	Over working age	3 657	3 593	3 501
Krivodol Municipality	Under working age	1 143	1 106	1 119
	In working age	4 263	4 243	4 136
	Over working age	2 918	2 821	2 679
Miziya Municipality	Under working age	744	731	715
	In working age	3 310	3 254	3 153
	Over working age	1 916	1 876	1 798
Oryahovo Municipality	Under working age	1 331	1 276	1 224
	In working age	4 861	4 818	4 681
	Over working age	3 144	3 044	2 908
Hairedin Municipality	Under working age	491	522	513
	In working age	2 153	2 120	2 038
	Over working age	1 451	1 407	1 337
Montana Region	**Under working age**	**18 471**	**18 245**	**17 969**
	In working age	**70 624**	**69 985**	**68 688**
	Over working age	**37 906**	**37 165**	**35 522**
Boychinovtsi Municipality	Under working age	1 251	1 245	1 252
	In working age	241	4190	4135
	Over working age	2 598	2 531	2 363
Valchedrum Municipality	Under working age	1 318	1 284	1 281
	In working age	4 447	4 501	4 445
	Over working age	2 521	2 421	2 264
Lom Municipality	Under working age	3 407	3 357	3 299
	In working age	13 573	13 328	13 084
	Over working age	6 987	6 843	6 533
Sofia Region	**Under working age**	**33 589**	**34318**	**34 234**
	In working age	**132 072**	**140 841**	**138 341**
	Over working age	**61 010**	**63 317**	**61 032**
Elin Pelin Municipality	Under working age	3 227	3 288	3 294
	In working age	13 053	14 424	14 235
	Over working age	5 602	5 858	5 652

Data - NSI

The data shows that in all municipalities of the districts of Vratsa and Montana the population from 2019 to 2021 is decreasing in all "working age groups", except for the municipality of Kozloduy,

where in the age range up to 18 years ("under working age") there is a slight increase in the number of inhabitants. This is a good trend for labour supply in the area.

For the Municipality of Elin Pelin, the data varies without a definite trend, but also, as in the Municipality of Kozloduy, there is an increase in the number of residents under working age, i.e. children and young people.

Mechanical population growth (mechanical movement)

Data by districts and municipalities is presented in Table 25.

Table 25 - Mechanical movement (mechanical growth) of population (2019-2021)

Districts and municipalities	2019			2020			2021		
	Settled	Displaced	Mechanical growth	Settled	Displaced	Mechanical growth	Settled	Displaced	Mechanical growth
Vratsa Region	**4980**	**6227**	**- 1247**	**5064**	**4692**	**372**	**4266**	**5081**	**- 815**
Kozloduy Municipality	447	650	- 203	445	502	- 57	430	559	**- 129**
Borovan Municipality	206	241	-35	148	161	-13	155	170	-15
Byala Slatina Municipality	530	805	-275	480	534	-54	584	644	-60
Krivodol Municipality	464	444	20	375	339	36	316	325	-9
Miziya Municipality	141	193	-52	153	145	8	154	202	-48
Oryahovo Municipality	171	291	-120	221	211	10	201	297	-96
Hayredin Municipality	183	222	-39	195	138	57	155	179	-24
Montana Region	**3654**	**4427**	**-773**	**4574**	**3887**	**687**	**3335**	**3689**	**-354**
Boychinovtsi Municipality	461	339	122	320	283	37	276	298	-22
Valchedrum Municipality	225	294	-69	287	201	86	237	239	-2
Lom Municipality	460	666	-206	462	444	18	575	600	-25
Sofia Region	**5799**	**6062**	**- 263**	**19553**	**4901**	**14652**	**5604**	**6801**	**- 1197**
Elin Pelin Municipality	720	593	**127**	2437	473	**1964**	711	761	**- 50**
Total for the country	***166 108***	***168 120***	***- 2012***	***234 606***	***203 891***	***30 715***	***167 423***	***154 717***	***12 706***

Data - NSI

The analysis of the data by districts and municipalities shows the following:

- For Vratsa District, 2019 is associated with high negative mechanical growth, followed by positive growth in 2020 and again negative in 2021, but with a lower value than in 2019. In the municipalities of Vratsa District in 2019, only Krivodol Municipality recorded positive mechanical growth. For 2020, there is positive growth in the municipalities of Krivodol, Miziya, Oryahovo, Hayredin, and in 2021 - no municipality with positive mechanical growth (all have negative mechanical growth). Negative mechanical growth for all three years is

noted in the municipalities of Kozloduy, Byala Slatina and Borovan. Simultaneously with the negative natural growth, this led to depopulation of some settlements in this region;

- In Montana, mechanical growth is positive in 2020 and negative in 2019 and 2021. In the municipalities of the Montana District, the values of mechanical growth vary over the years, and for 2021 it is negative for all municipalities;
- In Sofia District, there is a pronounced variation from low negative growth in 2019, through high positive mechanical growth in 2020 and high negative growth in 2021. For Elin Pelin municipality, mechanical growth is positive in 2019 and 2020, and very low negative in 2021. Overall, the most favourable trend is found in Elin Pelin Municipality. Elin Pelin Municipality and its adjacent settlements have enjoyed a great interest in recent years, both for residential and business investments, relocation of production premises, offices, logistics centres, etc. Specifically in the land of the village of Novi Han, there is a large residential complex (which is being expanded and new buildings continue to be constructed), where people from the region, as well as from Sofia and the whole country live.

The reported positive mechanical growth in 2020 for most of the regions (districts and municipalities) can be associated with people "moving back" to smaller towns and settlements and staying there due to the COVID-19, imposed anti-epidemic measures, travel restrictions, travel restrictions, teleworking, etc., reasons mainly related to the pandemic situation.

Negative values of the mechanical growth for 2021 are associated with the repeal of the anti-epidemic measures, the recovery of travel, the "return" to work and to educational institutions, the move back to the big cities, the intensification of migration processes, in which the displacement from the districts and municipalities under consideration prevails.

Birth. The main indicators of birth rate are the number of live births and the fertility rate, which expresses the number of live births per 1,000 population.

The number of live births in 2019, 2020 and 2021 in the districts and municipalities related to the draft updated Strategy under assessment are presented in Table 26.

Table 26 - Number of live births in the considered districts and municipalities (2019-2021)

Districts and municipalities	2019			2020			2021		
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls
Vratsa Region	**1348**	**669**	**679**	**1334**	**678**	**656**	**1242**	**633**	**609**
Borovan	54	26	28	58	25	33	50	29	21
Byala Slatina	194	93	101	194	111	83	183	88	95
Kozloduy	200	110	90	199	106	93	173	89	84
Krivodol	79	39	40	65	35	30	68	26	42
Miziya	35	15	20	39	17	22	39	20	19
Oryahovo	83	43	40	55	31	24	71	39	32
Hayredin	42	27	15	28	13	15	27	14	13
Montana Region	**936**	**486**	**450**	**923**	**459**	**464**	**953**	**493**	**460**
Boychinovtsi	76	41	35	73	33	40	82	50	32

Districts and municipalities	2019			2020			2021		
	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls
Valchedrum	83	42	41	66	30	36	72	33	39
Lom	148	82	66	177	82	95	146	79	67
Sofia Region	**2056**	**1041**	**1015**	**2079**	**1075**	**1004**	**2113**	**1084**	**1029**
Elin Pelin	172	87	85	204	109	95	223	120	103

Data from NSI

Live births in Vratsa district and Vratsa municipalities decrease from 2019 to 2021.

In Montana Region and in Boychinovtsi Municipality there is a slight increase in births in 2021 compared to 2020, in other Montana municipalities the data varies without a definite trend.

In Sofia District, the number of live births increases noticeably from 2019 to 2021, indicating a positive demographic trend for the district.

The comparison between Kozloduy Municipality and Elin Pelin Municipality shows that in Kozloduy Municipality the number of live births decreases from 200 in 2019 to 173 in 2021, while in Elin Pelin Municipality it increases from 172 in 2019 to 223 in 2021. This noticeable increase in the birth rate in Elin Pelin Municipality is in line with the district trend and is a positive demographic trend for the region.

Birth rate. It expresses the number of live births per 1,000 population.

Table 27 - Birth rates in Vratsa, Montana and Sofia districts (2019-2021)

District/Municipality	Birth rate (per 1000 population) (‰)								
	Total			Towns			Villages		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Vratsa Region	8.4	8.4	8.0	8.0	7.9	7.8	8.9	9.1	8.2
Montana Region	7.3	7.3	7.7	7.0	7.2	7.7	7.9	7.5	7.7
Sofia Region	9.1	8.9	9.0	9.7	9.4	9.5	8.0	8.2	8.4
About the country	*8.8*	*8.5*	*8.5*	*8.9*	*8.6*	*8.7*	*8.5*	*8.2*	*8.1*

Data from NSI

The birth rate in the districts under consideration in the 3 years was the highest in Sofia district, the lowest in Montana district. In Vratsa district it decreases in 2021 compared to 2019 and 2020. In Montana District it increases slightly in 2021 compared to 2019 and 2020, in Sofia District it remains almost constant.

The birth rate for Kozloduy Municipality is 10.6‰ in 2019, 10.7‰ in 2020 and 9.5‰ in 2021, higher than the national average.

The birth rate for Elin Pelin Municipality by these years is 7.9‰, 8.7‰ and 9.6‰.

It can be seen that in proportion to the number of live births, the birth rate in Kozloduy Municipality decreases in the years (2019-2021), while in Elin Pelin Municipality it clearly increases from 2019 to 2021 (Data for Kozloduy and Elin Pelin municipalities - NSI, RHI - Vratsa and RHI - Sofia region).

Mortality. This is the second main demographic indicator characterizing the natural population movement.

Number of dead. Deaths in all districts and municipalities considered increased over the 3 years, increasing from 2019 to 2021. All municipalities are affected by this negative process, which is an expected result due to increased mortality during the Covid pandemic.

In Kozloduy Municipality the number of deceased by year increases from 306 to 353 and to 394 in 2021, Elin Pelin Municipality - 373, 480 and 562 people. The number of deceased increases in 3 years, more markedly in 2021, related both to the factors known so far and to the high mortality rate of COVID-19.

Table 28 - Number of deaths in districts and municipalities (2019-2021)

Districts and municipalities	2019			2020			2021		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Vratsa Region	**3180**	**1697**	**1483**	**3539**	**1906**	**1633**	**4364**	**2301**	**2063**
Borovan	108	54	54	126	62	64	144	76	68
Byala Slatina	382	200	182	496	259	237	579	310	269
Kozloduy	306	145	161	353	191	162	394	213	181
Krivodol	241	136	105	255	145	110	295	167	128
Miziya	147	77	70	156	87	69	186	96	90
Oryahovo	225	119	106	263	138	125	300	147	153
Hayredin	142	73	69	131	62	69	164	82	82
Montana Region	**2799**	**1400**	**1399**	**3216**	**1754**	**1462**	**3815**	**1991**	**1824**
Boychinovtsi	232	114	118	234	118	116	276	159	117
Valchedrum	221	113	108	232	112	120	286	131	155
Lom	518	236	282	634	349	285	733	374	359
Sofia Region	**4163**	**2222**	**1941**	**4926**	**2696**	**2230**	**5785**	**3082**	**2703**
Elin Pelin	373	200	173	480	269	211	562	295	267

Data from NSI and RHI - Vratsa, Montana and Sofia Region

Mortality rate.

Causes of death data overall and by nosological entity are listed in Table 29.

Table 29 - Total and infant mortality rates in Vratsa, Montana and Sofia districts

Districts and municipalities		*Total mortality rate*			*Infant mortality rate*		
	Years	Total	In cities	In the villages	Total	In cities	In the villages
Vratsa Region	***2019***	19.8	15.1	26.4	4.5	5.3	3.4
	2020	22.3	17.3	29.5	3.7	2.7	5.0
	2021	28.0	23.6	34.4	4.0	2.8	5.7
Montana Region	***2019***	21.8	22.3	21.3	3.2	4.1	2.2
	2020	25.5	28.5	22.6	10.8	6.5	15.1
	2021	30.8	33.0	28.7	9.4	8.1	10.9
Sofia Region	***2019***	18.3	14.7	24.0	4.4	5.2	2.9
	2020	21.2	18.1	25.8	5.3	5.3	5.3
	2021	24.5	20.9	29.7	4.7	3.8	6.3
Total for the country	***2019***	*15.5*	*13.3*	*21.6*	*5.6*	*4.7*	*8.0*
	2020	*18.0*	*15.7*	*24.2*	*5.1*	*4.5*	*6.9*
	2021	*21.7*	*19.2*	*28.3*	*5.6*	*4.5*	*8.7*

Data - NSI

The total mortality rate for all districts, in all three years, was higher than the national average.

The total mortality rate increases from 2019 to 2021 in all districts and in Elin Pelin Municipality, as well as in the whole country, which is consistent with the data on the increase in the number of deaths in this period. The year-by-year comparison between the districts under consideration shows that Montana District is the leading district and Sofia District has the lowest mortality rate.

The total mortality rate for Kozloduy Municipality by year is: 2019 -16.3‰, 2020 - 19.0‰, 2021 - 21.6‰, the values are lower than the district average and very close to the national average.

The total mortality rate for Elin Pelin Municipality by year is 17.0‰, 20.4‰ and 24.2‰. (*Data for Kozloduy Municipality and Elin Pelin Municipality - NSI, RHI Vratsa and RHI - Sofia Region*)

For infant mortality, the data vary by year, with no clear trend.

Mortality by causes. Below are data on mortality by cause (as a relative share and per 100,000 population) for the period 2019 - 2021 on average for the country.

Table 30 - Mortality by cause in the country for 2019, 2020 and 2021

Disease classes (ICD)	2019		2020		2021	
	Per 100,000	%	Per 100,000	%	Per 100,000	%
Total	**1 549.6**	**100**	**1 798.9**	**100**	**2 166.3**	**100**
I. Certain infectious and parasitic diseases	6.4	0.4	6.1	0.3	6.9	0.3
II. New formations (neoplasms)	262.3	16.9	267.2	14.9	250.4	11.6
III. Diseases of the blood, hematopoietic organs and individual disorders involving the immune mechanism	2.1	0.2	2.1	0.1	1.7	0.1
IV. Diseases of the endocrine system, eating and metabolic disorders	22.4	1.5	26.1	1.5	26.3	1.2
V. Mental and behavioural disorders	1.4	0.1	2.0	0.1	1.7	0.1
VI. Diseases of the nervous system	14.5	0.9	13.7	0.8	14.0	0.6
VII. Diseases of the eye and its appendages	-	-	-	------	---------	-------
VIII. Diseases of the ear and mastoid process	-	-	-	------	---------	-------
IX. Diseases of the circulatory organs	998.2	64.4	1 090.1	60.6	163.2	53.7
X. Diseases of the respiratory system	60.1	3.9	86.6	4.8	99.0	4.6
XI. Diseases of the digestive system	59.0	3.8	59.9	4.6	62.9	2.9
XII. Diseases of the skin and subcutaneous tissue	0.7	0	0.8	0.0	1.1	0.5
XIII. Diseases of the musculoskeletal system and connective tissue	0.5	0	0.5	0.0	0.7	0.0
XIV. Diseases of the genitourinary system	26.2	1.7	5.9	1.4	25.4	1.2
XV. Pregnancy, childbirth and the postnatal period	-	-	0.1	0.0	---------	---------
XVI. Some conditions occurring during the perinatal period	2.2	0.1	2.0	0.1	1.9	0.1
XVII. Congenital anomalies [developmental defects, deformities and chromosomal aberrations	1.6	0.1	1.3	0.1	1.4	0.1
XVIII. Symptoms, signs and abnormalities detected by clinical and laboratory investigations, not elsewhere classified	55.1	3.6	55.0	3.1	71.8	3.3
XIX. Injuries, poisonings and certain other consequences of the impact of external causes	36.9	2.4	36.2	2.0	36.7	1.7
XXI. Factors affecting the health status of the population and contact with health services						
XXII. Codes for special purposes (Covid 19)			123.4	6.9	401.1	18.5

NCPHA Bulletins

The data shows that the main causes of mortality are related to cardiovascular diseases (CVDs), cancer, and to a lesser extent diseases of the respiratory system, digestive and urinary system, trauma, etc.

In all three years, cardiovascular diseases are the leading cause of death with a relative share in 2019 of 64.6%, 2020 - 60.6% and 2021 - 53.7%. It is evident that this percentage is decreasing from 2019 to 2021.

The second place as a cause of death is accounted for neoplasms, respectively having a share in 2019 of 16.9%, 2020 - 14.9% and 2021 - 11.6%. Again, there is a decrease in the reported deaths from this cause.

Respiratory diseases rank third as a cause of death, with a slight increase in relative share from 3.9% in 2019 to 4.6% in 2021.

Diseases of the digestive system occupied almost the same relative share by year - 3.8%, 4.6% and 2.9%.

Injuries and poisonings have a smaller relative share (by year - 2.4%, 2.0% and 1.7%), which also show a decrease in 2020 and 2021 compared to 2019.

The new pathology, COVID-19, is reported as the cause of death in 6.9% in 2020 and 18.5% in 2021.

Mortality from COVID-19 increases in 2021 compared to 2020, with a concurrent increase in mortality from respiratory diseases.

Causes of death by district and municipality.

Vratsa District (*Data from NSI and RHI Vratsa*) - in the structure of causes of death the leading place is occupied by CVD (about 65% in 2020 and 55% in 2021). Neoplasms are the cause of death in 18.8% of cases in 2020 and decrease to 13.2% in 2021. Respiratory diseases are the cause of death in 6.4% of cases in 2020 and 7.3% in 2021. The relative proportion of deaths from COVID-19 in 2020 is 5.6% and rises sharply to 19.9% in 2021. Other causes of death are digestive system diseases (about 4%), endocrine system - about 3%.

Montana District (*NSI data*) - The leading mortality rate is occupied by CVD (about 56%), the second place in 2020 is occupied by malignant diseases about 12%), followed by diseases of the respiratory system (10%), digestive and genitourinary with about 7%, trauma and diseases of the nervous system, etc. COVID-19 was the cause of death in 5.6% of the cases. In 2021, the structure changes with COVID-19 coming second (17.8% of cases) after CVD, followed by malignancy (9.76%), respiratory system diseases (4.6%), digestive system, and other causes with a smaller relative share.

Sofia District (*Data from NSI and RHI Sofia District*) - Data for Sofia District shows similar trends as described above for the country. Mortality rates for all disease classes except COVID-19 are decreasing from 2019 to 2021. For COVID-19, from 3.5% in 2020 the mortality rate increases to 13.8% in 2021.

The analysis of the above data on the nature and dynamics in causes of death for the period presented is somewhat hampered and the final conclusions perhaps not sufficiently accurate, for reasons related to the pandemic setting: the inclusion of COVID-19 in mortality in 2020 and 2021 changes the structure of causes of death and the relative proportions of deaths from non-COVID-19 causes; the

reporting or accuracy in reporting deaths from other diseases is impaired, due to the leading role of COVID-19. Also, there is often a combination of chronic disease with COVID-19 that exacerbates chronic disease and results in death reported as COVID-19 mortality. These and other reasons may explain the figures for reduced mortality from cardiovascular disease, neoplasms, urinary tract disease and others in 2020 and 2021 compared to 2019.

Reduced mortality from injury and poisoning is associated with pandemic restrictions, reduced travel, working from home (home office, teleworking), which reduces the risk of injuries, traffic accidents, and other serious disorders.

Natural population growth. An indicator that is the result of the aggregate manifestation of birth and mortality. The data on the natural population movement by districts and for the municipality of Elin Pelin are presented in Table 31.

Table 31 - Indicators of natural population growth in Vratsa, Montana and Sofia (2019, 2020, 2021)

Districts and Municipalities	Natural increase (number)			Natural increase (‰)		
	Total	Town	Village	Total	Town	Village
2019						
Total for the country	**-46545**	**-22560**	**-23985**	**-6.7**	**-4.4**	**-13.1**
Vratsa Region	-1832	-670	-1162	-11.4	-7.1	-17.5
Montana Region	-1863	-765	-1098	-14.5	-9.2	-24.0
Sofia Region	-2107	-704	-1403	-9.3	-5.0	-16.0
2020						
Total for the country	**-65649**	**-36123**	**-29526**	**-9.5**	**-7.1**	**-16.0**
Vratsa Region	-2205	-876	-1329	-13.9	-9.4	-20.4
Montana Region	-2293	-1084	-1209	-18.2	-13.4	-26.7
Sofia Region	-2847	-1217	-1630	-12.3	-8.7	-17.6
2021						
Total for the country	***-90 317***	***-52 732***	***-37 585***	***-13.2***	***-10.5***	***-20.2***
Vratsa Region	-3 122	-1 449	-1 673	-20.0	-15.8	-26.2
Montana Region	-2 862	-1 308	-1 554	-23.1	-16.6	-34.7
Sofia Region	-3 672	-1 607	-2 065	-15.5	-11.5	-21.4

Data from NSI

There are negative natural growth rates for all districts considered. The negative natural growth rates for the 3 years are a measure of the unfavourable demographic vitality of these districts as well as for the country as a whole.

Montana and Vratsa districts have the lowest natural growth rates (with the highest negative values), while Sofia district has more favourable natural growth rates.

Declining fertility rates combined with significantly increased mortality rates in the years analysed, particularly in 2020 and 2021, have an adverse impact on population reproduction. Even the districts and municipalities with increased birth rates cannot compensate for the significantly higher mortality rates in the years of the COVID-19 pandemic.

Comparatively, it should be noted that the above negative trends are more pronounced in Vidin District, followed by Vratsa, compared to Sofia District. As it was pointed out above for the settlements in Sofia district, including Elin Pelin municipality, being close to the capital and actively developing, attracts people who wish to live outside the big city and settle on its territory. The municipality has a good employment rate with a high relative share of the active population.

Unemployment is one of the lowest in the region and does not cause problems in the labour market in the municipality.

4.12.2. Sickness, morbidity and deaths from cause

Health status of the population

Population sickness is reported by two main indicators:

- **Morbidity** - registered diseases in health facilities for a calendar year (old and new diseases are included). Reported as number, relative proportion and per 1000 population.
- **Sickness** - the newly detected (newly registered) diseases in health care facilities. Reported as number, relative proportion and per 1000 population.

Vratsa District. The data from the Regional Health Inspectorate of Vratsa shows that the leading morbidity indicators in Vratsa District are:

- Cardiovascular diseases (CVDs) - 45,684 cases in 2020 and 64,372 in 2021;
- Musculoskeletal diseases - also rising from 22,116 cases in 2020 to 28,394 in 2021;
- Diseases of the genitourinary system - increase from 21,125 to 26,711 cases;
- Respiratory diseases - 16,259 in 2020 and 23,106 in 2021;
- Diseases of the endocrine system - 10,972 in 2020 and 13,339 in 2021;
- Malignancies - 6,669 cases recorded in 2020, 6,658 in 2021, 562 new cases in 2021 and 586 in 2022 respectively;
- COVID-19 - from 359 cases in 2020 to 4,593 cases in 2021.

All disease groups show an increase in 2021 compared to 2020, particularly pronounced for COVID-19.

Montana District. According to the data of the Regional Health Inspectorate-Montana (for the municipalities of Lom, Boychinovtsi and Valchedrum), the leading places in the structure of morbidity are:

- CVDs - 13,493 cases in 2020 and 14,720 in 2021;
- Respiratory diseases - 9,604 in 2020 and 8,990 in 2021;
- Diseases of the genitourinary system - 3,232 cases for 2020 and 3,113 for 2021;
- Digestive diseases - 2,778 cases in 2020 and 3,072 in 2021;
- Diseases of the endocrine system - 2,435 in 2020 and 2,740 in 2021;
- Diseases of the nervous system - 2,249 in 2020 and 2,199 in 2021;
- Malignant diseases - for the district 2,821 cases are registered in 2020 and 2,820 cases in 2021.

The leading place is occupied by the CVDs, and the next most frequent diseases differ from those in Vratsa district.

Sofia District. According to the data from the Regional Health Inspectorate - Sofia, the leading place in morbidity in Sofia District is occupied by:

- Cardiovascular diseases - decrease from 513.4‰ in 2020 to 491.4‰ in 2021;
- Diseases of the respiratory system - remain almost the same: 598.6‰ in 2020 and 595.8‰ in 2021;
- Diseases of the musculoskeletal system - 182.6 ‰ for 2020 and 186.2 ‰ for 2021, respectively;
- Diseases of the genitourinary system - 162.0‰ in 2020 and 151.0‰ in 2021;
- Diseases of the endocrine system - unchanged over the two years: 154.3 per 1000 in 2020 and 152.6 per 1000 in 202;.
- Diseases of the digestive system - 83.7 ‰ and 90,9 ‰;
- New formations - 2019 - 40.5 ‰ in 2020 and 35.8 ‰ for 2021;
- COVID-19 - 30.3 ‰ and 125.8 ‰.

Noteworthy is the low relative share of neoplasms in the structure of morbidity in Sofia region, which can be associated with the fact that the diagnosis and treatment of these diseases is carried out mainly or entirely in Sofia hospitals, as well as possible incomplete reporting in 2020 and 2021 in relation to the pandemic situation.

Overall, the incidence of disease in the districts of Vratsa and Montana is increasing in 2021 compared to 2020, i.e. more registered diseases in 2021 compared to 2020. This is not the case for all disease groups in Sofia District - for some there is a decrease (CVDs, genitourinary system), for others the number of reported cases remains almost the same (respiratory system, nervous system, endocrine system), while an increase is observed for digestive system diseases, musculoskeletal diseases and COVID-19.

Hospitalized morbidity.

Data about the patients who passed through the hospitals of Vratsa, Montana and Sofia region are presented in Table 32.

Table 32 - Hospitalized cases (discharged and deaths) in hospitals from 2019 to 2021 in districts Vratsa, Montana, Sofia and average for the country (per 100,000 population)

District	2019	2020	2021
Vratsa	32,476.2	30,116.1	29,147.9
Montana	36,481.0	30,274.6	29,929.5
Sofia	35,429.0	27,384.4	24,985.4
Total for the country	***34,584.4***	***28,321.6***	***29,268.6***

NCPHA Bulletins

Hospitalised morbidity in the districts under consideration, as well as in the country, fluctuated over the period analysed, with a downward trend from 2019 to 2021. The comparison between districts shows the highest rates in Montana District, the lowest in Sofia District.

Hospitalized cases (discharges and deaths) in hospitals by disease class are shown in Table 33.

Table 33 - Hospitalized cases (discharged and deaths) in hospitals by disease class for 2019-2021 (per 100,000 population and relative share in %)

Disease classes (ICD)	2019		2020		2021	
	Per 100,000	%	Per 100,000	%	Per 100,000	%
Total	**34 584.4**	100	**28 321.6**	100	**29 268.6**	100
I. Some infectious and parasitic diseases	671.3	1.9	344.1	1.2	257.1	0.9
II. New formations	2 473.5	7.2	2 160.2	7.6	2 254.1	7.7
III. Diseases of the blood, hematopoietic organs and individual disorders involving the immune mechanism	302.6	0.9	256.8	0.9	247.3	0.8
IV. Diseases of the endocrine system, eating and metabolic disorders	1 061.8	3.1	803.8	2.8	700.6	2.4
V. Mental and behavioural disorders	550.1	1.6	471.8	1.7	459.1	1.6
VI. Diseases of the nervous system	972.3	2.8	721.0	2.5	639.8	2.2
VII. Diseases of the eye and its appendages	1 071.6	3.1	804.0	2.8	911.0	3.1
VIII. Diseases of the ear and mastoid process	540.3	1.5	383.3	1.3	344.2	1.2
IX. Diseases of the circulatory organs	4 697.4	13.6	3 618.0	12.8	3 343.8	11.4
X. Diseases of the respiratory system	3 285.9	9.5	2 284.8	8.1	1 849.1	6.3
XI. Diseases of the digestive system	3 193.1	9.2	2 594.9	9.2	2 563.7	8.8
XII. Diseases of the skin and subcutaneous tissue	818.8	2.4	699.7	2.5	650.6	2.2
XIII. Diseases of the musculoskeletal system and connective tissue	1 870.5	5.4	1 400.4	4.9	1 317.2	4.5
XIV. Diseases of the genitourinary system	2 327.2	6.7	1 802.4	6.4	1 692.2	5.8
XV. Pregnancy, childbirth and the postnatal period	1 797.4	5.2	1 661.8	5.9	1 627.6	5.6
XVI. Some conditions occurring during the perinatal period	315.9	0.9	299.5	1.1	287.4	1.0
XVII. Congenital anomalies [developmental defects, deformities and chromosomal aberrations	108.7	0.3	87.7	0.3	97.9	0.3
XVIII. Symptoms, signs and abnormalities detected by clinical and laboratory investigations, not elsewhere classified	487.4	1.4	399.2	1.4	396.8	1.3
XIX. Injuries, poisonings and some other consequences of the impact of external causes	2 064.9	6.0	1 755.0	6.2	1 751.9	6.0
XXI. Factors affecting the health status of the population and contact with health services	5 973.7	17.3	4 951.3	17.5	5 484.5	18.7
XXII. Codes for special purposes (Covid 19)			821.9	2.9	2 392.7	8.2

NCPHA Bulletins

Cardiovascular diseases (CVDs) led the country in the structure of hospitalizations in all three years, with a slight decline in relative share from 2019 to 2021, 13.6%, 12.8% and 11.4%, respectively. The other most frequent causes of hospitalizations are respiratory and digestive diseases, neoplasms, trauma and poisoning, with coronavirus cases occupying an important part of hospitalizations in 2020 and 2021. In dynamic terms, there is a decrease in cases of hospitalizations for diseases of the respiratory and digestive system from 2019 to 2021, the relative share of hospitalizations for neoplasms increases from 2019 to 2021 (7.2%, 7.6% and 7.7%), and cases of trauma and poisoning remain constant over the 3 years analysed.

In 2019, following CVDs, the second place is occupied by respiratory diseases (9.5%), which also have a decline in 2020 and 2021, largely related to the precautions imposed in the coronavirus pandemic. The third place is for diseases of the digestive system (9.2%) and in fourth place – neoplasms with 7.2% of all hospitalizations. Injuries and poisonings follow with 6%, the other disease groups are presented with lower relative shares.

In 2020, there are some changes in the structure of hospitalizations, and after CVDs, the 2nd place is occupied by diseases of the digestive system - 9.22%, displacing diseases of the respiratory system in the 3rd place (8.1%). Hospitalizations due to neoplasms, as in 2019, occupy the 4th place with 7.6%, the 5th place is occupied by injuries and poisonings (6.2%). The new infection, COVID-19, accounted for 2.9% of hospitalizations.

In 2021, after the leading CVDs, digestive system diseases rank 2nd in hospitalizations (8.8%), neoplasms rank 3rd (7.7%), and respiratory system diseases rank 4th (6.3%), with trauma and poisoning ranking 5th again this year at 6.0%. Hospitalizations for COVID-19 are up from 2020 at 8.2%.

Hospitalized morbidity at district level. At district and municipal level, there are significant differences in the number and type of health facilities, respectively differences in the type and structure of hospitalizations. In large district hospitals, more severe cases or those corresponding to the specificity of the health facility are admitted. Municipal hospitals do not have all types of wards; milder cases and/or those for which there are specialists are admitted, so the admission of patients is different, the stay and outcome of the disease is also different. Because of these and other concomitant factors, it is difficult to compare hospitalised morbidity between districts and municipalities, and conclusions would be inaccurate and/or incorrect.

Incidence of radiation-related diseases. Malignant diseases

The morbidity (and mortality) of diseases in the genesis of which the radiation factor may be the leading factor includes the following groups of diseases: malignant neoplasms, diseases of the blood, hematopoietic organs and individual disorders involving the immune mechanism and congenital anomalies (developmental defects), deformities and chromosomal aberrations.

The most informative indicator - "Incidence of malignant diseases" is available by districts and shows that new cases of malignant diseases in the districts of Vratsa, Montana and Sofia-region for several years (2015 - 2021) vary, with the values in Sofia-region always being many times lower than the national average.

Table 34 - Incidence of malignant diseases - registered cases (per 100,000 population)

Years	Newly diagnosed malignancies by year						
	2015	2016	2017	2018	2019	2020	2021
Vratsa District	457.4	419.7	432.5	427.2	460.8	425.1	433.6
Montana District	338.5	437.4	382.2	302.5	342.9	335.2	337.7
Sofia District	299.7	234.7	229.7	158.5	200.1	174.1	159.3
Bulgaria	***447.2***	***435.54***	***424.8***	***406.7***	***434.9***	***399.3***	***392.2***

NSI

The highest incidence rates of malignant diseases are in Vratsa district, and they do not change significantly by year, remain high and vary around the national average.

For Montana, the values vary over the years, in most cases being slightly lower than the national average.

Sofia-region District has the lowest incidence of malignant diseases, significantly lower than the national average.

The national averages also vary, but without a clear upward trend. There is a slight decrease for the last 2 years, 2020 and 2021, which may be related to the incomplete and accurate reporting of new and/or existing cases during the COVID-19 pandemic.

Dispensary monitoring of chronically ill persons

The dispensary is carried out on persons with chronic diseases, which will provide information on the permanent morbidity in the area of the sites of the analysed Strategy, the structure of chronic pathology, including specific diseases related to the effects of ionizing radiation. For the country as a whole, the largest proportion of dispensary people ape with diseases of the blood circulatory organs, diseases of the endocrine system, nutritional and metabolic disorders, most often diabetes, malignant diseases, etc.

Health and safety of the staff of Kozloduy NPP and SD "PRRAW-Novi Han"

Health and Safety of Kozloduy NPP Staff

The health status of the NPP staff is monitored by the Occupational Medicine Service Contractor and the Medical Facility at the plant through: preliminary and periodic medical examinations, examinations in case of complaints by the workers, outpatient examinations and data from sick leaves, and the results are compared and correlated with the environmental factors and working conditions at the NPP. There is no published data on staff health status.

According to data published in the magazine "First Atomic" (https://www.kznpp.org/bg/libraries?library=1), it is assessed that occupational health and safety (OHS) conditions are ensured at the nuclear power plant in accordance with national regulatory requirements for occupational safety and health and with applicable international legal norms, criteria, standards, recommendations and proven best practices.

Prevention plays a leading role in the protection of workers' health - an organization has been established for the implementation and control of the regulated requirements and for the implementation of measures aimed at preventing adverse effects of specific factors of the working environment.

Only persons who are qualified and have received training and instruction are allowed to work. Effective safety equipment is provided, as well as initial and periodic medical examinations. As a result of the steady improvement in working conditions, the occupational injury rate at the nuclear power plant (0.05 in 2021) is significantly lower than the national average of 0.62 and the industry average of 1.2.

In addition to the health status, the radiation situation at the Kozloduy NPP site is constantly monitored. Since 2006, the scope of aerosol monitoring in the Kozloduy NPP area has been extended in order to control more effectively and to assess more precisely the distribution of radioactive substances in the atmosphere close to the source of emissions.

Health and safety status of the staff of SD "PRRAW-Novi Han"

SD "PRRAW-Novi Han" also ensures occupational health and safety (OHS) in accordance with the national regulatory requirements for occupational safety and health and with the applicable international legal norms, criteria, standards, recommendations and proven best practices.

No data were received on the health and safety status of the staff of SD "PRRAW-Novi Han".

4.12.3. Healthcare

Healthcare in the districts and municipalities under consideration is represented by medical and diagnostic facilities for outpatient and inpatient medical care, dental care, outpatient clinics of general practitioners, as well as emergency units.

Table 35 - Hospital beds per 10,000 population

District	Number			Per 10,000 population		
	2019	2020	2021	2019	2020	2021
Vratsa	1 002	1 197	1 004	62.8	75.9	65.3
Montana	994	994	994	78.3	79.3	81.4
Sofia - region	1 647	1 709	1 661	72.7	71.7	71.1
For the country	***51 776***	***50 636***	***52 246***	***74.5***	***73.2***	***76.4***

For the period 2019 to 2021, the medical facility beds per 10,000 people increased from 2019 - 74.5/10,000 to 76.4/10,000 in 2021. For Vratsa and Montana districts there is also an increase in the provision of beds per 10,000 population in 2021 compared to 2019, while in Sofia district the results are reversed - a decrease in the ratio from 72.7/10,000 in 2019 to 71.1/10,000 in 2021 is reported.

Below is shown data on the organization of health care and the availability of healthcare facilities in the municipalities under consideration:

- Borovan Municipality (Vratsa region) - According to data from the District Healthcare Centre - town of Borovan and the Regional Healthcare Centre - Vratsa in the municipality operate four practices for outpatient medical care of general practitioners, respectively in the villages of Borovan, Malorad, Dobrolevo and Sirakovo. Dental care is provided by dentists in the former dental surgeries of the municipality - 3 individual practices in the villages of Borovan, Malorad and Dobrolevo;
- Byala Slatina Municipality (Vratsa region) - Byala Slatina Hospital Ltd., total number of beds - 100, medical specialists and support staff - 164, works under contract with the National Health Fund on 68 clinical pathways. Also general practitioners;
- Kozloduy Municipality (Vratsa region). Medical facilities in Kozloduy municipality are:
    - Kozloduy Hospital with 105 beds;

- 5 Outpatient medical facilities with 2 beds;
- 1 dental centre and 3 dental medics in private offices.

The headquarters of the individual practices are: Kozloduy (6) and 1 in each of the villages of the municipality (excluding Kriva Bara). Emergency medical care of the population of the municipality is provided by a branch of the Emergency Medical Care Centre - Vratsa. The branch of the Emergency Medical Services Centre - Kozloduy serves the population of the entire municipality through 2 teams - one stationary and one mobile.

- Krivodol Municipality (Vratsa region) - At present on the territory of Krivodol Municipality are available:
  - Emergency medical unit at the Vratsa centre in the town of Krivodol;
  - 6 general practitioners;
  - Clinical laboratory;
  - 3 dentists (dental medics).
- Miziya Municipality (Vratsa Region) - According to the data from the District Healthcare Centre Vratsa, the following facilities are functioning on the territory of Mizia Municipality:
  - Primary care outpatient clinics - individual practices - 5;
  - Outpatient clinics for specialized medical care - individual practices - 1;
  - Primary dental care clinics - individual practices - 2.

All established medical practices in the municipality are staffed by doctors, and for those covering two populated places for 24-hour medical care, contracts with paramedics are foreseen.

The hospital care in the municipality is provided by the Multiprofile Hospital for Active Treatment - Kozloduy.

- Oryahovo municipality (Vratsa region) - the Oryahovo hospital is functioning;
- Hayredin municipality (Vratsa region) - only general practitioners;
- Boychinovtsi Municipality (Montana Region) - Boychinovtsi Municipality has no hospitals or municipal health facilities. The total number of medical practices is 4, dental practices are 1 and serve the entire population of the municipality;
- Valchedrum Municipality (Montana Region) - In the municipal centre - town of Valchedrum - There is 1 individual practice with 1 general practitioner and 1 group practice with 2 general practitioners. There are also individual practices with one general practitioner in the villages of Dolni Tsibar and Septemvriytsi (also serving the population of Komoshchitsa village).

The population receives hospital medical care from hospital “St. Nicholas the Wonderworker" in the town of Lom, and when more specialized hospital care is needed - in Hospital "Dr. Stamen Iliev" - Montana. In the town of. An Emergency Medical Care Branch (EMCB) of the Emergency Medical Care Centre (EMCC) - Montana is established in Valchedrum.

- Lom municipality (Montana region) - Multiprofile hospital for active treatment - Lom EOOD; medical centre, general practitioners, pharmacies;

- Elin Pelin Municipality (Sofia region). Medical institutions Hospital Elin Pelin EOOD and Hospital Skin Systems, with private funding. For primary outpatient care - 19 pcs, including registered as individual practices - 18 pcs. Primary dental care facilities - 23 pcs. There are primary outpatient care establishments in the town of Elin Pelin. There are also primary outpatient clinics in Elin Pelin, the villages of Gara Elin Pelin, Doganovo, Novi Han, Ravno Pole, Stolnik, Gabra and Lesnovo. Emergency and urgent medical care for the population of the municipality is provided by the Emergency Centre at the Elin Pelin Hospital, which is a branch of the EMCC - Sofia Region.

Medical Staff. Table 36 presents data on medical personnel (total and per 10,000 population) in Vratsa, Montana and Sofia districts for 2019-2021.

Table 36 - Medical personnel (total and per 10,000 population) in Vratsa, Montana and Sofia districts for 2019-2021

Districts and municipalities	Number			Per 10 000 population		
	2019	2020	2021	2019	2020	2021
Vratsa	597	598	585	37.4	37.9	38.1
Montana	449	437	427	35.7	34.9	34.9
Sofia region	907	882	874	40.0	37.0	37.4
Country average	***29 612***	***29 717***	***29 604***	***42.6***	***43.0***	***43.3***

There is a good provision of medical personnel overall and per 10,000 population in the districts under consideration. There are no significant changes in medical staff in the three years indicated, apart from some reduction in 2021 compared to previous years.

The average medical staffing for the country is increasing from 2019 to 2021, Sofia District is approximately at the national average, while Vratsa and Montana districts are significantly behind, which is true for all three years.

4.12.4. Analysis of risk factors related to population and human health, including those related to the environment

Non-radiation risk

The non-radiation risk is determined by the quality of the environment - ambient air, water, physical and chemical factors, noise, vibrations and other non-ionizing factors existing in the area. The data so far for the Kozloduy NPP area and the village of Novi Han do not show significant deviations in the environmental factors investigated.

Radiation Risk

A method for assessing the potential effects of ionizing radiation, consists of 4 independent steps:

- Hazard Identification;
- Dose-response assessment;
- Exposure assessment;
- Risk Characteristics.

Radiation effects are deterministic (non-probabilistic or non-stochastic or threshold) and stochastic (probabilistic or without threshold):

- Deterministic effects are characterized by the presence of an irradiation dose threshold below which the effect does not manifest clinically. The threshold doses for the occurrence of different deterministic effects depend on the radiosensitivity of tissues and organs. Deterministic or non-stochastic effects include some tissue-specific effects such as cataracts, skin damage, etc.;
- Stochastic effects are characterized by the absence of a threshold dose for their occurrence. The biological effect increases with increasing ingested dose and a latent period is required for its clinical manifestation. This includes all genetic (hereditary) effects and, of the somatic effects, radiation-induced malignancies. It is carcinogenesis that determines the main somatic risk of chronic exposure to low doses of ionizing radiation.

For those working in ionising radiation environments, there are regulatory dose limits which observation and the application of the requirement to continuously optimise radiation protection reduces the risk of stochastic effects by a further two orders of magnitude. At present, the radiation risk for workers in the nuclear industry is lower than 1.1 and is fully commensurate with the risk in other industrial sectors.

Kozloduy NPP

Kozloduy NPP has all necessary measures and procedures for safety culture of workers, nuclear safety, radiation protection. There is no evidence of violations of the limits and conditions for safe operation of Kozloduy NPP.

Kozloduy NPP maintains a high level of radiation safety. In a separate issue of "First Atomic" magazine, "Report for 2021" (https://www.kznpp.org/upload/30936/Kozloduy_NPP_AR_2021.pdf?inline=1), data on the activities at Kozloduy NPP on ensuring radiation safety for the personnel, the population and the environment, which include:

- safety culture for workers at Kozloduy NPP;
- nuclear safety;
- radiation protection;
- radiation control of emissions to the environment;
- radioactive waste management;
- management of SNF;
- emergency planning and preparedness;
- nuclear security;
- cyber security;
- fire safety;
- radioecological monitoring;
- estimation of the dose load on the population;
- environmental protection.

Radiation risk from radioactive gas-aerosol releases and liquid releases

Continuous automated monitoring of gaseous aerosol and liquid releases is carried out and no values above the specified control levels have been recorded throughout the period of operation.

Continuous optimization of radiation protection measures, based on the ALARA (As Low As Reasonably Achievable) principle, is achieved through rigorous implementation of reliable and effective radiation control, training and motivation of personnel, precise planning, preparation and analysis of activities, use of best practices from domestic and international operating experience.

In general, no elevated values of specific activities of natural and technogenic radionuclides (total beta-radioactivity) were observed in various samples (bottom sediments, surface and groundwater, etc.) both in the Kozloduy NPP area and in the 30 km controlled zone.

The data from the National Automated System for Monitoring of Radiation Gamma Background (website of the Executive Environmental Agency - https://eea.government.bg/bg/nsmos/radiation/auto-gamma-background) at the sites around Kozloduy NPP (Valchedrum village, Hayredin village, Vratsa town, Montana town), shows results in the range of 0.075 - 0.114 μSv/h, with normal values of radiation background up to 0.36 μSv/h.

The reported 2021 emission rates for radioactive noble gases (RNG), radioactive aerosols and iodine-131 (^{131}I) are 0.03%, 0.06% and 0.16% of control levels, respectively. Radioactive substances in the effluent from the plant are within 0.05% of the control level. There are also no exceedances of the specified limits for tritium in environmental emissions.

Radioecological monitoring **-** control of radiation parameters of the main environmental components (air, water, soil, vegetation, agricultural production) in the Kozloduy NPP area is carried out continuously. The monitoring area includes the plant site and the Bulgarian section of the 30-kilometre monitoring area with comparison posts in a 100-kilometre radius around Kozloduy NPP. Radiation gamma background data from 14 settlements in the area, measured continuously by the automated radiation monitoring system, is widely available to the public. They are displayed on information boards placed in public places and transmitted in real time to the nuclear power plant, from where they are transferred to the EEA and the NRA. The results of radioecological monitoring do not deviate from typical natural gamma background levels for the area.

Dose exposure of the population - The low levels of emissions into the environment during the operation of Kozloduy NPP result in negligible dose exposure of the population in the area. In recent years, conservatively estimated, the maximum annual individual effective doses to the population range from 4 to 7 μSv/a - hundreds of times lower than the natural gamma background exposure for the country (2.33 mSv/a) and about 30 times below the regulatory dose limit.

Radiation risk to the child population **-** In many cases, the radiation impact on children's bodies is different from that of adults, which affects the general prognosis for the health of future generations. In the operating conditions of Kozloduy NPP, two surveys of children from the NPP area were carried out in 2003 and 2012 by the NCRRP to determine possible local changes on the thyroid gland. Radon concentration in air was measured in 2 schools in Mizia and Oryahovo.

SD "PRRAW-Novi Han"

Elin Pelin Municipality and the village of Novi Han - Data from the National Automated System for Monitoring Radiation Gamma Background (website of the Executive Environmental Agency - https://eea.government.bg/bg/nsmos/radiation/auto-gamma-background show low levels of the status of the radiation gamma background at the nearest point of the National Automated System for Continuous Monitoring of Radiation Gamma Background - Sofia, about 0.129 μSv/h, with normal values of radiation background up to 0.36 μSv/h.

Note: The value μSv/h (H(10) on the EEA website) shows the absorption of gamma radiation in a tissue-equivalent medium (equivalent to the human body), i.e., H*(10) can be used to directly calculate the absorbed dose to humans.*

The available information regarding the levels of radioactive elements in the environment in the area of SD "PRRAW-Novi Han" does not indicate elevated levels of the general radiation background, i.e. the site is not expected to have a negative impact on the radiation situation in the area.

The results of the measurements show that the natural gamma background in the 6-90 km zone around Kozloduy NPP and in the area of SD "PRRAW-Novi Han" is not affected by the operation of the nuclear facilities and does not differ from the local gamma background typical for the respective regions. The radioactivity of air, water, soil, flora and fauna varies within normal limits. There are no deviations from the regulatory requirements for radiation protection.

The available information regarding the levels of radioactive elements in the environment in the area around Kozloduy NPP and SD "PRRAW-Novi Han" do not show elevated levels of the general radiation background, i.e. the sites are not expected to have a negative impact on the radiation situation in the area and respectively on the environment and human health.

5. Possible development of the environment without the implementation of the draft of an updated Strategy

The possible development of the environmental aspects without implementation of the draft of an updated Strategy is defined as "Zero Alternative". The likely consequences are analysed by components/factors below.

5.1.Climatic factors

Electricity production from NPPs generates virtually no greenhouse gases and makes a significant ecological contribution to environmental protection.

From the commissioning of Unit 1 of Kozloduy NPP until the end of 2022, the nuclear power plant has saved the release of about 809 695 thousand tons of carbon dioxide (CO_2) emissions into the environment (source: https://www.kznpp.org/bg/za-nas/za-aec-kozloduy).

In 2022 alone, Kozloduy NPP's power generation saved to the population and the environment the harmful impact of over 18.15 million tonnes of carbon dioxide (CO_2), 31 thousand tonnes of sulphur

dioxide (SO_2), 12 thousand tonnes of nitrogen oxides (NOx) and 100 tonnes of dust containing natural radioactivity.

Without the implementation of the draft of the updated Strategy, no positive effect will be achieved in terms of climate change and adaptation to climate change, since the management activities, especially of SNF, increase the potential of nuclear energy in our country, and it contributes to the limitation of greenhouse gas emissions and is conductive to the achievement of the objectives of the Paris Agreement in fulfilling the Union's goal of reducing greenhouse gas emissions by 2030.

5.2.Ambient air

There are regions that are critical in terms of air pollution due to activities in the energy sector (sulphur and nitrogen oxides) that use fossil fuels.

Without implementation of the draft of the updated Strategy, the stable development and the potential of nuclear energy will be delayed, with the aim of reducing the emissions, mainly sulphur and nitrogen oxides and carbon compounds in general for the country, according to Directive (EU) 2016/2284 of the European Parliament and of the Council, dated December 14, 2016, regarding the reduction of national emissions of certain ambient air pollutants, i.e. to align the regime of national emission ceilings with the EU's international commitments.

Regarding the radioactive state of the ambient air, in the event of failure to implement the draft of the updated Strategy, no change in the current state can be expected. But it will not be possible to improve the management of the generated nuclear waste from SNF and to minimize the risk of radioactive air pollution and the increase in the radiation gamma background in the areas around the nuclear facilities.

5.3.Water

5.3.1. Surface water

Non-radiation aspect

Without the implementation of the draft of an updated Strategy, the existing situation regarding surface water in the area of Kozloduy NPP is expected to be largely unchanged. The use of water resources required to cool SNF cartridges will continue, which is likely to increase gradually over time. In connection with the specifics of nuclear energy, an essential element in the operation of storage facilities for SNF is its reliable cooling. For this purpose, mostly natural waters are used, and the process itself is the basis of the so-called "thermal water pollution". This pollution is temporary and of a local nature, and its effect is neutralized after the water used for cooling flows back into the Danube. These processes do not lead to significant changes in the qualitative and quantitative state of surface waters.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW is not expected to change the state of the surface waters in the area of the SD „PRRAW- Novi Han" from a non-radiation point of view.

Radiation aspect

According to data from the RIEW-Vratsa regional report on the state of the environment (2021), the results of the annual water monitoring show that no increased values of the tested natural and technogenic radionuclides were observed in the waters at the monitoring points in 2-30 km area around Kozloduy NPP. The values of the tested indicators do not differ from those registered in the previous years and no abnormal values are reported. Without the implementation of the draft of an updated Strategy, the amount of SNF stored, is likely to increase and hence the amount of water used for its cooling. As a result, it is possible to observe a slight increase in the amount of water with radioactive contamination, but it will remain within the permissible limits and will have no significant impact.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW is not expected to change the state of the surface waters in the area of SD „PRRAW-Novi Han" from a radiation point of view. All RAW storage facilities at this site are of the closed type, and direct transfer of radiation and radiation-contaminated water from them is unlikely. Failure to implement the draft of an updated Strategy and, respectively, keeping the facility in the future would retain the risk with regard to its safe operation and potential impacts, in the event of an accident, to surface waters in the adjacent lakes and streams of the Gabra River catchment.

5.3.2. Groundwater

Non-radiation aspect

If the updated Strategy is not implemented, no changes are expected in the existing situation regarding groundwater in the area of Kozloduy NPP. The use of water resources necessary for industrial and domestic drinking needs will continue. Under normal operation and maintenance of the facilities, no changes in the quality of groundwater are expected.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW is not expected to change the state of the surface waters in the area of SD „PRRAW- Novi Han" from a non-radiation point of view.

Radiation aspect

The results of the radiological monitoring of the environment in 2021 show that the radiation gamma background in Vratsa District is within the limits of the background values typical for the country. No increases in the specific activities of the tested natural and technogenic radionuclides were observed in the waters and soils at the monitoring points within the scope of RIEW-Vratsa. The values do not differ from those registered in previous years. Failure to implement the draft of an updated Strategy is not expected to result in changes in the quality of groundwater in the area of Kozloduy NPP.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW is not expected to change the state of the surface waters in the area of the SD „PRRAW- Novi Han" from a radiation point of view. All RAW storage facilities at this site are of the closed type, and direct transfer of radiation and radiation-contaminated water from them is unlikely. Failure to implement the draft of an updated Strategy and, respectively, keeping the facility in the future would retain the risk with regard to its safe operation and potential impacts, in the event

of an accident, to groundwater in the area of the SD „PRRAW- Novi Han".

5.4.Subsoil

Without the implementation of the updated Strategy, the existing situation with respect to the subsoil is expected to be maintained.

5.5.Soil

Non-radiation aspect

Without the implementation of the updated Strategy, the existing situation of the soil is expected to be maintained.

Radiation aspect

Failure to implement the draft of an updated Strategy and, as a consequence, the limited possibilities for storage of SNF, in a radiation perspective, may affect the state of the environment through radionuclide contamination of the soil layer.

Without the implementation of the updated Strategy, the level of risk of soil contamination with radionuclides remains unchanged.

5.6.Landscape

Without the implementation of the updated Strategy, the level of risk of landscape components contamination with radionuclides remains unchanged. No change is expected in the visual impact.

5.7.Biodiversity

5.7.1. Flora

Non-radiation aspect

In a non-radiation aspect, the development of the flora is not contingent on the implementation of the draft of an updated Strategy.

Radiation aspect

Without the implementation of the draft updated Strategy, there will be no reduction in the terms for intermediate storage of SNF, as well as the quantities of SNF at the Kozloduy NPP site, which could lead to a negative radiation impact on the flora. There will be no benefits to the flora resulting from maintaining the SNF in a safe condition, choosing more modern and safe containers, improving the efficiency of RAW separation, minimizing the RAW generation, increasing the safety of storage and management of liquid and solid historical RAW.

Currently, RAW is processed in the facilities of SD “RAW-Kozloduy" and stored in the Warehouse for the storage of conditioned RAW. The capacity of the warehouse is limited, it is an intermediate unit in the overall RAW management system. In the event that the NRRAW is not constructed, there are risks of contamination of the soil layer and groundwater with radionuclides, which would have a negative impact on the flora.

Without implementation of the draft of an updated Strategy, a negative impact on the flora is to be expected, and also due to the fact that strategic goals aimed at stimulating scientific research and development, resulting in improved management and regulation of SNF and RAW, will not be achieved; enhancing the qualification of personnel for better management of SNF and RAW; preparation of the plans and projects and their implementation in order to achieve safe management of RAW from previous activities and, thus, to reduce the impact on the environment.

5.7.2. Fauna

Fauna - Invertebrate

Non-radiation aspect

Failure to implement the draft of an updated Strategy, in a non-radiation aspect, will not lead to changes in the currently existing impacts on the invertebrate fauna, in their intensity and degree of manifestation. Natural successional processes will continue in the affected areas where no human activity takes place (riverside ecosystems and those on the Danube islands, abandoned agricultural lands and pastures), and these processes are the main factor determining the changes in the composition and abundance of the invertebrate fauna. Intensive agriculture with the use of pesticides, developed road and transport infrastructure and urbanization in the area of Kozloduy NPP, as well as the conduct of forestry activities in the area of SD „PRRAW- Novi Han", will continue to be the main limiting factors for the richness of species of the terrestrial invertebrate fauna, including species of conservation importance from the groups of Coleoptera, Lepidoptera, etc.

Radiation aspect

Failure to implement the draft of an updated Strategy and, as a consequence, the limited possibilities for storage of SNF, in a radiation perspective, may affect the state of the environment through radionuclide contamination of the soil layer. Accumulation of radioactive elements is possible along the way of the food chains from the pedobionts to the predatory invertebrates, and from there to the higher levels of the trophic pyramid. Depending on the degree of accumulation of radionuclides in invertebrate populations, negative changes are possible, both at the molecular level (different type of mutations) and the physiological level in individual organisms. The release of radionuclides into the groundwater would primarily affect the stygobiontic invertebrate fauna in the Quaternary pore waters of the Kozloduy lowland, where crustaceans of the Copepoda and Amphipoda subclasses are to be found.

Fauna - Fish

Non-radiation aspect

Without the implementation of the draft of an updated Strategy, the existing situation is expected to be largely preserved in terms of fish populations in the water bodies in the area of Kozloduy NPP. The lack of a long-term policy (including modernization) regarding the management of SNF and RAW, on the one hand, and the consumption of water resources needed to cool the SNF cartridges, which is likely to increase over time, on the other hand, would lead to a cumulative negative effect on fish due to reduction of water supplies on a regional scale.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW at SD „PRRAW- Novi Han" is not expected to change the condition of the

fish and their populations in the monitored zone in the area of the site in a non-radiation aspect.

Radiation aspect

It is expected that if the draft of an updated Strategy is not implemented, the state of the environment will be preserved and no over-the-limit values of the tested natural and technogenic radionuclides will be observed in the waters at the monitored points in the 2-30 km zone around Kozloduy NPP. Although the radio-resistance of fish ranks them among the radiation-resistant organisms, their participation as a link in the food chains creates a risk of the spread of radiation contaminants. In this sense, failure to implement the draft of an updated Strategy will at best maintain the level of risk in the state of the existing situation.

Although all RAW storage facilities at SD „PRRAW-Novi Han" are of the closed type and direct transfer from them is unlikely, failure to implement the draft of an updated Strategy and, respectively, keeping the facility in the future would retain the risk with regard to its safe operation and potential impacts on the fish populations in the adjacent lakes and streams of the Gabra River catchment.

Fauna - Amphibians and reptiles

Non-radiation aspect

In a non-radiation aspect, failure to implement the draft of an updated Strategy is expected to result in maintaining the trends in the condition of amphibians and reptiles, and, in some cases, to the accumulation of effects of various adverse impacts in the 30 km zone around Kozloduy NPP.

Failure to implement the draft of an updated Strategy is expected to result in maintaining the trends in the condition of amphibians and reptiles, and, in some cases, to the accumulation of effects of various adverse impacts in the 5 km zone around SD „PRRAW-Novi Han". The conservation status of the species may deteriorate or remain at its current level.

Radiation aspect

It is expected that if the draft of an updated Strategy is not implemented, the state of the environment will be preserved and no over-the-limit values of the tested natural and technogenic radionuclides will be observed in the waters and soils at the monitored points in the 2-30 km zone around Kozloduy NPP. Failure to implement the draft of an updated Strategy will at best maintain the level of risk with regard to the status of amphibian and reptile populations and their conservation status, despite their resistance to radiation.

Failure to implement the draft of an updated Strategy and the envisioned long-term policy regarding the management of RAW at SD „PRRAW-Novi Han" will, in the most general case, preserve the existing risk of increasing the radioactive background in the environment, and will accumulate the negative impact of potentially existing threats to amphibians and reptiles in the area of the site.

Fauna - Mammals

Non-radiation aspect

Failure to implement the draft of an updated Strategy, in a non-radiation aspect, will not lead to changes in the currently existing impacts on the mammal fauna. The current state of the mammal populations in the two zones (Kozloduy NPP zone and SD „PRRAW- Novi Han") depends primarily on the levels of socio-economic development and prevailing human activities, determining the nature and extent of impacts on the species' habitats. Most often, these activities have a limiting effect on the species composition and worsen the population parameters of some species of conservation significance, such as the ground squirrel, the Romanian hamster, forest species of bats, etc. Together with natural processes of succession in ecosystems, these factors will continue to determine the state

of mammalian communities, including widespread and pest species in cultivated agricultural areas and urban territories.

Radiation aspect

In a radiation aspect, failure to implement the draft of an updated Strategy and, as a consequence, the limited possibilities for storage of SNF may affect the state of the environment through radionuclide contamination. As final consumers in food chains, mammals are particularly vulnerable. In the event of an increase in the content of radionuclides in the soil, they are actively absorbed by the root system of plants and through herbivorous mammals reach predators. The impact of radionuclides can be manifested at the molecular level by the occurrence of mutations in the genome of organisms.

Fauna - Birds

Non-radiation aspect

In a non-radiation aspect, the development of the avifauna is not contingent on the implementation of the draft of an updated Strategy.

Radiation aspect

Without the implementation of the draft updated Strategy, there will be no reduction in the terms for intermediate storage of SNF, as well as the quantities of SNF at the Kozloduy NPP site, which could lead to a negative radiation impact on the birds in the area. There will be no benefits for the environment and hence for the birds resulting from maintaining the SNF in a safe condition, choosing more modern and safe containers, improving the efficiency of RAW separation, minimizing the RAW generation, increasing the safety of storage and management of liquid and solid historical RAW.

Without implementation of the draft of an updated Strategy, a negative impact on the birds is to be expected, and also due to the fact that strategic goals aimed at stimulating scientific research and development, resulting in improved management and regulation of SNF and RAW, will not be achieved; enhancing the qualification of personnel for better management of SNF and RAW; preparation of the plans and projects and their implementation in order to achieve safe management of RAW from previous activities.

5.7.3. Protected territories and protected areas of Natura 2000

Non-radiation aspect

In a non-radiation aspect, with the failure to implement the draft of an updated Strategy, there will be a possibility that the existing situation will be preserved or the environmental conservation status of the species and natural habitats subject to protection in the protected areas and protected zones near Kozloduy NPP will deteriorate as a result of the cumulative impact of natural and anthropogenic factors. This also applies to the overall state of the ecosystems in protected areas and protected zones.

In the monitored 5 km zone around the site of SD „PRRAW-Novi Han" there are no territories with protected status in the sense of PAA (Protected Areas Act), as well as protected areas from the NATURA 2000 network. In this sense, the failure of the Zero Alternative is not relevant to this component.

Radiation aspect

Regardless of the fact that there is no information about any specific or particular data on radioactive contamination in protected areas and protected territories, the failure to implement the draft of an updated Strategy may lead, in the radiation aspect, to increasing of the risks for the species and natural habitats subject to protection in the protected areas and protected territories. The lack of long-term management of SNF and RAW at Kozloduy NPP will inevitably lead to an increase in their volume, and this poses risks for their safe storage. There is a possibility of a deterioration of the conservation status of the species and habitats subject to protection in the PAA, which will lead to the maintaining or even increasing of certain risks in this direction. This applies with equal force to the areas under the two Directives, as well as in terms of the overall state of the ecosystems in the protected territories and the protected zones, while maintaining the existing risks of deterioration of individual components, including pollution of aquatic and terrestrial habitats.

In the monitored 5 km zone around the site of SD „PRRAW-Novi Han" there are no territories with protected status in the sense of PAA, as well as protected areas from the NATURA 2000 network. In this sense, the failure of the Zero Alternative is not relevant to this component.

5.8.Cultural and historical heritage

The state of the cultural and historical heritage is not contingent on the implementation of the draft of an updated Strategy.

5.9.Waste

Non-radiation aspect

Non-radioactive waste - The management of non-radioactive waste does not depend directly on the draft of an updated Strategy for the management of spent nuclear fuel and radioactive waste in Bulgaria. Without its implementation, existing trends regarding the state of waste management will be maintained.

Radiation aspect

Radioactive waste - Failure to implement the draft of an updated Strategy for the management of spent nuclear fuel and radioactive waste in Bulgaria is in contradiction with the current European and Bulgarian legislation. The strategy is a basic document presenting the national policy, principles, goals and tasks related to the safe and responsible management of all stages of the management of SNF and all types of RAW - from their generation to their disposal. The draft of an updated Strategy outlines the implemented and planned practical solutions, their stages and deadlines for implementation, as well as the method of their financing. Failure to implement an updated Strategy will not fulfil the set strategic goals related to the long-term management of RAW, which may lead to significant negative impacts on the environment, population and human health.

5.10. Harmful physical factors

Non-radiation aspect

Some of the harmful physical factors – noise, vibrations and non-ionizing radiations are not directly addressed in the draft of an updated Strategy. Without implementation of the draft of an updated Strategy, existing trends regarding their status will be maintained.

Radiation aspect

As regards ionizing radiation - without implementing the draft of an updated Strategy, the terms for intermediate storage of nuclear fuel will not be reduced, neither will the quantities of nuclear fuel at the Kozloduy NPP site; the introduction of more modern and safer containers will not be implemented, neither will there be an improvement in the efficiency in the process of separating and minimizing the generation of RAW or in the increase in the safety in storing and managing liquid and solid historical RAW, which could result in an increase in the radiation impact, i.e. an increase in the impact of harmful physical factors.

5.11. Material assets

If the draft of the updated Strategy is not implemented, the state of material assets will develop in accordance with natural and anthropogenic processes. Without carrying out periodic repair and rehabilitation activities, the condition of the road, railway, water supply, sewerage, gas transmission, etc. infrastructure will deteriorate. Whereas, with the timely implementation of repair and rehabilitation activities by the owners of the infrastructure, its condition will remain the same or mark an improvement.

As regards the nuclear infrastructure, if the draft of an updated Strategy is not implemented, its quality will also deteriorate due to natural processes of depreciation of the facilities.

5.12. Population, human health

Non-radiation aspect

If the draft of an updated Strategy is not implemented, the state of the population and human health will continue to be the same as it is now.

Radiation aspect

With regard to the population and human health, the main negative consequences that may occur in terms of radiation in the event of failure to implement the draft of an updated Strategy are related to:

- the impossibility of transporting SNF for long-term storage and processing and, respectively, an increased risk to the safety and health of the population;
- increase in the amount of SNF stored at the Kozloduy NPP site;
- reduction of the storage capacity for intermediate storage of SNF;
- delay in the activities related to planning and construction of a deep geological repository (DGR);
- delay in commissioning of the NRRAW;
- delay/blocking of the process of processing and conditioning of RAW from the operation of Kozloduy NPP and from the decommissioning (DC); suspension/extension of the decommissioning process, etc.

All these risks of non-implementation of the draft of an updated Strategy may lead to an increase in the direct and indirect radiological risk to the population.

6. Environmental characteristics for territories that may be significantly affected

Considering that there is concrete information about the tasks and measures that will be implemented in view of the set strategic goals, attention will be directed to the most vulnerable territories that should be taken into account in future assessments, below is a brief overview of the main groups of these territories.

6.1.Landscapes and territories of Community interest

Below are described Protected Areas (PAs) from the Natura 2000 environmental network within the meaning of the Biodiversity Act, which fall within the territorial scope of:

Kozloduy NPP

As described above in item 4.7.7. the following Protected Areas (PAs) are located in the 30 km monitored zone (MZ) around Kozloduy NPP:

According to Directive 2009/147/EC on the protection of wild birds:

- PA “Zlatiyata” BG0002009;

According to Directive 92/43/EEC on the conservation of habitats and wild flora and fauna:

- PA "Kozloduy Islands" BG0000533;
- PA "Tsibar" BG0000199
- PA "Ogosta River" BG0000614;
- PA "Skat River" BG0000508;
- PA "Kozloduy" BG0000527;
- PA "Zlatiya" BG0000336.

The general conservation objectives of the protected areas for birds are as follows:

- Conservation and maintenance of the habitats of bird species subject to protection in the area, to achieve their favourable conservation status;
- Restoration of the habitats of bird species subject to protection in the area, for which it is necessary to improve their conservation status.

The general conservation objectives of protected areas for habitats are as follows:

- Preservation of the area of natural habitats and the habitats of species and their populations subject to conservation within the protected area;
- Conservation of the natural state of the natural habitats and the habitats of species subject to protection within the protected area, including the species composition natural to these habitats, characteristic species and environmental conditions;
- Restoration, if necessary, of the area and natural state of priority natural habitats and habitats of species, as well as populations of species subject to conservation within the protected area.

For all protected areas for birds, as well as for some of the areas for habitats, there are promulgated orders pursuant to Art. 12 of the Biodiversity Act, where specific conservation objectives are indicated.

SD „PRRAW-Novi Han”

In the 5-km monitored zone around SD „PRRAW-Novi Han” there are no protected areas according to the meaning of the Biodiversity Act. The nearest PAs are:

- According to Directive 92/43/EEC on the conservation of habitats and wild flora and fauna: PA Plana BG 0001307 - 6,600 m;
- According to Directive 2009/147/EC on the protection of wild birds: PA Dolni Bogrov-Kazichene BG 0002004 – 10,000 m.

6.2.Landscapes and territories with national protected status

Below are described Protected Territories (PT) within the meaning of the PAA, falling within the scope of:

Kozloduy NPP

In the 30 km Monitored Zone (MZ) around Kozloduy NPP, are located the following protected areas and protected territories, for which information was taken from the electronic register of protected areas and protected territories in the Republic of Bulgaria, published on the Environment Executive Agency (EEA) website:

- Protected locality "Kozloduy" with an area of 10 ha, in the land of the town of Kozloduy; recategorized from a historical site by Order of the Ministry of the Environment and Water No. РД-639/26.05.2003 for the conservation of a characteristic landscape;
- Maintained reserve "Ibisha" with an area of 34.47 ha in the land of the village of Dolni Tsibar, Valchedram municipality; announced by Order No. РД-794/08/10/1984, with the aim of protecting characteristic Danube island communities - floodplain forests and swamps inhabited by protected species of plants and animals;
- Protected locality "Kochumina" with an area of 2.5 ha, in the land of Selanovtsi village, Oryahovo municipality; announced by Order No. РД-2109/20.12.1984 and recategorized by Order No. РД-642/26.05.2003, with the aim of protecting a water lily site;
- Protected locality "Gola bara" with an area of 2 ha, in the land of Selanovtsi village, Oryahovo municipality; announced by Order No. РД-2109/20.12.1984 and recategorized by Order No. РД-643/26.05.2003, with the aim of protecting a water lily site;
- Protected locality "Kalugerski Grad - Topolite" with an area of 0.2 ha, in the land of Selanovtsi village, Oryahovo municipality; announced by Order No. РД-2109/20.12.1984 and recategorized by Order No. РД-644/26.05.2003, with the aim of protecting a Stratiotes aloides;
- Protected locality "Koritata" with an area of 2 ha, in the land of the village of Sofronievo, municipality of Mizia; announced by Order No. РД-407/07.05.1982 and recategorized by Order No. РД-641/26.05.2003, with the aim of protecting a natural red peony site and a remarkable landscape;

- Protected area "Daneva Mogila" with an area of 4.9 ha, in the land of Sofronievo village, Mizia municipality; announced by Order No. 413 /10.05.1982 , with the aim of preserving a characteristic river landscape and a group of centuries-old trees.
- Protected locality "Tsibar Island" with an area of 101.48 ha, in the land of the villages of Gorni and Dolni Tsibar, Valchedram municipality; announced by Order No. РД-292/10.04.2007, with the aim of protecting habitats for nesting, wintering and resting during migration of protected bird species (common tern, little white-fronted tern, oystercatcher, curly pelican, mixed heron colony and others.).

The closest area to the Kozloduy NPP site with nature conservation status under the Protected Areas Act is the Kozloduy Protected Locality (PL), located about 9 km as the crow flies, northwest of the Kozloduy NPP site. The protected locality has an area of 10 ha, and falls within the land of the town of Kozloduy, Kozloduy municipality, a few kilometres from the town, under the jurisdiction of RIEW-Vratsa. It was announced by Order No. 913, dated 08.04.1972, SG No. 41/1972 and was recategorized by Order No. РД-639, dated 26.05.2003, SG No. 60/2003. The purpose of the announcement is the preservation of a landscape representing the result of a harmonious coexistence of man and nature.

For each of the protected territories there are certain management regimes with which all potential interventions should comply.

SD „PRRAW-Novi Han”

In the 5-km monitored zone around SD „PRRAW-Novi Han” there are no protected territories according to the meaning of the PAA.

The closest protected area is the "Vrana" protected area - at 15,000 m.

- It falls within the territory of the Regional Inspectorate for the Environment and Water, Sofia, Announced by Order No. РД1027, dated 28.12.2001, No. 16/2002 of the State Gazette 1027-2001. The objectives of the announcement: Protection of habitats of rare and endangered plant and animal species, including yew and holly and Preservation of a unique forest and a unique park with a remarkable landscape.

6.3.Water protection zones

According to the provisions of Art. 6 of the Water Framework Directive (WFD), EU Member States are required to also ensure the preparation of registers for all water protection zones within the boundaries of each individual basin management area. The requirements of Art. 6 of the WFD are transposed in Art. 119a. para. 1 of the Water Act, regulating the following water protection zones:

- the catchment area of the surface water bodies and the ground surface above the groundwater bodies under Art. 119, para. 1. items 1 and 2;
- the water bodies defined as water bodies intended for recreation and water sports, including the designated areas with bathing waters, according to the Regulation under Art. 135. para. 1, item 7;
- the areas where waters are sensitive to biogenic elements, including: vulnerable areas; sensitive areas;

- the zones for the protection of economically valuable species of fish and other aquatic organisms;
- the protected territories and zones designated or declared for the conservation of habitats and biological species, in which the maintenance or improvement of the state of the waters is an important factor for their conservation.

When determining water protection zones, the following are taken into account:

- the water sources for the needs of the population within the borders of the settlements;
- granted individual rights through a license for water abstraction and use of a water body;
- water bodies granted for general water consumption and use, and the lands belonging to them;
- water protection zones, in particular - water bodies and water sources for drinking - domestic water supply of the population and their zones of sanitary protection;
- the natural state of riverbeds, riverbanks and coastal floodplains.

6.3.1. Surface water

There are no zones for the protection of drinking water from surface water bodies in the areas of Kozloduy NPP and SD „PRRAW-Novi Han".

6.3.2. Groundwater

Kozloduy NPP - The area of Kozloduy NPP falls within the zones for the protection of groundwater bodies "Pore water in the Neogene - Lom-Pleven depression" and "Pore water in the Quaternary - Kozloduy lowland".

SD „PRRAW-Novi Han" - The area of SD „PRRAW-Novi Han" falls within the zone for the protection of groundwater body "Fissure water in the area of the Erma and Iskar rivers".

6.4.Recreational waters

There are no zones for the protection of water bodies intended for recreation and water sports in the areas of Kozloduy NPP and SD „PRRAW-Novi Han".

6.5.Zones for protection of economically valuable aquatic organisms

There are no zones for the protection of water bodies intended for preservation of economically valuable aquatic organisms in the areas of Kozloduy NPP and SD „PRRAW-Novi Han".

6.6.Sensitive zones

Kozloduy NPP - The Kozloduy NPP area falls into the BGSARI03 "Danube River" sensitive zone.

SD „PRRAW-Novi Han" - The area of SD „PRRAW-Novi Han" falls into BGCSARI04 "Catchment basin of the Iskar River" sensitive zone.

6.7.Vulnerable zones

The area of Kozloduy NPP falls into the Northern vulnerable Zone.

The area of SD „PRRAW-Novi Han" does not fall into a vulnerable zone.

The activities envisaged in the draft updated Strategy do not affect Sanitary Protection Zones (SPZ) around water sources and facilities for drinking water supply and around mineral water sources used for medicinal, prophylactic, drinking and hygienic purposes.

The implementation of the draft of the updated Strategy will not have an impact different from that already assessed in the assessments made for the individual facilities included in it. This impact is not expected to be significant on the above-mentioned water protection zones.

7. Existing environmental issues identified at different levels relevant to the draft of an updated Strategy, including those relating to areas of particular environmental importance, such as protected areas under the Biodiversity Act

Major environmental issues and trends are addressed by component as follows.

7.1.Climatic factors

As stated in point 4.1.4 above, according to the existing climate change scenarios for Bulgaria, there is a tendency to increase the frequency of extreme events and disasters, which is evidenced by frequent intense rainfalls, heat and cold waves, floods and droughts, wildfires, and landslides. Biodiversity, terrestrial and aquatic ecosystems, as well as the water resources, agriculture and forestry sectors are expected to be affected by the forecasted changes. These changes will further affect society and its citizens, as well as the economy as a whole. Climate change does not affect all people and territories equally due to different levels of exposure, their respective vulnerability and adaptive coping capabilities. The risk is greater for those segments of society and business that are less prepared and more vulnerable.

The draft of an updated Strategy can be considered directly and indirectly affected by the observed and expected climate changes to the extent that the proposed engineering solutions as part of the strategic goals, tasks and measures of the Action Plan do not take into account the expected temperature changes and deviations in precipitation levels.

7.2.Ambient air

In the Republic of Bulgaria, there are no insolvable chronic problems with the main pollutants, with the exception of excessive levels of fine particulate matter, which are mainly due to the use of local solid fuels for heating and the old vehicle fleet, a problem existing in the majority of EU Member States. The data from the monitoring of the ambient air quality in the last reporting year indicate that:

- Pollution with fine particulate matter (**PM_{10}**) continues to be a major problem for the quality of ambient air in the country, and the percentage of the population living with levels of PM_{10} pollution above the limit values is very high - 60.2% of the 3.3 million population living in settlements where this pollutant is controlled. Compliance with the norms for **PM_{10}** has been achieved in 13 municipalities out of a total of 28, included in the infringement procedure of the European Commission for non-compliance with the limit values for the indicator of fine

particulate matter. In 2020, these are Galabovo, Devnya, Dobrich, Pirdop, Sliven, Stara Zagora, Lovech, Varna, Vratsa, Shumen, Dimitrovgrad, Kardzhali and Nesebar;

- The trend of exceeding the average hourly pollutant concentrations for **sulphur dioxide** (SO_2) in the town of Galabovo continues, but the registered excesses in the last reporting year are significantly less. Cases of exceeding of the alarm threshold for sulphur dioxide (500 $\mu g/m^3$) continue to be recorded for the region. The main sources of sulphur dioxide in the southeastern area for assessment and management of ambient air quality are the thermal power plants from the "Maritsa East" energy complex. In 2020, the population in the country was not exposed to levels of **sulphur dioxide** exceeding the permissible average daily norm;
- In 2020, a case of exceeding the target average annual norm for the content of **cadmium** in ambient air was registered in one of the 13 monitoring points ("Pirdop" point) that monitor the levels of this indicator. No case of exceeding the population warning threshold for **ozone** (three consecutive concentrations above 240 $\mu g/m^3$) was recorded. A total of 7 cases of exceeding the threshold for informing the population (180 $\mu g/m^3$) were recorded in the "Sofia - Druzhba" poinr - 6 cases, and in the "Sofia - Kopitoto" point - 1 case;
- The country's population is exposed to levels of **ozone** (O_3) above the short-term target norm, with people living in non-urban areas exposed to higher levels of ozone than people living in the cities;
- In 7 out of a total of 16 sites, the exceedance of the average annual norm (AAN) for the **benzo(a)pyrene** indicator was observed. About 68% of the population lives at pollution levels above the target norm for the respective pollutant.

These issues are not related to the draft of an updated Strategy and will not be affected by its implementation.

In radiation aspect, with regard to the radioactive pollution of the ambient air, no deviations from the radiation gamma background are observed, other than the natural and characteristic ones for the respective areas. There is no deviation in atmospheric radioactivity.

The implementation of the draft of an updated Strategy is expected to continue this trend.

7.3.Water

7.3.1. Surface water

For the broader area around Kozloduy NPP, the main problem related to water pollution remains the anthropogenic impact on surface water bodies from point and diffuse sources. Another significant pollutant is domestic sewage discharged from agglomerations where WWTPs have not yet been constructed, as well as households in towns and villages without urban sewerage systems in place, which discharge domestic sewage into cesspools/septic pits. A significant problem is the formation of unregulated landfills near water bodies and the direct disposal of waste into the water bodies. Pollution due to fertilization of agricultural lands is also a significant pollutant.

These issues are not related to the draft of an updated Strategy and will not be affected by its implementation.

For the broader area around SD „PRRAW-Novi Han", the trend to discharge untreated wastewater from the towns and villages with over 2000 equivalent residents without a constructed WWTP in

settlements and resorts, including in the area of the town of Elin Pelin and Elin Pelin railway station, remains unchanged. On the territory of some settlements, there is either a partial sewerage network constructed or there is none at all. The wastewater is discharged into the adjacent gullies and tributaries, including Iskar River, without any treatment. This creates prerequisites for contamination of groundwater and surface water and deterioration of the environmental situation in the area.

These issues are not related to the draft of an updated Strategy and will not be affected by its implementation.

7.3.2. Groundwater

The main sources of groundwater pollution are: contaminated surface water; nitrate pollution from agricultural sources; diffuse sources have an increasing impact on groundwater; the untreated domestic sewage and the use of cesspools/septic pits in the agglomerations without constructed sewage systems and WWTP; waters from livestock farms.

In general, it must therefore be concluded that the sites which are potential pollutants of groundwater do not have a significant impact on their composition and character. Biogenic pollutants - nitrates, nitrites, etc. are introduced into the groundwater through untreated domestic sewage, water from livestock farms and rainwater from fertilized agricultural fields. The presence of biological and organic components in groundwater is not always a sign of contamination, and sometimes these components have a mineral origin. The iron content in most cases is of natural origin, but one of the reasons for the excessive values is the materials used in the construction of the water intake facilities.

These issues are not related to the draft of an updated Strategy and will not be affected by its implementation.

7.4. Subsoil

The main problems with regard to the subsoil component are related to mining activities and are the result of disruption and compromising the integrity of geological formations on significant areas, as well as the destruction of geological formations and phenomena. The open-pit extraction of natural resources creates conditions for the development of erosion processes, which in the long term lead to the destruction of the bedrock. In itself, the process of rock destruction is natural and is the basis of soil formation, but the extraction of natural resources is most often associated with the disturbance of terrains where natural erosion is not well manifested.

Another existing problem is the impact on the subsoil resulting from various construction activities for facilities and road/railway infrastructure. The connection between this problem and the draft of an updated Strategy is the envisioned:

- construction of the NRRAW - whose impact is assessed in the Environmental Impact Assessment (EIA) Report as a negative, but unavoidable, direct, secondary, permanent, long-term and irreversible impact on the subsoil, with a very low degree and territorial scope of the site of the investment proposal. It does not lead to a significant change in the structure of the geological environment;
- the construction of a deep geological repository - but at this stage details of the project are not available and assessment can be made upon refinement of the envisaged project activities in some of the next updates of the Strategy.

Based on the above, it can be concluded that the implementation of the draft of an updated Strategy is not expected to compound the problem of affecting the subsoil.

7.5.Soil

The main environmental problems and trends in relation to soils in a non-radiation aspect are mostly manifested in the development of problems related to soil compaction, sealing, erosion, landslide processes, local pollution, salinization and acidification.

Of the problems listed above, the ones related to the updated Strategy are local pollution and soil sealing, which arise from the construction activities, mainly of the NRRAW, and are expressed in the disturbance/destruction of the soil layer within the scope of the construction sites of the facilities for the storage of radioactive waste. During construction, the impacts on the soils are irreversible, direct, negative.

The monitoring carried out by the Executive Environment Agency (EEA) to monitor the radiation status of soils and sediments is divided into background radiation monitoring and monitoring of areas with potential pollutants. The content of natural radionuclides in soils is not regulated, therefore the degree of contamination is determined by comparison with the relevant background values in the area.

The analysis and assessment of the results obtained in the last published report of the EEA show that the values of the specific activities of the natural radionuclides in the surface soil layer, in the individual monitoring points, do not exceed the characteristic values for each point.

In terms of soil contamination with radionuclides, the territory that was comparatively the most affected by the Chernobyl nuclear accident in 1986 was that of southern Bulgaria - Plovdiv, Smolyan and Pazardzhik regions.

During the implementation of the draft of an updated Strategy, no impacts are expected regarding the radiation status of the soils in the area of the NRRAW site, during the operational period of the repository, since the packaging of the conditioned RAW (reinforced concrete containers) and the other engineering barriers of the NRRAW guarantee non-spreading of radioactive substances and environmental protection from radioactive contamination. No change in soil radiation indicators beyond the typical background levels for the region is expected as a result of the implementation of the NRRAW.

No significant negative impacts in both non-radiation and radiation aspects are expected upon implementing the draft of an updated Strategy, given the foreseen engineering barriers preventing the transfer of radionuclides into the environment. The implementation of the draft of an updated Strategy is not expected to compound the soil problems or lead to the emergence of new problems.

7.6.Landscape

Environmental problems related to the landscape arise mainly from the lack of specific legislation, the pollution of the landscape components, the change and disturbances of the landscape types, and the resulting visual-aesthetic impacts.

The draft of an updated Strategy includes objectives, tasks and measures in which construction activities are envisioned and which involve impacts on the landscapes, mostly associated with the

construction of the NRRAW. During the construction stage, the following landscape components will be affected: geology, soils and vegetation, and the socio-economic functions of the landscape will not change. No disturbances in the structure and functioning of the landscapes are expected, but a change is expected only in the local structure, without impact on the main landscape type.

The period of operation is not associated with a negative impact on the landscape components, therefore contamination of landscape components with pollutant emissions is not expected.

Contamination of landscape components, alteration and disturbance of landscape types and resulting visual and aesthetic impacts are not anticipated.

On the basis of the above, it can be concluded that the implementation of the draft of the updated Strategy is not expected to compound the problems with respect to the landscapes.

7.7.Biodiversity

7.7.1. Flora

The flora and vegetation in Bulgaria are facing a wide range of threats. According to the Biodiversity Strategy of the Republic of Bulgaria (2022), threats to biodiversity can be classified into several main groups:

- habitat loss/change;
- overexploitation/unsustainable use of biodiversity;
- invasive alien species (IAS);
- climate change and pollution.

The implementation of the draft of an updated Strategy will not have an impact on the existing environmental problems in the country. It is not expected to lead to habitat loss/change, overexploitation/unsustainable use of biodiversity, introduction or support of the spread of invasive alien species, and climate change. With respect to pollution, the implementation of the draft of an updated Strategy is relevant to radioactive pollution, which is mentioned in the Biodiversity Strategy of the Republic of Bulgaria (2022), but not addressed as an existing problem. The implementation of the draft of an updated Strategy will have a long-term positive impact in terms of radiation aspect from reducing the terms for intermediate storage of SNF and reducing the quantities of SNF at the site. The impact will be both local, within the Kozloduy NPP site, and regional. Stimulating scientific research and providing staff with the necessary expertise and qualifications to better deal with SNF and RAW management, as well as involving the public in discussion and decision-making as regards SNF and RAW management, will have a long-term positive impact in radiation aspect.

7.7.2. Fauna - Invertebrate

The results of the radiological monitoring of the environment in 2022 on the territory of RIEW-Vratsa, RIEW-Montana and RIEW-Sofia show that the radiation gamma background is within the limits of the background values typical for the country. No increases in the specific activities of the studied natural and technogenic radionuclides were observed in the ambient air, water and soil. The values do not differ from those registered in previous years. Currently, these results do not

predetermine the existence of environmental problems pertaining to the invertebrate fauna and relevant to the draft of an updated Strategy.

7.7.3. Fauna - Fish

As a component of biological diversity in the aquatic environment, fish are directly related to the state of surface waters. In connection with the specifics of nuclear energy, an essential element in the operation of storage facilities for SNF is its reliable cooling. For this purpose, mostly natural waters are used, and the process itself is the basis of the so-called "thermal water pollution". The immediate environmental consequences of the increase in water temperature for hydrobionts, and fish in particular, are the reduced content of oxygen dissolved in the water, the acceleration of the respiratory process and strengthening of the metabolism of aquatic organisms, etc.

Of the impacts on fish the greatest negative effect comes from the thermal load on the Danube River, as well as from the impact of invasive aquatic species, and to a lesser extent from the water transport, organic load and pollution with inert substances of the Danube River and the estuarine areas of its larger tributaries on the territory of Bulgaria (Ogosta River, Iskar River, etc.). The increase in the water temperature of the Danube River from the discharge of the cooling channel causes a significant temperature difference between the outflowing water and the water of the Danube River. The adverse impact is strongest on the more cold-loving species, e.g. The spined loach (Cobitis taenia), the Zingel zingel (Zingel zingel), the streber (Zingel streber) among others. An indirect effect of this impact is stimulation of the spread of invasive and alien aquatic species, and when their impact increases (increased filtration and mussel fouling, strong competition and predation in fish) it will result in lasting adverse effects that can occur not only for fish but also for the aquatic ecosystem as a whole.

The implementation of the draft of an updated Strategy is expected to have a long-term positive impact in terms of radiation aspect by reducing the terms for intermediate storage of SNF and reducing the quantities of SNF at the site, and consequently reducing the radiation impact and reducing the risk to the environment, including the aquatic ecosystem and the fish populations.

The implementation of the draft of an updated Strategy is not expected to compound the existing problems.

7.7.4. Fauna - Amphibians and reptiles

According to the European Environment Agency's (EEA) report “State of Nature in the EU”, the increased use of fertilisers, irrigation and pesticides, and the increase in land use conversion and land use are among the main sources of pressure on local organism populations. Draining of swamps, deforestation, intensive agriculture/livestock farming, land fragmentation and drainage for agricultural purposes destroy/damage habitats where amphibians and reptiles find food and shelter and breed. Among the factors that put the greatest pressure on the sustainable maintenance of their populations the following can be mentioned: felling, ploughing of pastures and meadows or overgrowth of pastures, pollution, poaching, drying up of water bodies, etc.

Since the 1980s, a significant decline in the number and species diversity of amphibians has been recorded worldwide, characterized by a sharp decline in numbers and mass extinctions of individuals. Worryingly, the threat to amphibians affects species in all ecosystem types. The mass extinction and the decline of amphibian populations is also due to global causes. Among them are the following: the increase in ultraviolet rays reaching the surface of the Earth (due to the depletion of the ozone layer), the appearance of new predators in ecosystems (introduced, invasive species), loss of habitats and their fragmentation, poisoned environment and acidity, emergence of diseases, climate change, as well as the combination of more than one of the above factors.

The draft updated Strategy does not foresee any change in the operation of the reactors and the SNF storage facilities, nor does it foresee any change in the quantity and temperature of the used water that is discharged into the Danube River, so no exacerbation of the environmental consequences of the increase in water temperature is expected.

The existing problems are not pertinent to the draft of an updated Strategy, and its implementation is not expected to lead to the compounding of the existing problems or to the emergence of new problems.

7.7.5. Fauna - Mammals

The results of the radiological monitoring of the environment in 2022 on the territory of RIEW-Vratsa, RIEW-Montana and RIEW-Sofia show that the radiation gamma background is within the limits of the background values typical for the country. No increases in the specific activities of the studied natural and technogenic radionuclides were observed in the ambient air, water and soil. The values do not differ from those registered in previous years.

Currently, these results do not predetermine the existence of environmental problems pertaining to the mammal populations and relevant to the draft of an updated Strategy.

7.7.6. Fauna - Birds

According to the Biodiversity Strategy of the Republic of Bulgaria (2022), threats to biodiversity can be classified into several groups – habitat loss/change, overexploitation/unsustainable use of biodiversity, invasive alien species, climate change and pollution.

The implementation of the draft of an updated Strategy will not have an impact on the existing environmental problems in the country. It is not expected to lead to habitat loss/change, overexploitation/unsustainable use of biodiversity, and climate change. With respect to pollution, the implementation of the draft of an updated Strategy is relevant to radioactive pollution, which is mentioned in the Biodiversity Strategy of the Republic of Bulgaria (2022), but not addressed as an existing problem. The implementation of the draft of an updated Strategy will have a long-term positive impact in radiation aspect from reducing the terms for intermediate storage of SNF and reducing the quantities of SNF at the site. The impact will be both local, within the Kozloduy NPP site, and regional. Stimulating scientific research and providing staff with the necessary expertise and qualifications to better deal with SNF and RAW management, as well as involving the public in discussion and decision-making as regards SNF and RAW management, is expected to have a long-term positive impact in radiation aspect.

7.7.7. Protected Areas (PAs) and Protected Territories (PTs)

Bulgaria is currently in the stage of preparing specific goals and measures for protected areas under Natura 2000. In the conditions of insufficient and/or insufficiently up-to-date spatial data, this process is extremely time-consuming. This leads to insufficiently adequate management of the national environmental network. Activities related to protecting and/or restoring natural habitats and species habitats and populations are often not well prioritized, resulting in a lower than expected impact. An additional problem is the very small number of protected areas for which there are prepared management plans, which creates chaos in the activities of conserving the biodiversity in the PA, as well as lower than expected efficiency.

It should be noted that in some regions of the country, a significant negative cumulative effect on biodiversity is recorded as a result of inconsistency in the activities (or lack thereof) with regard to the implementation of environmental protection goals and measures.

The described existing problems are not pertinent to the draft of an updated Strategy, and its implementation is not expected to lead to the compounding of the existing problems or to the emergence of new problems.

7.8.Cultural and historical heritage

The main problems related to the preservation of cultural and historical heritage can be summarized as follows:

- Insufficient compliance with the requirements for the protection and preservation of immovable cultural values under the Spatial Planning Act, the Cultural Heritage Act, the Environmental Protection Act and the decrees thereof; with the specific rules and norms in the general and detailed spatial development plans regarding the organization of the territories representing cultural and historical heritage;
- Failure to foresee and undertake preventive measures for physical protection and preservation;
- Insufficiency of the regulatory requirements regarding the scope and content of spatial development plans and investment projects to provide for complex measures involving renovation, restoration and protection of cultural heritage sites and the environment for their presentation from damage and destruction as a result of foreseeable natural and human factors;
- Storage and restoration activities that have not been performed with satisfactory quality or with the use of materials that are unsuitable for storage and restoration activities, affecting the specific conditions (microclimate) in the presentation environment;
- Inappropriately selected materials for storage and restoration activities in relation to the sustainable and specific conditions (microclimate) in the presentation environment;
- Incompetence and improvisations in carrying out current repair works and storage and restoration activities in the construction and restoration works of immovable cultural values in their presentation environment;
- Lack of institutionalized permanent control of the alterations in the parameters of the various factors affecting the material carriers and the presentation environment of the cultural heritage sites;
- Not adequately clarified regimes for protection, preservation and management of the promotion of cultural values;
- Prioritization of activities that are risky with a view to the protection and preservation of immovable cultural values, and activities involving renewal of both the values themselves and their presentation environment.

These issues are not directly relevant to the draft of an updated Strategy.

7.9.Waste

Non-radioactive waste

With respect to non-radioactive waste, the existing problems are mainly related to:

- unregulated waste disposal;
- waste dump sites liable to closure, but still in operation;
- the lack of places for recycling and disposal of construction waste.

These problems are not directly pertinent to the draft of an updated Strategy, and its implementation is not expected to lead to the compounding of these problems or to the emergence of new problems.

Radioactive waste

In the draft of an updated Strategy for the management of spent nuclear fuel and radioactive waste in Bulgaria, an analysis of the existing situation with regard to RAW has been made, the existing problems, difficulties and risks related to the management of RAW have been identified, as well as the responsible and involved departments in the process of RAW management.

Given the analyses and conclusions made in the Strategy, goals have been set and an Action Plan has been drawn up according to the RAW Management Strategy.
The implementation of the draft of an updated Strategy will not lead to the compounding of the existing problems, but is rather expected to have a long-term positive impact in radiation aspect of the foreseen responsible and safe RAW management - responsible and safe interim storage of high-level waste (HLW) at the Kozloduy NPP site, safe management of low- and medium-level radioactive waste from Units 5 and 6 of Kozloduy NPP, and achieving and maintaining sustainability in the RAW management. The impact is expected to be both local and regional and to lead to a reduction in the risk to both human health and life and to the environment.

7.10. Harmful physical factors

Noise - From the analysis of the state of the factor as a serious environmental problem at the national level, increased levels of noise in populated areas are established. This problem is not directly relevant to the draft of an updated Strategy.

Ionizing radiations - With regard to ionizing radiations, the problem of the effective reclamation of sites from the former uranium mining and processing industry has also been identified as unresolved. This problem is also not directly relevant to the draft of an updated Strategy.

It is not expected that the draft of an updated Strategy will lead to compounding the existing problems, or to the emergence of new problems with respect to the harmful physical factors. On the contrary, a reduction in radiation impact is expected, i.e. a reduction in the impact of harmful physical factors.

7.11. Material assets

As described in item 4.11, there are existing problems related to the state of material assets in Kozloduy municipality (around Kozloduy NPP) and Elin Pelin municipality (around SD „PRRAW-Novi Han"). They are mainly related to the state of the water supply and sewerage network. The water supply facilities are old, accidents are frequent and there are significant losses of potable water. The sewage network needs to be expanded, and WWTPs need to be constructed.

The described problems are not directly related to the implementation of the strategic goals, tasks and measures laid down in the draft of an updated Strategy. The implementation of the draft of an updated Strategy is not expected to result in compounding the existing problems or the emergence of new ones.

7.12. Population, human health

The main problems of demographic development in the country and in the analysed districts and municipalities are related to the reduction of the population in some regions, depopulation of small settlements, negative natural and mechanical growth rates, continued, albeit at lower rates, emigration, etc., negative processes at the state, district, municipal level. These negative processes were aggravated with the increased morbidity and mortality rates from COVID-19 in 2020 and 2021.

The demographic and health issues are not directly relevant to the draft of an updated Strategy. It is not expected that the draft of an updated Strategy will lead to compounding the existing demographic problems, or to the emergence of new problems with respect to population and human health.

The implementation of the draft of an updated Strategy will have a long-term positive impact in radiation aspect from reducing the terms for intermediate storage of SNF and reducing the quantities of SNF at the site. The impact will be both local, within the Kozloduy NPP site, and regional. A reduction in the radiation impact is expected, respectively a reduction in the risk to people's health and life.

Also, the implementation of the draft of an updated Strategy is expected to create an opportunity to provide and maintain sustainable financial and human resources in relation to the sites and the foreseen tasks, measures and necessary activities under the Strategic Objectives. Stimulating scientific research and providing staff with the necessary expertise and qualifications to better deal with SNF and RAW management, will have a strong positive effect on attracting and establishing young personnel and settling new people in these areas. It is therefore expected that the implementation of the draft of an updated Strategy will be conductive to a certain extent to solving the existing problems with respect to population decline.

Involving the public in discussion and decision-making regarding the management of SNF and RAW will also have a long-term positive impact on the population.

8. The national and international environmental protection objectives relevant to the draft updated Strategy and the manner in which these objectives and any environmental considerations have been taken into account during the preparation of the draft updated Strategy

The following table analyses the relevance of the environmental protection goals at the international and national level, included in the strategies, plans and programs described in point 3 to those of the draft of an updated Strategy for SNF and RAW.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
Strategic documents and environmental protection objectives at the international level			
Eighth EU Environment Action Program 2030	2020-2030	The program aims to accelerate the transition to a climate-neutral, resource-efficient economy and to support the European Green Deal and its environment and climate initiatives	The main principles, policies and objectives of the updated Strategy are in line with and complement the objectives set out in the Eighth EU Environment Action Program to 2030. The following principles, policies and objectives of the draft of an updated Strategy: - *consideration of the interrelationships between all stages of the generation and management of radioactive waste* - *traceability of waste at all stages of its management* - *reducing to a minimum the generated amount of spent nuclear fuel and its disposal volumes* - *involvement of all interested parties in the decision-making process* - *management guaranteeing the absence of negative impacts on the population and human health* - *the provision and maintenance of sustainable financial and human resources to maintain expert knowledge* are in line with the following priority objectives of the Eighth Programme: - *ongoing progress in improving administrative capacity, strengthening resilience and reducing vulnerability to climate change* - *Pursuing the ambition of zero environmental pollution for an environment without toxic substances* - *Promoting environmental sustainability and reducing key environmental and climate pressures*
EU Circular Economy Action Plan	2020-2050	The plan contains initiatives related to each stage of the product life cycle in order to reduce pressure on natural resources and to secure sustainable growth and jobs. The plan is also a prerequisite for achieving the EU's goal of climate neutrality by 2050 and halting the loss of biodiversity. It	The objectives of the updated Strategy for the Management of Spent Nuclear Fuel and the objectives of the EU Circular Economy Action Plan contain complementary elements in the area of waste limitation as follows: <u>Objectives of the Circular Economy Plan:</u> - *Generating less waste through the introduction of specific instruments such as a more effective waste management policy aimed at preventing waste and supporting its circular nature, increasing circularity in a non-toxic environment, creating a*

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		focuses on the way in which products are designed and produced, creating sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible.	*well-functioning EU market for secondary raw materials and taking stricter measures in relation to the export of waste to third countries* <u>Corresponding principle of the updated SNF and RAW Management Strategy:</u> - *Principle of traceability of radioactive waste at all stages of its management* - *Reducing to a minimum the amount of spent nuclear fuel generated and the volumes of radioactive waste for disposal* - *A strategic goal to sustainably reduce the quantities of SNF at the Kozloduy site, and to construct appropriate storage and processing facilities.* - *A key aspect of the policies defined by the updated strategy is to take into account the interrelationships between all stages of the generation and management of SNF and RAW and the safety requirements, part of which is the minimization of the volume and activity of RAW through applying all measures to reduce their volume and activity in the generation process, and through applying appropriate practices in their subsequent management, including recycling and reuse of materials and taking into account the requirements for minimizing RAW in the design, construction, operation and decommissioning of nuclear facilities.*
Strategic documents and environmental protection objectives at national level			
Strategy for sustainable energy development of the Republic of Bulgaria until 2030 with a horizon until 2050, and a draft of an Integrated National Plan in the field of the energy	2020-2030	The strategy lays down common European policies and goals for the development of energy and for limiting climate change, reflecting national specificities in the field of energy resources, production, transmission and distribution of energy. The strategy for sustainable energy development of the Republic of Bulgaria until 2030 with a horizon until 2050 clearly reflects the trends, measures and policies in the field of energy security, energy efficiency, the liberalization of the	The updated Strategy for SNF and RAW management is aligned with the following goals at the national level of the Strategy for Sustainable Energy Development: - *Ensuring the adequacy and sustainability of the national electricity system* - *Increasing network and information security of the energy system* In order to guarantee energy security in the field of nuclear energy, the Strategy for Sustainable Energy Development of Bulgaria states that the operation of nuclear facilities in the country must be carried out in compliance with the highest levels of nuclear safety, including in the management of spent nuclear fuel. The draft of an updated SNF and RAW Strategy meets this requirement through the following basic principle: - *In the SNF and RAW management, nuclear safety and radiation protection take priority over all other aspects of this activity* Interaction between the two strategic documents is also present with regard to Priority 4 of the Strategy for Sustainable Energy Development:

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
and climate of the Republic of Bulgaria until 2030.		electricity and gas markets and their integration into the common European energy market, the development and implementation of new energy technologies. These policies are also reflected in the Integrated Plan in the field of energy and climate of the Republic of Bulgaria until 2030, which was prepared in implementation of Regulation (EU) 2018/1999 on the management of the Energy Union and actions in the field of climate.	- *Sustainable energy development for clean energy and decarbonisation of the economy.* The priority includes in its scope nuclear energy as a proven emission-free resource and a factor in the effective fight against climate change. The role of the qualified human potential that our country has in terms of the safe and secure operation of nuclear power facilities is indicated as a factor in the fight against climate change. The draft of an updated strategy for SNF and RAW management meets Priority 4 through the following strategic objective: - *Ensuring and maintaining sustainable financial and human resources for the availability of the necessary expertise and qualifications, including for carrying out scientific research and development, necessary for SNF and RAW management and regulation*
Strategic vision for sustainable development of the electricity sector of the Republic of Bulgaria	2023-2053	It reflects the state's vision for the development of the electricity sector, consistent with the current European framework of climate and energy policy and the global trends in the development of new technologies. The vision lays down common European policies and goals for the development of energy and for limiting climate change, reflecting national specificities in the field of energy resources, production, transmission and distribution of energy.	The vision focuses on the development of an appropriate energy mix to achieve Bulgaria's decarbonization goals by 2050, putting the following main priorities on the agenda: - *Maintaining a secure, stable and reliable electricity system;* - *Energy should continue to be a leading branch of the Bulgarian economy with a pronounced foreign trade orientation;* - *Maintaining the country's role as a net exporter of electricity in the region and a balancer in the national electricity systems of neighbouring countries;* - *Ensuring the security of energy supplies;* - *Promotion of clean and low-emission energy;* - *Increasing energy efficiency* Nuclear power is part of the sustainable energy mix. The draft of an updated Strategy for SNF and RAW Management is indirectly related to the Strategic Vision for the Sustainable Development of the Electricity Sector, as the sustainable management of radioactive waste and spent nuclear fuel is part of the existence of a secure and stable electricity system and indirectly contributes to the security of the supplies of energy.
National strategy for the	2022-2032	The strategy for the development of human resources in the nuclear sphere sets a vision for creating	The draft of the updated SNF and RAW Management Strategy has taken into account and is in line with all the strategic objectives (as well as the activities envisaged for them) of the national strategy for the development of human resources, namely:

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
development of human resources in the nuclear sector		and maintaining a sustainable system for the development and enhancement of human resources to ensure the effective functioning of the nuclear sector. An essential element necessary to ensure and maintain nuclear safety and radiation protection at the highest possible level is the presence of personnel with the necessary qualifications in all organizations carrying out activities in the nuclear sector. To achieve the set vision, the strategy defines seven strategic objectives with key activities for each one of them.	- *Strategic objective 1: Enhancing the quantitative and qualitative characteristics of human resources in the nuclear sector.* - *Strategic objective 2: Enhancing the education and training of students in nuclear specialties and specialties related to the nuclear sector* - *Strategic objective 3: Enhancing the preparation and increasing the motivation of the academic and teaching staff employed in training nuclear specialists* - *Strategic objective 4: Improvement and modernization of the material, technical and testing facilities in the academic field* - *Strategic objective 5: Ensuring conditions for career growth of young people in the nuclear sector* - *Strategic objective 6: Creating mechanisms for preservation and exchange of acquired knowledge in the nuclear sector.* - *Strategic objective 7: Improving the interaction between government bodies, as well as between government bodies, economic entities and non-governmental organizations in the nuclear sector.* The draft of an updated Strategy for SNF and RAW management meets the strategic objectives set by the National Strategy for the Development of Human Resources in the Nuclear Sector through the following strategic objective: - *Ensuring and maintaining sustainable financial and human resources for the availability of the necessary expertise and qualifications, including for carrying out scientific research and development, necessary for SNF and RAW management and regulation*
National Development Program Bulgaria 2030	2020-2030	The National Development Program Bulgaria 2030 is a framework strategic document of the highest order in the hierarchy of national program documents, determining the vision and general goals of development policies in all sectors of state administration, including their territorial dimensions. The National Program	The draft of an updated Strategy for the SNF and RAW management is consistent with the applicable aspects of the priorities and axes of development outlined in the National Program, and in particular: - *Axis "Innovative and intelligent Bulgaria":* o *Priority 1: Education and skills* o *Priority 2: Science and scientific infrastructure* - *Axis "Green and Sustainable Bulgaria"* o *Priority 4:* Circular and low-carbon economy; sub-priority "Transition to a circular economy"

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		outlines a vision for Bulgaria in 2030 as having a high standard of living and a competitive, low-carbon economy. The country develops and implements innovations in every sector of the economy, adapting to the changing world through its highly educated, creative, united and healthy society.	The draft of an updated Strategy for SNF and RAW management contributes to the achievement of the outlined priorities from the respective axes of development through the following principles, policies and objectives: - *Ensuring and maintaining sustainable financial and human resources for the availability of the necessary expertise and qualifications, including for carrying out scientific research and development, necessary for SNF and RAW management and regulation* - *Reducing to a minimum the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process.* - *Taking into account the requirements for reducing RAW to a minimum in the processes of design, construction, operation and decommissioning of a nuclear facility* - *Processing of the entire amount of SNF generated* - *Sustainable reduction of the quantities of SNF stored at the Kozloduy NPP site*
National Air Pollution Control Program	2020-2030	The National Air Pollution Control Program was developed in response to the requirements of Article 6 of Directive (EU) 2016/2284, which requires each EU member state to prepare, adopt and implement a National Air Pollution Control Program, which is to be presented to the European Commission. The main objective of the National Air Pollution Control Program is to meet the obligations to reduce emissions compared to 2005 under the provisions of Directive (EU) 2016/2284, which will lead to the gradual achievement of ambient	The updated Strategy for SNF and RAW management is not directly connected with the implementation of the objectives of the National Air Pollution Control Program. There is an indirect link between the two documents, expressed in the interaction between the quality of the ambient air and the contribution of nuclear energy as part of the energy mix for the protection of the purity of the ambient air. Proper management of spent nuclear fuel and radioactive waste is an important process in nuclear power generation and as such has an indirect contribution to ambient air quality.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		air quality levels that do not lead to significant negative impacts and risks to human health and to the environment. The program foresees measures and responsible institutions in sectors that are more significant sources of emissions in the ambient air, such as agriculture, road transport and domestic heating.	
National Program for Improvement of Ambient Air Quality	2018-2024	The national program contains measures, a plan and a timetable for their implementation, to be implemented by the end of 2024, in order to achieve compliance with the Clean Air Directive for Europe in terms of the levels of PM_{10}. Domestic heating using inefficient solid fuel stoves and boilers, which are estimated to account for at least 85% of PM_{10} emissions, is indicated as a source of primary PM_{10} emissions in all municipalities. Transport – exhaust emissions, particularly from diesel vehicles – is an additional contributor and can be a significant factor at the local level. The program proposes four main measures to reduce PM_{10} emissions from domestic heating, which relate to the type of fuels,	The updated Strategy for SNF and RAW management is not directly connected with the implementation of the objectives of the National Program for the Improvement of Ambient Air Quality There is an indirect link between the two documents, expressed in the interaction between the quality of the ambient air and the contribution of nuclear energy as part of the energy mix for the protection of the purity of the ambient air. Proper management of spent nuclear fuel and radioactive waste is an important process in nuclear power generation and as such has an indirect contribution to ambient air quality.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		the quality of the fuels and the technologies used to convert the energy from the fuels into useful heat.	
Strategy and Action Plan for the transition to a circular economy of the Republic of Bulgaria.	2022-2027	The strategy for the transition to a circular economy is built upon the basic principles of the circular economy, which are: 1/ Designing and manufacturing products in a way that does not lead to waste and pollution, 2/ Extending the life cycle of products and materials; 3/ Restoration of natural systems. The vision of the strategy for the transition to a circular economy is related to the provision of economic growth, a clean environment, social well-being and a society with a high environmental awareness that thinks about future generations. The strategy outlines Bulgaria's policy for the transition to a circular economy, to be implemented through a green and competitive economy, with less waste and more resources and an economy for the benefit of consumers.	The draft of an updated RAW and SNF Management Strategy has taken into account and is in line with the applicable strategic objectives of the Strategy and the Action Plan for the transition to a circular economy, and is conductive to the achievement of: - *Strategic objective 2: "Less waste, more resources" and in particular activities related to the generation of ever smaller amounts of waste by promoting activities involving re-use, repair, restoration and processing of products* The following goals from the draft of an updated SNFAW Management Strategy correspond to this strategic goal: - *Reducing to a minimum the amount of SNF generated, and the volumes of RAW for disposal* - *Reducing to a minimum the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process.* - *Taking into account the requirements for reducing RAW to a minimum in the processes of design, construction, operation and decommissioning of a nuclear facility*

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
National Waste Management Plan	2021-2028	The National Waste Management Plan plays a key role for effective and efficient waste management in Bulgaria. It is a tool supporting the central and local authorities in the proper directing and use of the limited resources to projects in the field of waste management with priority funding from national and European funding sources. The plan aims at reducing the harmful impact of waste on the environment and the health of the population, as well as achieving the most efficient use of resources, opening up new markets and creating new jobs. An important part of the Plan is the creation of the most favourable conditions for the prevention of waste generation. It outlines the transition from waste management to efficient use of waste as a resource and sustainable development by preventing its generation.	The connection between the main principles of the National Waste Management Plan and the updated Strategy for SNF and RAW Management is in the prevention of waste generation. In this regard, the Waste Management Plan sets the following goal: - *Reducing the harmful impact of waste by preventing its generation and promoting its reuse, thereby reducing the harmful impact of waste on people and the environment.* The following objectives from the draft of an updated Strategy for SNF and RAW Management correspond to this goal: - *SNF and RAW management must be carried out in such a way that the negative effects on human health and the environment are minimal* - *Reducing to a minimum the amount of SNF generated, and the volumes of RAW for disposal* - *Reducing to a minimum the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process.* - *Taking into account the requirements for reducing RAW to a minimum in the processes of design, construction, operation and decommissioning of a nuclear facility.* An interaction and connection between the National Waste Management Plan and the updated Strategy for the Management of Spent Nuclear Fuel and Radioactive Waste also exists with regard to the participation of stakeholders in waste management decision-making. The main principle of the Waste Management Plan is: - Involvement of the public - the relevant stakeholders and authorities, as well as the general public, have the opportunity to participate in the development of waste management plans and waste prevention programs and have access to them once they have been developed The following strategic objective from the draft of an updated SNF and RAW Management Strategy corresponds to this principle: - *Implementing a policy of openness and transparency and involving the public in the discussion and decision-making regarding the SNF and RAW management*

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
Operational Program Environment	2021-2027	The sectoral nature of the program in itself predetermines its main goal of preserving, protecting and improving the quality of the environment, as provided for in Art. 11 and Art. 191, par. 1 of the TFEU, taking into account the "polluter pays" principle. The main objectives of OPE 2021-2027 meet the objectives of the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) on climate change and disaster risk, water, circular economy, biodiversity and reducing air pollution, while fully respecting European and national legislation in the field of environment, resource and energy efficiency, circular economy. They are in line with the League of Nations' goal of promoting sustainable development and climate action. The objectives of the Operational Program are related to the improvement of the water supply infrastructure and the quality of the ambient air, environmentally-friendly waste management and protection of our rich biodiversity.	The two strategic documents are interconnected in terms of their objectives to improve the protection and preservation of nature from all forms of pollution. Operational Program Environment has foreseen the following priority and specific objective: - *Priority 2: "Waste"* o *Specific objective: Improving the protection and conservation of nature, biodiversity and environmentally-friendly infrastructure, including in urban areas, and reducing all forms of pollution* These aspects were taken into account during the development of the draft of an updated strategy for SNF and RAW management, and the following principle corresponds to them: - *SNF and RAW management ought to be carried out in such a way that the negative effects on human health and the environment are minimal*

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
Interreg VI-A Romania-Bulgaria Programme	2021-2027	The program focuses on projects that jointly solve challenges specific to the cross-border region, have a real cross-border impact and benefit the population, businesses and institutions in the cross-border region. The program invests in operations related to climate change, risk prevention and management, environmental conservation and protection, promotion of resource efficiency, sustainable transport, promotion of employment and labour force mobility. The vision of the Interreg VI-A Romania-Bulgaria program includes strengthening the socio-economic dimension of the Romania-Bulgaria cross-border territory through development and retention of human capital, creating opportunities for personal and professional growth, ensuring an attractive, safe and sustainable living environment and support for innovation and entrepreneurship	There is a connection between the two strategic documents at the spatial level, since the cross-border program operates in the border region of Romania and Bulgaria, in which are located also some of the main facilities for the processing, storage and treatment of radioactive waste and spent nuclear fuel (on the territory of Kozloduy municipality). At the strategic and planning level, the documents interact with each other by incorporating specific priorities and objectives as follows: - *Priority "Greener region" under the Interreg VI-A Romania-Bulgaria Program and a specific goal related to it, involving the improvement and protection of nature conservation and the reduction of all forms of pollution* The draft of an updated Strategy is in line with and complements the indicated priority and specific objective by laying down the following basic principle: - *SNF and RAW management ought to be carried out in such a way that the negative effects on human health and the environment are minimal* And through the following objectives: - *Reducing to a minimum the amount of SNF generated, and the volumes of RAW for disposal* - *Reducing to a minimum the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process.* - *Taking into account the requirements for reducing RAW to a minimum in the processes of design, construction, operation and decommissioning of a nuclear facility*
River Basin Management Plans (RBMP) for the four river basin	2016-2021	The River Basin Management Plans are prepared in accordance with the requirements of Art. 155, para. 1, item 2 of the Water Act (WA) and Art. 13 of the Water Framework Directive (WFD –	There is a spatial relationship between the River Basin Management Plan of the Danube Region Basin Management and the draft of an updated SNF and RAW Management Strategy at the spatial level, as all the facilities intended for management in the updated Strategy are located on the territory of the Danube Region.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
management areas		Directive 2000/60/EU), which has been transposed into the Water Act. The RBMPs are strategic documents that regulate water management in the river basin management areas (RBMA) and were developed in parallel with the Flood Risk Management Plans (FRMP) for the same period, with the aim of ensuring consistency between the two strategic documents as elements of an integrated river basin management. According to the requirements of Art. 14 of the Water Framework Directive (WFD) and Art. 159, para. 1 of the WA, RBMPs are revised and updated every six years after their initial publication. The main goal that is to be achieved through the implementation of the RBMPs is a good state of the waters and their related ecosystems and water protection zones. Achieving the objectives for good water state is related to the implementation of measures to remove or reduce the negative impact of human activity and improve the state of waters in each river basin management area. Each of the four RBMP plans to	The river basin management plans and the updated SNF and RAW management strategy are not directly related. However, both documents act in synergy, with the final effect of applying them together being greater than the final effect of applying each document individually. The updated Strategy for SNF and RAW management provides for the management of specific waste in a way that ensures the absence of effects or minimal effects on human health and the environment. On the other hand, the main objective in the implementation of the RBMPs, namely the good condition of the waters and the related ecosystems and water protection zones, is a prerequisite for the absence of negative effects on human health and the environment.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		implement measures that are aimed at a specific type and sources of pressure, giving rise to significant problems in water management, taking into account the specific conditions and state of the individual water bodies. The programs of measures included in the RBMPs involve measures to limit and reduce the impact on water and ecosystems from various human activities. For each measure, specific actions are foreseen to achieve the relevant environmental goals in response to the specific pressure.	
Flood Risk Management Plans (FRMP) for the four river basin management areas	2016-2021	The plans are prepared based on flood risk assessments and include flood risk management objectives and priorities aimed at reducing the potential adverse effects of flooding on human health, the environment, cultural heritage, technical infrastructure and economic activity, as well as reducing the likelihood of floods. Flood risk management plans aim at flood prevention, preparedness and protection, including through the establishment of early warning systems.	There is a spatial relationship between the Flood Risk Management Plan of the Danube Region Basin Management and the draft of an updated SNF and RAW Management Strategy at the spatial level, as all the facilities intended for management in the updated Strategy are located on the territory of the Danube Region. The Flood Risk Management Plans and the updated RAW and SNF Management Strategy have a mutually complementary, synergistic effect through the implementation of priorities aimed at protecting human life, public health and the environment. In this direction, the FRMP envisages the following main priorities: - Priority 1: Protecting human life and public health - Priority 3: Enhancing environmental protection These priorities are in line with and complement the following elements of the draft for an updated strategy for RAW and SNF management: Main principle: - *SNF and RAW management ought to be carried out in such a way that the negative effects on human health and the environment are minimal*

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
			Objectives: - *Reducing to a minimum the amount of SNF generated, and the volumes of RAW for disposal* - *Reducing to a minimum the volume and activity of RAW by applying all measures to reduce its volume and activity in the generation process.* - *Taking into account the requirements for reducing RAW to a minimum in the processes of design, construction, operation and decommissioning of a nuclear facility* In addition, both documents emphasize the need to introduce and implement strategic goals related to the maintenance and development of sustainable human and professional resources in their individual fields of application through: - *Priority 5 of FRMP: Creation of modern regulations for spatial planning of territories and flood risk management* - *Strategic objective of the draft of an updated Strategy: Ensuring and maintaining sustainable financial and human resources for the availability of the necessary expertise and qualifications, including for carrying out scientific research and development, necessary for SNF and RAW management and regulation*
National Strategy for Management and Development of the Water Sector of the Republic of Bulgaria	Short-term (2013 - 2015), Medium-term (2016 - 2021) Long-term (2022	The strategy was developed on the basis of a series of analyses describing the existing state of the water sector at the time of its preparation. On the basis of the analyses carried out, the strategy outlines the development perspective of the water sector. These relate to achieving the objectives of guaranteed water supply for the population and business in the face of climate change, preserving and improving the status of surface water and	There is a link between the National Strategy for Management and Development of the Water Sector and the draft updated Strategy for the Management of RAW and SNF, which is a prerequisite for complementarity and common contribution to the implementation of the objectives and measures in both documents. The National Strategy for Management and Development of the Water Sector foresees a strategic objective (Objective 3) related to Improving the efficiency of integrated water management as an economic resource. The implementation of this objective ensures that the water resource is returned to nature in a manner that ensures the same quality as before its use. Through this objective, the Strategy introduces measures concerning society as a system that determines the use of the resource, the creation of waste and the pollution of the resource.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
	- 2037)	groundwater, improving efficiency through integrated water resources management and reducing the risk of flood damage.	The following elements of the draft updated Strategy for the Management of SNF and RAW are consistent with Objective 3 of the National Strategy for Management and Development of the Water Sector: Basic principles: - Traceability of RAW at all stages of its management - Management of SNF and RAW should be carried out in such a way that negative effects on human health and the environment are minimised Objectives: - Minimise the amount of SNF generated and the volume of RAW for disposal - Minimize the volume and activity of RAW by implementing all measures to reduce its volume and activity in the generation process. - Consideration of the requirements for minimisation of RAW in the design, construction, operation and decommissioning of a nuclear installation
Marine Strategy of the Republic of Bulgaria	2016-2021 2022-2027	The Marine Strategy of the Republic of Bulgaria has been prepared in response to the requirements of the Marine Strategy Framework Directive 2008/56/EU. The Directive defines a good state of the marine environment as one in which marine waters provide ecologically diverse and dynamic oceans and seas that are clean, healthy and productive, using the marine environment to an extent that is sustainable, thereby maintaining the potential for uses and activities by present and future generations. Achieving good environmental status is the	The updated Strategy for the Management of SNF and RAW has no direct link to the Marine Strategy as the facilities and activities envisaged for the management of radioactive waste and spent nuclear fuel have no connection to marine waters and the marine environment. However, the objectives of both documents are not in conflict as both strategies provide for measures in relation to the reduction, prevention and control of waste and pollution and the outcome of their implementation will contribute to achieving a better quality of the environment.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		responsibility of each Member State, as there are specific problems, conditions and challenges that can only be addressed at national level. Bulgaria is responding to the requirements set out in the Directive by developing and implementing a Marine Strategy at national level, the aim of which is to achieve and maintain good environmental status of the marine environment.	
Strategic Action Plan for Environmental Protection and Restoration of the Black Sea	2009 ongoing	The Strategic Action Plan for Environmental Protection and Restoration of the Black Sea was established in 1996 as an agreement between six countries: Bulgaria, Georgia, Romania, the Russian Federation, Turkey and Ukraine. The plan was updated again in 2009, reflecting the efforts of the Black Sea countries to act in synergy to support the continued restoration of the Black Sea as one of the world's most unique ecosystems. The Strategic Plan addresses four identified transboundary issues to be resolved: eutrophication, changes in living marine resources, chemical pollution and changes in	The updated Strategy for the Management of SNF and RAW has no direct link to the Strategic Action Plan for Environmental Protection and Restoration of the Black Sea, as the envisaged facilities and activities related to the management of radioactive waste and spent nuclear fuel have no link to marine waters and the marine environment. However, the objectives of both documents are not in conflict as both strategies provide for measures in relation to the reduction, prevention and control of waste and pollution and the outcome of their implementation will contribute to achieving a better quality of the environment. An indirect link and synergistic effect can be considered in relation to the requirements set out by CEQA 4b: Reduction of pollutants coming from vessels and land-based facilities of the Strategic Plan and the key principle of the draft updated Strategy relating to the requirement to manage SNF and RAW in a way that does not assume negative effects on human health and the environment as a whole. SNF and RAW are pollutants generated by onshore facilities, which suggests a further indirect link between the stated objective of the national plan for environmental protection and restoration of the Black Sea and the objectives of the draft updated Strategy related to minimising the quantities of SNF and RAW, implementing measures to reduce their volumes already in the process of their generation and taking into account the requirements for minimising RAW in the design, construction, operation and decommissioning of a nuclear facility.

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
		biodiversity (including the emergence of non-indigenous species).	
National Programme for Conservation, Sustainable Use and Restoration of Soil Functions	2020-2030	The aim of the programme is to protect soil resources and their sustainable use, as well as to implement good practices to prevent soil damage. The programme defines objectives, priorities and measures for the practical implementation of the state policy for soil resources conservation at national, regional and local level. The Soil Conservation Programme is the instrument that specifies the ways and means of implementing soil conservation policy in Bulgaria.	The draft updated Strategy for the Management of WRA and SNF under consideration will have a complementary and synergistic effect with the implementation of the priorities, directions and measures of the National Programme for the Protection, Sustainable Use and Restoration of Soil Functions. The commonalities between the two strategic documents are in the application of the principles of integrated management approach and polluter pays, which aim at reducing or eliminating possible negative effects on the health of the population and environmental protection. Another common principle of both documents is the involvement of all stakeholders, pursuing policies of openness, transparency and public awareness in decision-making in management processes. In addition to these principles at the strategic level, the two documents also contain points of convergence in their more specific measures and aspects. Both documents foresee soft measures related to the strengthening of administrative capacity and the provision of expert resources with regard to soil quality control and the management of SNF and RAW. Sustainable management of SNF and RAW is interlinked with soil quality protection and in this sense the draft updated Strategy for SNF and RAW Management is in line with and contributes to the following priorities of the National Soil Protection Programme: - Priority 2: Prevention of degradation processes, restoration and conservation of soil functions - Priority 3: Sustainable management of soils as a natural resource The draft updated Strategy for the Management of SNF and RAW contributes to the achievement of the above priorities by implementing the following key aspect: - The main approach to the management of SNF and RAW is to concentrate and isolate it from the environment, including disposal with the application of passive structures, components and systems to ensure safety. Further synergies exist between the two documents in relation to the following Programme priority:

Strategic document	Time frame	Brief description	Relevance of the draft of an updated Strategy for the management of SNF and RAW to the strategic document and its contribution to achieving its goals
			- Priority 4: Involve the public in soil management, sustainable use and conservation processes and the following strategic objective of the draft updated Strategy: - Pursue a policy of openness and transparency and involve the public in discussions and decision-making on the management of SNF and RAW
Draft of the Strategy for Biodiversity in the Republic of Bulgaria (in the process of adoption) and Draft of the National Plan for Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 (in the process of preparation and adoption)	2022-2030	The Strategy reflects Bulgaria's commitment to the conservation and restoration of biodiversity in Europe, in the context of the EU Biodiversity Strategy for 2030, providing the framework for the implementation of the European Strategy in the local context of our country. Bulgaria's Biodiversity Strategy sets out Bulgaria's medium-term targets and priorities for biodiversity conservation. The Strategy identifies actions in three priority areas and defines 13 objectives.	There is no direct link between the Biodiversity Strategy and the updated Strategy for the Management of SNF and RAW. However, both documents work synergistically as both documents have been developed in the context of priorities, objectives, measures and activities aimed at protecting the environment and avoiding negative impacts on specific components of the environment. A Draft National Plan for the Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 is also under development and adoption. Information on this plan is not publicly available at the time of writing. In the event that information on the National Plan for the Conservation and Sustainable Use of Biodiversity and Genetic Resources 2021-2025 is published in the course of the environmental assessment procedure of the draft updated Strategy for the Management of SNF and RAW, this analysis of the relationship of the draft updated Strategy with other plans and programmes will be completed in due course.

9. Probable significant impacts on the environment, including biodiversity, population, human health, fauna, flora, soils, water, air, climate factors, material assets, cultural and historical heritage, including architectural and archaeological heritage, landscape and the interrelationships between them

In this section an analysis and assessment of the expected significant impacts on the components of the environment have been made, both in terms of strategic objectives provided for in the draft of an updated Strategy, and at the level of tasks and measures for the individual strategic objectives outlined in the Action Plan.

Pursuant to Art. 86, para. 3, item 6 of the Environmental Protection Act (EPA), this EA report includes an analysis of: likely significant impacts on the environment, including biodiversity, population, human health, fauna, flora, soils, water, air, climate factors, material assets, cultural and historical heritage, including architectural and archaeological heritage, landscape, waste and the interrelationships between them.

The assessment of these impacts includes secondary, cumulative, simultaneous, short-term, medium-term and long-term, permanent and temporary, positive and negative consequences that are expected during the implementation of the draft of an updated Strategy.

Assessment of impacts

Receptors

For the purpose of impact assessment, an assessment of the quality of the impact receptor or simply called receptor is carried out. In general, it can be summarised that receptors are the components and factors of the environment.

Impacts

- Positive impact - an impact that leads to an improvement in the existing state of the environment or leads to the manifestation of a new, positive and desirable factor;
- Negative impact - an impact that leads to a negative/unfavourable change in the existing state of the environment or leads to the manifestation of a new, negative and undesirable factor;

Magnitude of impact

The magnitude/degree/size of the impact is usually expressed through quantitative and qualitative values compared to national and international standards.

The assessment of the magnitude of the positive and negative impacts of the specific objectives, as well as the tasks and measures set out in the draft of an updated Strategy for the individual Strategic Objectives listed in the Action Plan is summarized in a rating matrix using the following designations shown in Table 37.

Table 37 - Rating matrix (assessment matrix)

+2	Significant positive impact
+1	Insignificant positive impact
0	Not expected or not relevant to the environmental components and factors
-1	Insignificant negative impact
-2	Significant negative impact
=	An impact is expected, but due to insufficient detailing of the tasks, an impact assessment is not possible

To determine the extent of the impact, an assessment system has been used - to determine the significance of the impact on the scale of possible impacts indicated in Table 38 (matrix of impacts).

Table 38 - Determining the significance of the impact on the scale of potential impacts (matrix of impacts)

Assessment	Impact	Comment
+2	Significant positive	Impacts of "medium" or "high" significance - represent visible and lasting positive changes in the existing state
+1	Insignificant positive	Impacts of "minor" or "low" significance - these are visible positive changes to the existing state
0	No impact expected or no impact	No impact or not relevant to the environmental components and factors. These do not require mitigation measures and are not relevant to decision-making.
-1	Insignificant negative	Impacts of "minor" or "low" significance - represent visible changes in the existing condition that may cause damage or degradation to the given receptor, although its overall function and value are not impaired. Mitigation measures are defined for these impacts in order to prevent or reduce the significance of the impact.
-2	Significant negative	Impacts of 'medium' or 'high' significance - may disrupt the functions and value of a receptor and have wider implications (for example on ecosystems or social well-being). These impacts are prioritized in determining mitigation measures aimed at preventing or reducing the significance of the impact.
=	It could not be determined	An impact is expected, but due to insufficient detailing of the tasks, an impact assessment is not possible. There is insufficient information to determine the impact.

The assessment of the type, reversibility, extent, frequency and duration of impacts is shown below:

Type of impact:

- Direct - impact as a result of the direct interaction between the Specific Objectives and also the tasks and measures of the individual strategic objectives set out in the Action Plan and an environmental component or factor;
- Indirect - impacts as a result of the activities of the Specific Objectives and also the tasks and measures of the individual Strategic Objectives set out in the Action Plan and the

environmental component or factor;

- Secondary - direct or indirect impacts as a result of recurring interaction between the Specific Objectives and also the tasks and measures of the individual Strategic Objectives set out in the Action Plan and the environmental components and factors;
- Cumulative - an impact acting together with another impact (including the impact of other plans/projects/activities) affecting the same environment or receptor.

Reversibility of impact:

- Reversible - an impact is reversible when the receptor can return to its original state after the impact has been removed, the cause of the changes triggered by the implementation of the Specific Objectives and also the tasks and measures of the individual Strategic Objectives set out in the Action Plan;
- Irreversible - impact where the receptor cannot recover its original state after the cessation of the intervention caused by the implementation of the Specific Objectives and also the tasks and measures of the individual Strategic Objectives set out in the Action Plan.

Distribution/territorial scope of impact:

- Local - impacts affecting receptors at a local level, in the vicinity of the Specific Objectives and also tasks and measures under the individual Strategic Objectives outlined in the Action Plan - for the purposes of this particular assessment, local impacts are considered to occur within the boundaries of the Kozloduy NPP site or the “PRRAW-Novi Han”;
- Regional - impact affecting receptors at a greater distance from the source and may be characterised by regional extension. The area of influence/impact is determined for each receptor depending on its sensitivity. For the purpose of this particular assessment, regional impact is considered to occur: for Kozloduy NPP - in the Zone for preventive protective measures (ZPPM) with a radius of 2 km and in the Monitored Zone (MZ) with a radius of 30 km, and for SD "PRRAW-Novi Han" - in the Operational Zone with a radius of 1 km around the Repository and in the Monitored Zone (MZ) with a radius of 5 km;
- National - impact of national significance, the consequences of which are spread in a national context;
- Transboundary - impacts of relevance to the territory of other (neighbouring) countries, the consequences of which spread beyond the national territory.

Impact Frequency:

- Temporary - impacts occur over a short period of time and possibly intermittently/occasionally;
- Permanent - the impact causes a permanent change in receptors and this change will be present after the impact has ended.

Duration of impact:

- Short-term - the impact is expected to be active for a very short period of time (e.g. during the transport and construction works for the implementation of the Specific Objectives and also for some of the tasks and measures under the individual strategic objectives outlined in the

Action Plan) and will cease after the activity causing it is completed;

- Medium-term - the impact is expected to be active for a limited period of time (during the implementation of the Specific Objectives and also of the tasks and measures of the individual Strategic Objectives set out in the Action Plan), will cease completely after the cessation of the activity causing it;
- Long-term - the impact may occur for a long period of time and will not cease completely after the cessation of activities under the Specific Objectives and also the objectives and measures under the individual strategic objectives set out in the Action Plan.

The assessment of the expected impacts is made below, and for those components for which radiation monitoring of the environment is conducted - water, air, soil, flora, fauna and population, an assessment was made in radiation aspect and in non-radiation aspect.

The assessment of the impact on each environmental component and factor and on the population has been developed by the experts based on their experience and best practices in the preparation of such assessments.

The assessments are based on the above definitions of the magnitude, type, reversibility, territorial extent, frequency and duration of expected impacts.

9.1. Assessment of impacts at the level of Strategic Objectives

The EA Report assessed the environmental impact of the most important Strategic Objectives in the draft of an updated Strategy, which are in accordance with the requirements of Directive 2011/70 Euratom:

1. Reducing to a minimum the terms for intermediate storage of SNF, given the fact that it is not an alternative to the final stage of SNF management.
2. Processing of the entire generated amount of SNF from WWER-440 and WWER-1000, and disposal in the DGR of the vitrified high-level waste (HLW) as well as the other RAW generated during processing and returned to the country.
3. Sustainable reduction of the quantities of SNF stored at the Kozloduy NPP site by means of an average annual removal of a minimum of 77 tons of heavy metal (HM) for long-term storage and processing in other countries.
4. Development of a long-term plan for the construction of a repository for the interim storage of returned vitrified HLW and other RAW from the processing of SNF.
5. Commissioning of Stage 1 of the NRRAW by the end of 2025.
6. Construction of Stage 2 and Stage 3 of the NRRAW in the medium term.
7. Design and construction of the DGR in the long term.
8. Provision of financial resources for the construction of the DGR through the creation of a new target fund.
9. Ensuring and maintaining sustainable financial and human resources for the availability of the necessary expertise and qualifications, including for carrying out scientific research and development, necessary for SNF and RAW management and regulation.
10. Implementing a policy of openness and transparency and involving the public in the discussion and decision-making regarding the SNF and RAW management.

The analysis and assessment of the expected impacts of these Strategic Objectives was conducted by

individual components and factors of the environment according to the impact matrix and is shown in a table in ***Appendix 2***.

9.2. Assessment of the impacts at the level of tasks and measures under the Strategic Objectives in the Action Plan according to the draft of an updated Strategy

The analysis made of the potential impact on the environment of the tasks and measures set out in the Action Plan for each ***Strategic Objective*** for the individual components and factors of the environment is shown in a table in ***Appendix 2***.

9.3. Summary of impacts

The potential impacts of both the Strategic Objectives and the envisaged tasks and measures under the Strategic Objectives in the Action Plan are summarized by components below:

9.3.1. Climatic factors

At the level of Strategic Objectives

All Strategic Objectives have a significant predictable positive impact on climate change as a result of zero greenhouse gas emissions throughout the life cycle of the facilities of the nuclear power sector and the associated management of spent nuclear fuel and radioactive waste.

The Strategic Objectives are also an important factor in achieving the goals of the "European Green Deal".

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Both the amount of non-radioactive emissions of harmful substances at Kozloduy NPP and SD “PRRAW-Novi Han” sites and the future DGR site, and the spatial scale of emission sources have a sub-grid effect on the spatial scales of climate change and do not contribute to such an impact, but contribute to achieving resilience to the consequences of climate change and to adaptation to the changes that have already occurred.

The implementation of the strategic objectives and targets and measures is likely to result in climate impacts, as implementation is expected to have positive impacts on climate change and achieve resilience to the consequences of climate change, which may lead to positive secondary permanent consequences.

9.3.2. Ambient air

In non-radiation aspect

At the level of Strategic Objectives

No impact is expected as a result of the implementation of a large part of the Strategic Objectives: Strategic Objectives No. 1, 4, 5, 6, 8, 9 and 10, as they are not relevant to ambient air quality (AQ) in a non-radiation aspect.

A negative impact on the AQ, local, reversible and with low significance is expected in the implementation of:

- Strategic Objective No. 2 – in the transportation of vitrified HLW and other RAW, with the impact being negative, but negligibly small, reversible, short-term and temporary.
- Strategic objective No. 3 – in the removal of heavy metal (HM) for long-term storage and processing in other countries, with the impact being negative, but negligibly small, reversible, short-term and temporary.

Due to the insufficient detailing of the tasks, it is not possible to assess the impact (as of now, there is still no concept developed in detail) of Strategic Objective No. 7 Design and construction of the DGR in the long term.

No consequences for air are expected in radioactive aspect from the implementation of the Strategic Objectives as no impacts are expected from the implementation of most of the Strategic Objectives and the potential negative impacts from the implementation of two of the Strategic Objectives are negligible, reversible, short-term and temporary, local and would not result in negative consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In a non-radiation aspect, during the implementation of the tasks and measures, in most general terms, no negative impact is expected on the air, with a possible local, temporary, reversible negative impact on the AQ, which will not be significant, resulting from:

- all transport schemes, with the impact distributed along the length of the road corridor, such as: Transportation of SNF from WWER-440 from the Wet Spent Nuclear Fuel Storage Facility (WSFSF) and the Dry Spent Fuel Storage Facility (DSFSF) for long-term storage and processing, and Transportation of spent nuclear fuel from WWER-1000 for long-term storage and processing (*under Objective I. Safe management of spent nuclear fuel*);
- Construction of NRRAW for low and medium active waste (*under objective II. Responsible and safe management of RAW);*
- dismantling and reclamation at decommissioning of the research reactor of the Bulgarian Academy of Sciences IRT-2000 (*under IV. Decommissioning of research nuclear reactor of the Bulgarian Academy of Science (BAS) IRT-2000);*
- modernization of the site infrastructure, reclamation of soils around Units 1-4 and restoration of their sites (*under V. Decommissioning of Units 1-4 of Kozloduy NPP*);
- carrying out activities for the decommissioning of the Wet Spent Nuclear Fuel Storage Facility (WSFSF) (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

The impacts listed are of very low level of significance and are therefore negligible and are not reported as such.

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Exploring the possibilities for removal and reprocessing of spent nuclear fuel from WWER-1000 in EU countries with technological capabilities (France) *(under Objective I. Safe management of spent nuclear fuel*);

- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF and Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW (*under Objective II. Responsible and safe management of RAW).*

No consequences on air are expected in radioactive aspect from the implementation of the tasks and measures, as no impacts are expected from the implementation of most of them, some of them cannot be assessed due to lack of sufficient information, and the possible local, temporary, reversible negative impacts from the implementation of several of them are of very low significance and are therefore negligible and are not accounted for as such and therefore will not lead to consequences.

Impacts on AQ in radiation aspect

At the level of Strategic Objectives

The expected impacts at the level of Strategic Objectives are reduced to entirely positive impacts of low to high significance in terms of ambient air quality (AQ) in radiation aspect, which are likely to result in positive consequences on air in radiation aspect of low significance, permanent and long-term.

Positive impacts of low to high significance, permanent, long-term and cumulative are expected upon implementation of:

- Strategic Objectives No. 1, 2, 3 and 4, given the improvement of the management of generated waste from SNF and reducing to a minimum the risk of radioactive air pollution and increase of the radiation gamma background in the area and the development of a long-term plan for the construction of a repository for interim storage of the returned vitrified HLW and other RAW from the processing of SNF;
- Strategic Objectives No. 8, 9 and 10, as they are expected to support the process of treatment of generated waste from NSF in compliance with regulatory requirements and the best available techniques and qualified human resources, will reduce to a minimum the risk of an increase in atmospheric radioactivity and the gamma radiation background in the affected areas.

Positive impacts are expected for Strategic Objectives No. 5, 6 and 7, but due to insufficient detailing of the tasks (as of now, there is no concept developed in detail yet), a full assessment of the impact is not possible.

It is possible that negative impacts of expected extremely low or even negligible significance could be manifested only and exclusively in the event of transporting heavy metal for long-term storage and processing in other countries (Strategic Objective 3), which impacts will be the result of non-compliance with the rules and the regulations for the safe transportation of SNF, as well as in the decommissioning of individual facilities, again as a result of non-compliance with the design and regulatory requirements, which is why they are not reflected in the assessment of the impacts.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

At the level of tasks and measures, the impacts will be mainly positive, with low to high significance, taking into account the main goals of the strategy, whose implementation is targeted by the outlined tasks and measures, and which are mainly related to the improvement of the management of generated

waste from SNF, including the commissioning of the first stage of the NRRAW, design and construction of the second and third stages of the NRRAW, and the design and construction of the DGR.

Positive impacts of low to high significance, permanent and long-term and cumulative are expected from the implementation of the following tasks and measures:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for SNF storage after 2024 for a new period of 10 years, Maintaining the WSFSF in a safe condition. Periodic renewal of the license for the operation of WSFSF after 2034. *(under Objective I. Safe management of spent nuclear fuel);*
- Ensuring the safe and efficient storage of RAW in the facilities for the temporary storage of State enterprise RAW and their subsequent transportation, conditioning and disposal, and the construction of the NRRAW for low- and medium-level waste. (*under Objective II. Responsible and safe management of RAW);*
- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal, Packaging (*under Objective III. Disposal of HLW, MARAW (Moderately active RAW) and SCRS (spent closed radioactive sources) categories 2b and 3*).

Positive impacts of low significance, permanent and long-term and cumulative are expected from the implementation of the following tasks and measures:

- Transportation of SNF from WWER-440 from WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts, Transportation of SNF from WWER-1000 for long-term storage and processing, Licensing of the expansion of the DSFSF for storage of SNF from WWER-1000, selection of containers for dry storage, Amendment of the WSFSF license, Updated assessment of the capacity of a Dry Spent Fuel Storage Facility (DSFSF) for dry storage of SNF from WWER-1000 *(under Objective I. Safe management of spent nuclear fuel);*
- Agreeing on a methodology for determining the amount and characteristics of RAW from the processing of SNF from WWER-440 and WWER-1000, Agreeing on a methodology for determining the amount and characteristics of RAW from the processing of SNF from WWER-1000, Development of a long-term plan for the construction of a storage facility for the interim storage of vitrified HLW and other RAW from the processing of SNF, Improving the efficiency in separating RAW according to their radiation, physical and chemical characteristics and achieving compliance with RAW acceptance criteria, Reducing to a minimum the generation of RAW, Improving safety in the storage and management of liquid and solid historical RAW. (*under II. Responsible and safe management of RAW);*
- Development of a preliminary concept for the decommissioning of Units 5 and 6 of Kozloduy NPP, Development of a decommissioning plan for Units 5 and 6 of Kozloduy NPP, Development of a preliminary concept and plan for decommissioning (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF);*
- All activities *under Objective VII. Adequate financial and human resources.*

Negative impacts are possible only and exclusively in the implementation of the tasks and measures,

which in one way or another are related to the transportation of SNF or the decommissioning of certain facilities, and only in the event of non-compliance with the technological rules and regulations for transportation or decommissioning operation of the facilities and will be of very low or even negligible significance. With compliance with the current regulations in this field, their manifestation will not be allowed.

During the implementation of the other tasks and measures, no impacts on the ambient air are expected.

The implementation of the tasks and measures is likely to result in consequences on air in radioactive aspect, as some of them are expected to have positive consequences of high and low significance, permanent and long-term, cumulative, leading to long-term, permanent, secondary positive consequences on air in radioactive aspect.

9.3.3. Water

Surface water

In non-radiation aspect

At the level of Strategic Objectives

In non-radiation aspect, during the implementation of the strategic objectives, no negative impact on surface waters is expected in general terms, with the exception of a minor negative impact during the construction of the NRRAW (Strategic Objectives No. 5 and 6). This negative impact will be short-term, temporary and reversible.

In the implementation of the rest of the Strategic Objectives, it is expected that either there will be no impact (Strategic Objectives No. 2, 3 and 8) or that the impact will be indirect, long-term positive, permanent, insignificant and cumulative (Strategic Objectives No. 1, 9 and 10).

For Strategic Objectives No. 4 and No. 7, the impact cannot be assessed at this stage due to lack of sufficient information.

No significant impacts on surface water are expected from the implementation of the Strategic Objectives. Therefore, they will not affect the achievement of the environmental objectives (ecological objectives) set out in the current RBMP of the Danube Region for Basin Management (2016-2021) in terms of the ecological and chemical status of surface waters in the Republic of Bulgaria as a whole, and in the areas around Kozloduy NPP and SD "PRRAW-Novi Han", as well as the flood risk assessed under the current FRMP of the Danube Region for Basin Management (2016-2021).

No impacts on water are expected from the implementation of the Strategic Objectives in a non-radiational aspect, as no impacts are expected from the implementation of most of the Strategic Objectives, and the potential negative impacts from the implementation of two of them are negligible, reversible, short-term and temporary, which would not lead to negative consequences, and also the expected positive impacts would be indirect, long-term, permanent and insignificant and would not lead to positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

An indirect permanent, long-term, secondary, local, insignificant positive impact with respect to surface water is expected from:

- maintaining the WSFSF in a safe condition (*under objective I. Safe management of spent nuclear fuel)*;
- Safe management of RAW from previous activities (*under II. Responsible and safe management of RAW);*
- provision of qualified personnel with the necessary expertise and qualifications for the implementation of the decommissioning activities (*under objective VII. Adequate financial and human resources*),

In non-radiation aspect, during the implementation of the tasks and measures, in general, no negative impact is expected on surface waters, with the exception of an insignificant local, temporary and short-term and reversible negative impact with a very low degree of significance from:

- The transportation of spent nuclear fuel from WWER-440 from WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts (insignificant, local, temporary and short-term negative impact or no impact) *(under I. Safe management of spent nuclear fuel);*
- Safety enhancement in the storage and management of liquid and solid historical RAW (insignificant negative impact during the extraction of sludge and sorbents due to the generation of small additional amounts of wastewater, local, temporary and short-term impact), Construction of NRRAW for low and medium-level waste, Preparation of documents for issuing a decommissioning license. Safe and effective decommissioning (*II. Responsible and safe management of RAW).*

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal (*under* Objective III. *Disposal of HLW, MARAW (Moderately active RAW) and SCRS categories 2b and 3);*
- carrying out the decommissioning (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In the implementation of the rest of the tasks and measures, no impact is expected on surface water.

No significant impacts on surface water are expected from the implementation of the strategic objectives and measures in the Action Plan to the draft updated Strategy. Therefore, they will not affect the achievement of the environmental objectives (ecological objectives) set out in the current RBMP of the Danube Region for Basin Management (2016-2021) in terms of the ecological and chemical status of surface waters in the Republic of Bulgaria as a whole, and in the areas around the Kozloduy NPP and SD "PRRAW-Novi Han", as well as the flood risk assessed under the current FRMP of the Danube Region for Basin Management (2016-2021).

No impacts on water are expected from the implementation of the tasks and measures in a non-radiational aspect, as no impacts are expected from the implementation of most of them, and the possible negative impacts from the implementation of some of them are negligible, reversible, short-term and temporary, which would not lead to negative consequences, and also the expected positive impacts would be indirect, long-term, permanent and insignificant and would not lead to positive consequences.

In radiation aspect

At the level of Strategic Objectives

In terms of radiation, no negative impact on surface waters is expected in the implementation of the Strategic Objectives, therefore no negative consequences on water are expected.

For a large part of the Strategic Objectives (No. 1, 2, 3, 9 and 10), the impact is expected to be positive, long-term, permanent, not significant and for another part of the Strategic Objectives no impact is expected (Strategic Objectives No. 5, 6, 8).

For Strategic Objectives No. 4 and No. 7, the impact cannot be assessed at this stage due to lack of sufficient information.

No positive consequences on water in radiation aspect are expected from the implementation of the Strategic Objectives, as the expected positive consequences would be long-term, permanent, but indirect and insignificant and would not lead to positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In terms of radiation, during the implementation of the tasks and measures, an indirect permanent, long-term, secondary, cumulative positive impact, not significant is mainly expected from:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, Exploring the possibilities for removal and processing of SNF from WWER-1000 in EU countries with technological capabilities (France), Transportation of SNF from WWER-1000 for long-term storage and processing and Transportation of SNF from WWER-1000 for long-term storage and processing (*under I. Safe management of spent nuclear fuel*);
- Reducing to a minimum the generation of RAW and Safe management of RAW from previous activities (*under II. Responsible and safe management of RAW);*
- Deep borehole disposal of spent closed radioactive sources (SCRS) (*under III. Disposal of HLW, MARAW (Moderately active RAW) and SCRS, categories 2b and 3);*
- Ensuring safe and efficient decommissioning of Units 1-4 of Kozloduy NPP. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP*);
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, as well as for the implementation of the decommissioning activities (*under VII. Adequate financial and human resources*).

In a radiative aspect, during the implementation of the tasks and measures, in general, no negative

impact is expected on surface waters, with the exception of an insignificant negative impact from:

- The transportation of spent nuclear fuel from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts (*under I. Safe management of spent nuclear fuel*);
- Increasing safety in the storage and management of liquid and solid historical RAW, Construction of NRRAW for low and medium level waste and Preparation of documents for issuing a decommissioning license. Safe and effective decommissioning (*under II. Responsible and safe management of RAW);*

This negative impact will be short-term, temporary, insignificant and reversible.

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW (Moderately active RAW) and SCRS, categories 2b and 3);*
- Conducting the decommissioning activities (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

As for the remaining part of the tasks and measures no impact is expected.

No consequences on water are expected from the implementation of the tasks and measures in radiation aspect, as no consequences are expected from the implementation of most of them, and the possible negative consequences from the implementation of some of them are short-term, temporary, minor and reversible, which would not lead to negative consequences, and also the expected positive consequences would be indirect, permanent, long-term, secondary, cumulatively insignificant and would not lead to positive consequences.

Groundwater

In non-radiation aspect

At the level of Strategic Objectives

In terms of non-radiation aspect, no negative impact on groundwater is expected in the implementation of the Strategic Objectives, therefore no negative consequences are expected.

Some of the Objectives are expected to have no impact (Strategic Objectives No. 1, 3, 5, 6 and 8), while others are expected to be indirect, insignificant, long-term, permanently positive (Strategic Objectives No. 9 and No. 10).

For Strategic Objectives No. 2, 4 and 7, the impact cannot be assessed at this stage due to lack of sufficient information.

No significant impacts on groundwater are expected from the implementation of the Strategic Objectives. Therefore, it is not expected the Strategic Objectives to affect negatively the achievement of the environmental objectives (ecological objectives) set out in the current RBMP of the Danube Region for Basin Management (2016-2021) in terms of the ecological and chemical status of surface waters in the Republic of Bulgaria as a whole, and in the areas around the Kozloduy NPP and SD

"PRRAW-Novi Han", as well as the flood risk assessed under the current FRMP of the Danube Region for Basin Management (2016-2021).

No non-radiational consequences on groundwater are expected from the implementation of the Strategic Objectives as the potential positive impacts would be indirect, long-term, permanent and insignificant and would not result in positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In terms of non-radiation aspect, no negative impact on groundwater is expected in the implementation of the Strategic Objectives, therefore no negative consequences are expected.

An indirect permanent, long-term, secondary, local, insignificant positive impact on groundwater is expected from:

- Maintaining the WSFSF in a safe condition (*under objective I. Safe management of spent nuclear fuel);*
- Increasing safety in the storage and management of liquid and solid historical RAW (*under II. Responsible and safe management of RAW);*
- provision of qualified personnel with the necessary expertise and qualifications for the implementation of the decommissioning activities (*under objective VII. Adequate financial and human resources*),

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal, Packaging (*under* III. *Disposal of HLW, MARAW and SCRS, categories 2b and 3)*
- carrying out the decommissioning (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and the WSFSF*)

In the implementation of the rest of the tasks and measures, no impact is expected on groundwater.

No significant impacts on groundwater are expected from the implementation of the strategic objectives and measures in the Action Plan to the draft updated Strategy. Therefore, it is not expected the Strategic Objectives to affect negatively the achievement of the environmental protection objectives (ecological objectives) set in the current RBMP of the Danube Region for Basin Management (2016-2021) with regard to the chemical and quantitative status of groundwater in the Republic of Bulgaria as a whole, and in the areas around Kozloduy NPP and SD "PRRAW-Novi Han".

No non-radiational consequences on groundwater are expected from the implementation of the tasks and measures, as no impacts are expected from the implementation of most of them or cannot be assessed, and the expected positive impacts would be indirect, long-term, permanent, secondary and insignificant and would not lead to positive consequences.

In radiation aspect

At the level of Strategic Objectives

In terms of non-radiation aspect, no negative impact on groundwater is expected in the implementation of the Strategic Objectives, therefore no negative consequences are expected.

For the remaining part of the Objectives, it is expected that either there will be no impact (Strategic Objectives No. 1, 5, 6 and 8) or that the impact will be indirect, insignificant, long-term positive, permanent, local positive (Strategic Objectives No. 3, 9 and 10).

For Strategic Objectives No. 2, 4 and 7, the impact cannot be assessed at this stage due to lack of sufficient information.

No consequences on groundwater in radioactive aspect are anticipated from the implementation of the Strategic Objectives as no impacts are anticipated from the implementation of the majority of them or cannot be assessed, and the potential positive impacts would be indirect, long-term, permanent and minor and would not result in positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In terms of non-radiation aspect, no negative impact on groundwater is expected in the implementation of the tasks and measures, therefore no negative consequences are expected.

An indirect permanent, long-term, insignificant, secondary positive impact on groundwater is expected from the implementation of:

- Maintaining the WSFSF in a safe condition (*under objective I. Safe management of spent nuclear fuel)*
- Increasing safety in the storage and management of liquid and solid historical RAW (*under II. Responsible and safe management of RAW)*
- Provision of qualified personnel with the necessary expertise and qualifications for the implementation of the decommissioning activities (*under objective VII. Adequate financial and human resources)*

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal, Packaging (*under* III. *Disposal of HLW, MARAW and SCRS, categories 2b and 3)*
- Carrying out the decommissioning (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*)

In the implementation of the rest of the tasks and measures, no impact is expected on groundwater.

No consequences on groundwater in radiation aspect are expected from the implementation of the tasks and measures as no impact is expected from the implementation of most of them or cannot be assessed and the expected positive impact would be indirect, long-term, permanent, secondary and insignificant and would not lead to positive consequences.

9.3.4. Subsoil

At the level of Strategic Objectives

In the implementation of Strategic Objectives No. 5 and No. 6 during the construction phases of the NRRAW as a result of the implementation of construction activities affecting the subsoil, negative impacts can be expected.

Indirect positive, local, long-term and permanent impacts can be expected in the implementation of Strategic Objective No. 3, related to the reduction of the quantities of stored SNF.

For some of the objectives, there are not enough details and a forecast of the impact cannot be given - these are Strategic Objectives No. 2, No. 4 and No. 7.

In the implementation of Strategic Objectives No. 1, No. 8, No. 9 and No. 10, no impact is expected on the subsoil.

No consequences on the subsoil are expected from the implementation of the Strategic Objectives, as no impacts are expected from the implementation of most of them or an estimate of their impacts cannot be given, and the potential negative impacts from the implementation of two of the Strategic Objectives are not significant and are not expected to result in negative consequences, nor are the indirect, positive, long-term and permanent impacts associated with the reduction of the quantities of stored SNF expected to result in positive impacts.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

The main negative impacts on the earth's subsoil, which will be local and are not expected to be significant, are concentrated in the period of construction of the NRRAW (*under II. Responsible and safe management of RAW*) and are expressed in the mechanical disturbance of the subsoil.

Indirect positive, long-term and permanent, insignificant impacts are expected from all tasks and measures that reduce the amount of SNF stored or improve the way of storage and therefore reduce to a minimum the risks of environmental pollution:

- Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Safe management of RAW from previous activities. *(under II. Responsible and safe management of RAW);*
- Packaging (*under III. Disposal of HLW, MARAW and SCRS, categories 2b and 3).*

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3) Disposal of HLW, MARAW and SCRS, categories 2b and 3)*

The remaining measures are related to administrative activities or activities that do not have an impact on the subsoil, therefore no impact is expected during their implementation.

No consequences on the subsoil are expected from the implementation of the tasks and measures, because:

- the negative impacts on the subsoil are concentrated in the construction period of the NRRAW, which are assessed in the EIA as not significant and will not lead to negative consequences;
- the implementation of some tasks and measures is expected to result in positive, long-term and permanent impacts, which will be indirect and not significant and therefore not expected to result in positive consequences.

9.3.5. Soil

In non-radiation aspect

At the level of Strategic Objectives

At the level of Strategic Objectives, long-term and permanent negative impacts can be expected as a result of the implementation of construction activities, which are expected to affect the soils in the area of the construction sites, and these impacts are expected to be local and not to be significant – mainly in the implementation of Strategic Objectives No. 5 and No. 6 during the construction of the various stages of the NRRAW.

At this stage, for some of the objectives, there are not enough details, and a forecast of the impact cannot be given - Strategic Objectives No. 2, No. 4 and No. 7.

Without impact on soils are Strategic Objectives No. 1, 3, 8, 9, and 10.

No consequences on soils are anticipated from the implementation of the Strategic Objectives as no impacts are anticipated from the implementation of most of the Strategic Objectives or can be predicted, and the potential negative impacts from the implementation of two of the Strategic Objectives (during the construction of the various phases of the NRRAW) are assessed in the EIA to be local and not to be significant and not expected to result in negative consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

The main negative impacts on the soils are in non-radiation aspect and are concentrated mainly in the period of construction of the NRRAW and are in the form of mechanical disturbance and destruction of the soil layer in the area of the construction sites. These impacts are expected to be local, long-term and permanent, but are not expected to be significant when implementing the following tasks and measures:

- Ensuring the safe and efficient storage of RAW in the facilities for the temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, and the construction of the NRRAW for low- and medium-level waste. *(under II. Responsible and safe management of RAW);*
- Ensuring the safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP).*

The impact cannot be assessed at the moment due to lack of sufficient information and specific plans for the following tasks and measures:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal, Packaging (*under III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- carrying out the decommissioning (*under VI. Decommissioning of Units 5 and 6 of Kozloduy*

NPP and the WSFSF).

In the implementation of the rest of the tasks and measures, no impact is expected on the soils in the non-radiation aspect.

No consequences on soils are expected from the implementation of the tasks and measures, as no impacts are expected from the implementation of most of them, a small number of them cannot be assessed due to lack of sufficient information, and the negative impacts on the subsoil are concentrated mostly in the construction period of the NRRAW, which are assessed in the EIA as not significant and will not lead to negative consequences.

In radiation aspect

At the level of Strategic Objectives

In terms of radiation, no negative impacts are expected on the soils from the implementation of the objectives in the draft of the updated Strategy, therefore no negative consequences are expected.

Indirect positive, insignificant impacts in terms of radiation can be expected in the implementation of the objectives related to the reduction of the quantities of stored SNF – Strategic Objectives No. 1 and No. 3, and these impacts are expected to be long-term and permanent, with cumulative effect.

At this stage, for some of the Strategic Objectives, there are not enough details, and a forecast of the impact cannot be given – Strategic Objectives No. 2, No. 4 and No. 7.

Strategic Objectives No. 5, 6, 8, 9, and 10 are not expected to have impacts.

The implementation of the Strategic Objectives is not expected to result in any positive consequences on soils in the radiation aspect, as the potential positive impacts from the implementation of two of the Strategic Objectives are not significant and are not expected to result in any positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Indirect positive, long-term and permanent cumulative impacts are expected from all tasks and measures that reduce the amount of SNF stored, or improve the way of storage and therefore reduce to a minimum the risks of environmental pollution – these are as follows:

- Maintaining the WSFSF in a safe condition, Transportation of SNF from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing, Transportation of SNF from WWER-1000 for long-term storage and processing according to the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing (*under objective I. Safe management of spent nuclear fuel*);
- Improving efficiency in the separation of RAW according to their radiation, physical and chemical characteristics and achieving compliance with the RAW acceptance criteria, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Construction of the NRRAW for low- and medium-level waste, Safe management of RAW from previous activities (*under II. Responsible and safe management of RAW);*
- Packaging (*under III. Disposal of HLW, MARAW and SCRS, categories 2b and 3).*

The negative impacts on the soils in terms of radiation, which will not be significant and will be local, are expected during the implementation of the following activities:

- Ensuring the safe and efficient decommissioning. Temporary storage of the received RAW

and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP).*

The other measures lack detailing and the expected impacts cannot be assessed at this stage - these are:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In the implementation of the rest of the tasks and measures, no impact is expected on soils.

No consequences on soils are expected from the implementation of the tasks and measures as no impacts are expected from the implementation of most of them or an estimate of their impacts cannot be given, the negative impacts on soils from the temporary storage of the resulting RAW will be local and are not expected to be significant and will not lead to negative consequences, and the implementation of some tasks and measures is expected to result in positive, long-term and permanent impacts which will be indirect and will not be significant, therefore not expected to lead to positive consequences.

9.3.6. Landscape

At the level of Strategic Objectives

Indirect positive, long-term and permanent insignificant impacts can be expected in the implementation of the objectives related to reducing the quantities of stored SNF or the terms for interim storage - Strategic Objectives No. 1 and No. 3.

At the level of Strategic Objectives, negative impacts can be expected as a result of the implementation of construction activities, which are expected to affect landscape components in the area of the construction sites. There are construction activities mainly in the implementation of Objectives No. 5 and No. 6, with the construction of the various stages of the NRRAW, where short- and long-term, permanent, local negative impacts can be expected, which will not be significant.

In the implementation of Strategic Objectives No. 8, 9 and 10, no impacts on the landscape components are to be expected.

For some of the objectives, there are not enough details and a forecast of the impact cannot be given - Strategic Objectives No. 2, No. 4 and No. 7.

No consequences for the landscape are anticipated from the implementation of the Strategic Objectives as no impacts are anticipated from the implementation of the majority of the Strategic Objectives or an estimate of the impacts cannot be given and the potential negative impacts from the implementation of two of the Strategic Objectives are local and not significant and are not expected to result in negative consequences. The indirect positive, long-term and permanent impacts that could be expected from the implementation of Strategic Objective 2 would not lead to positive consequences as they are expected to be minor.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Indirect, local, insignificant positive, long-term and permanent cumulative impacts are expected from all tasks and measures that reduce the amount of SNF stored, or improve the way of storage and therefore reduce to a minimum the risks of environmental pollution – these are as follows:

- Maintaining the repository for spent nuclear fuel (WSFSF) in a safe condition. Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, Transportation of SNF from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts, Transportation of SNF from WWER-1000 for long-term storage and processing, Licensing of the expansion of the DSFSF for the storage of SNF from WWER-1000, selection of containers for dry storage (*under Objective I. Safe management of spent nuclear fuel);*
- Increasing safety in the storage and management of liquid and solid historical RAW, Safe management of RAW from previous activities (*under II. Responsible and safe management of RAW);*
- Packaging (*under III.* Disposal of HLW, MARAW and SCRS, categories 2b and 3).

The main negative impacts on the components of the landscape are concentrated in the period of construction of the NRRAW, and include the implementation of the following measures and tasks:

- Ensuring the safe and efficient storage of RAW in the facilities for the temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, and the construction of the NRRAW for low- and medium-level waste. *(under II. Responsible and safe management of RAW)*
- Ensuring the safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP)*

and are expressed in the mechanical disturbance and change of the landscape type within the area of the construction sites, whereby a minor, local negative impact is expected.

The other measures lack detailing and the expected impacts cannot be assessed at this stage - these are:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In the implementation of the rest of the tasks and measures, no impact is expected on landscape.

No consequences on the landscape are expected from the implementation of the tasks and measures, as no impacts are expected from the implementation of most of them or an estimate of their impacts cannot be given, the negative impacts on the landscape from the construction of the NRRAW and the temporary storage of RAW will be local and are not expected to be significant and will not lead to negative consequences, and the implementation of some tasks and measures is expected to result in positive, long-term and permanent impacts, which will be indirect and will not be significant, therefore not expected to lead to positive consequences.

9.3.7. Biodiversity

Flora

In non-radiation aspect

At the level of Strategic Objectives

An indirect, secondary, local, insignificant positive, long-term and permanent impact is expected from providing staff with the necessary expertise and qualifications to better deal with the management of SNF and RAW, as well as involving the public in discussion and decision-making on SNF and RAW management in the implementation of Strategic Objectives No. 9 and No. 10.

In a non-radiation aspect, an insignificant local, direct and indirect, short-term and temporary negative impact is expected on the flora as a result of dust and emissions from transport activities, as well as during the construction of the NRRAW when removing the vegetation cover within the boundaries of the construction sites – in the course of implementation of Strategic Objective No. 3 and Strategic Objective No. 6.

The absence of details on the specific tasks for achieving Strategic Objectives No. 2, 4 and 7 does not allow to assess the impact in a non-radiation aspect at this stage.

No impact on the flora is expected when implementing Strategic Objectives No. 1, 5 and 8.

No consequences on flora are expected from the implementation of the Strategic Objectives as no impacts are expected from the implementation of some of them or an estimate of their impacts cannot be given, negative impacts on flora from transport activities as well as from the construction of the NRRAW will be short-term, temporary and local and are not expected to be significant and will not lead to negative consequences, and the implementation of some Strategic Objectives is expected to result in positive, long-term and permanent impacts which will be secondary and indirect and will not be significant and are therefore not expected to result in positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

An insignificant, local, indirect, temporary negative impact on the flora is expected as a result of dust and emissions from the transport activities during the implementation of tasks, measures and actions related to the transportation of SNF:

- Transportation of SNF from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts, Maintaining readiness for removal of SNF from WWER-440 for long-term storage and processing according to a transport scheme through third countries, Transportation of SNF from WWER-1000 for long-term storage and processing according to the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing according to the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing (*under objective I. Safe management of spent nuclear fuel*);
- Construction of NRRAW for low and medium level waste and Preparation of documents for issuing a license for decommissioning. Safe and effective decommissioning (*under Objective II. Responsible and safe management of RAW*) During the construction of the NRRAW, an insignificant negative impact is expected when removing the vegetation cover within the

boundaries of the construction sites, which is not related to the loss of plant species and habitats of conservation significance.

The absence of details about the specific tasks to achieve the measures described below does not allow an assessment to be made:

- Activities under Appendix 6 and Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3);*
- Conducting activities for the decommissioning of the WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and the WSFSF*).

During the implementation of measure: Ensuring the safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP,* the following is to be expected:

- No non-radiation impact is expected on the flora during the dismantling of the SSC (structures, systems and components) and during the execution of the reconstruction of the Reactor compartment and the delivery of containers, since these activities will be carried out within the area of the site;
- A direct, long-term, permanent, local, positive impact in a non-radiation aspect is expected from reclamation of the soils around the Units.

In the implementation of the rest of the tasks and measures, no impact is expected on the flora.

No consequences on the flora are expected from the implementation of the tasks and measures, as no impact is expected from the implementation of most of them or an estimate of their impact cannot be given, the negative impacts on the flora from the activities related to the transportation of SNF will be insignificant, local, indirect, temporary and will not lead to negative consequences, while the implementation of one of the measures is expected to result in positive, long-term and permanent impacts, which will be indirect and not significant and are therefore not expected to result in positive non-radiational consequences for the flora.

In radiation aspect

At the level of Strategic Objectives

In general, the implementation of the draft of an updated Strategy will have an insignificant positive effect in terms of radiation.

A direct and indirect, long-term and permanent cumulative positive impact in terms of radiation is expected on the flora from reducing the terms for interim storage of SNF and reducing the amount of SNF at the site. The impact will not be significant and will be both local within Kozloduy NPP site and regional when implementing Strategic Objectives No. 1 and No. 3.

A permanent, long-term, secondary positive impact in the radiation aspect is also expected from stimulating scientific research and providing personnel with the necessary expertise and qualifications to better deal with the management of SNF and RAW, as well as from involving the public in the discussion and decision-making regarding the management of SNF and RAW in the implementation of Strategic Objectives No. 9 and No. 10.

The absence of details on the specific tasks for achieving Strategic Objectives No. 2, 4 and 7 does not allow to assess the impact in radiation aspect at this stage.

No impact on the flora is expected when implementing Strategic Objectives No. 5, 6 and 8.

No consequences for flora are expected from the implementation of the Strategic Objectives, as no impacts are expected from the implementation of some of them, or an estimate of their impacts cannot be given, and the implementation of some Strategic Objectives is expected to result in direct and indirect, long-term and permanent minor cumulative positive radiative impacts on flora, as well as indirect, permanent, long-term, secondary positive radiative impacts and, overall, the implementation of the draft updated Strategy will have a negligible impact in radiation aspect and is therefore not expected to result in positive consequences on flora.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In general, the implementation of the Action Plan will have an insignificant positive effect in terms of radiation.

Direct and indirect, long-term, local and permanent insignificant positive cumulative impact is expected on the flora in radiation aspect from:

- Maintaining the *WSFSF* in a safe condition, renewal of the WSFSF license for SNF storage after 2024 for a new period of 10 years and periodic renewal after 2034. Transportation of SNF from WWER-440 from WSFSF and the DSFSF for long-term storage, Maintaining readiness for the removal of SNF from WWER-440, Transportation of SNF from WWER-1000 for long-term storage, Licensing of the extension of the DSFSF for SNF storage from WWER-1000 *(under objective I. Safe management of spent nuclear fuel);*

- Improving the efficiency in the separation of RAW, Reducing to a minimum the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Development of Plans and Programs for safe management of RAW from previous activities *(under objective II. Responsible and safe management of RAW);*

- Planning and implementation of a program for deep borehole disposal, Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*

- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, as well as for the implementation of the decommissioning activities (*under objective VII. Adequate financial and human resources);*

Insignificant, local, temporary, short-term and reversible negative radiation impact is expected:

- When carrying out the preparatory activities for the decommissioning for partial release of RAW on the territory of SD „PRRAW-Novi Han", as well as during the extraction of RAW and dismantling of the underground facilities;

- during the dismantling of the SSC and during the implementation of the reconstruction of the Reactor compartment and delivery of containers during the DC of Units 1-4 of Kozloduy NPP.

The absence of details about the specific tasks to achieve the measures described below does not allow an assessment to be made:

- Activities under Appendix 6 and Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3);*

- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

During the implementation of measure: Ensuring the safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under objective V. Decommissioning of Units 1-4 of Kozloduy,* the following is to be expected:

- An insignificant temporary and short-term local negative impact in terms of radiation is expected during the dismantling of the SSC and during the implementation of the reconstruction of the Reactor compartment and delivery of containers;
- A direct and indirect, long-term and permanent, local, insignificant positive impact in terms of radiation is expected from a reduction in the volume of RAW for disposal and from the deactivation of premises and buildings.

During the implementation of measure: Safety improvement in the storage and management of liquid and solid historical RAW during the extraction of sludge and sorbents in connection with the implementation of measure: Increasing the safety in storage and management of liquid and solid historical RAW from Units 5 and 6 of Kozloduy NPP under Objective II. Responsible and safe management of RAW, the following is expected:

- Through increasing the safety in the storage and management of liquid and solid historical RAW, a direct and indirect, local, long-term and permanent insignificant positive impact in terms radiation is expected on the flora;
- During extraction of sludge and sorbents, a local, short-term, reversible temporary, insignificant negative impact in terms of radiation is expected.

In the implementation of the rest of the tasks and measures, no impact is expected on the flora.

When summarising all the expected impacts, it can be seen that the implementation of the tasks and measures of the Action Plan as a whole will have insignificant local positive impact on the flora in radiation aspect, therefore it is not expected that these impacts will lead to positive consequences in radiation aspect on the flora.

Fauna - Invertebrates

In non-radiation aspect

At the level of Strategic Objectives

In non-radiation aspect, no impact is expected from Strategic Objectives No. 1, 2, 3, 9 and 10 on invertebrates.

Strategic Objectives No. 5 and 8 have no expected impacts in non-radiation aspect, since they concern either only the provision of financial resources, or the stage of the implementation of the tasks does not imply the occurrence of impacts on the fauna.

Insignificant negative local, direct and indirect, short-term impact in non-radiation aspect may occur during the construction of the two stages of the NRRAW under Strategic Objective No. 6, related to the construction activities.

The absence of details on the specific tasks for achieving Strategic Objectives No. 4 and No. 7 does not allow us at this stage to assess the impact in radiation and in non-radiation aspect.

No consequences to invertebrates are expected from the implementation of the Strategic Objectives as no impacts are anticipated from the implementation of any of them or an estimate of their impacts

cannot be given, and the construction of the two phases of the NRRAW in Strategic Objective 6 associated with construction activities is expected to result in negative direct and indirect, local, short-term non-radiational impacts that are insignificant and would not result in consequences to invertebrates in non-radiation aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

At this stage, the absence of details with regard to the planning and the specific tasks and territorial scope of the implementation of the concept of deep borehole disposal of HLW, MARAW and SCRS, categories 2b and 3, and the DC activities of the WSFSF, does not allow to assess the impact in non-radiation aspect of the following measures:

- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*
- All tasks and measures included in *Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under objective VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In non-radiation aspect, an insignificant indirect, temporary and short-term negative impact with a limited territorial scope (local) is expected - within the site, during the preparatory activities for the DC for the partial release of RAW on the territory of the SD „PRRAW-Novi Han" during the extraction of RAW and dismantling of the underground facilities, as well as during the restoration of the vacated grounds. *(under Objective II. Responsible and safe management of RAW).* The impact will be expressed in a temporary change of the existing environmental conditions in the habitats of invertebrates in the affected area as a result of dismantling and other technological activities.

All other tasks and measures have no impact on invertebrates in non-radiation aspect.

No consequences on invertebrates are expected from the implementation of the objectives and measures, as no impacts are expected from the implementation of most of them or an estimate of their impacts cannot be given, and the expected temporary and short-term negative impacts in non-radiation aspect from the implementation of some tasks to Objective II. Responsible and safe management of RAW would be local, indirect and insignificant and would not result in negative impacts on invertebrates in non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

In radiation aspect, no negative impacts on invertebrates can be identified. The defined ten Strategic Objectives include wide-ranging activities and tasks resulting in limiting the likelihood of environmental pollution and, hence, to the reduction of impacts on fauna, including on invertebrates.

The overall assessment of the achievement of Strategic Objectives No. 1, 2, 3, 9 and 10 is for an insignificant positive, local, long-term and indirect cumulative impact on invertebrates.

Strategic Objectives No. 5 and No. 8 have no expected impacts in radiation aspect, since they concern either only the provision of financial resources, or the stage of the implementation of the tasks does not imply the occurrence of impacts on the fauna.

Strategic Objective No. 6 concerns the construction of the two stages of the NRRAW and does not concern the storage of SNF itself, therefore no radiation impact is expected.

The absence of details for achieving Strategic Objectives No. 4 and No. 7 does not allow to assess the impact in radiation aspect at this stage.

No consequences for invertebrates are expected from the implementation of the Strategic Objectives as no impacts are expected from the implementation of any of them or an estimate of their impacts cannot be given, and a positive, local, long-term and indirect cumulative impact on invertebrates is expected from the implementation of 5 of them, which would not be significant and would not result in consequences for invertebrates in radiation aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Almost all tasks and measures involving the implementation of specific activities for the management of SNF and RAW, as well as the provision and maintenance of sufficient human resources for the fulfilment of duties with their safe management have an indirect long-term positive cumulative impact in terms of radiation, as they will ensure the protection of the environment from radionuclide contamination and ensure a minimum frequency of operational safety-related events:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, Periodic renewal of the license for the operation of WSFSF after 2034, Transportation of SNF from WWER-440 from the WSFSF and the DSFSF, Transportation of SNF from WWER-1000 for long-term storage and processing in accordance with the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing, Licensing of the expansion of the DSFSF for the storage of SNF from WWER-1000, selection of containers for dry storage (*under Objective I. Safe management of spent nuclear fuel);*
- Improving the efficiency in the separation of RAW, Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal and Safe management of RAW from previous activities. *(under Objective II. Responsible and safe management of RAW);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities (*under objective. VII. Adequate financial and human resources).*

At this stage, the absence of details with regard to the planning and the specific tasks and territorial scope of the implementation of the concept of deep borehole disposal of HLW, MARAW and SCRS, categories 2b and 3, and the DC activities of the WSFSF, does not allow to assess the impact in non-radiation aspect of the following measures:

- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*
- All tasks and measures included in *Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*

- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*);

All other tasks and measures have no impact on invertebrates in radiation aspect.

No consequences on invertebrates are expected from the implementation of the tasks and measures, as no impact is expected from the implementation of most of them or an estimate of their impact cannot be given, while the implementation of some tasks and measures involving the implementation of specific activities for the management of SNF and RAW, as well as the provision and maintenance of sufficient human resources to perform the duties with their safe management, have an indirect long-term positive cumulative impact in radioactive aspect, which would not be significant and would not result in positive consequences on invertebrates in radioactive aspect.

Fauna - Fish

In non-radiation aspect

At the level of Strategic Objectives

A permanent, indirect, local, positive cumulative impact is expected from the implementation of: Strategic objective No. 3 and Strategic objectives No. 9 and No. 10, which would lead to the improvement of SNF and RAW management and thereby to the reduction of the impacts on the environment, including on fish.

In the implementation of some of the Objectives directly aimed at the sustainable and safe storage of RAW, such as minimizing the terms for interim storage of SNF and the processing of the entire amount of SNF generated (Strategic objective No. 1 and No. 2), and building new, reliable long-term storage facilities (Strategic Objectives No. 5 and No. 6) no impact is expected in a non-radiation aspect: The process is constant over time, so no change of state is expected.

Some of the Objectives are purely administrative in nature, therefore their implementation is not expected to affect the fish component in the foreseeable future - they are related to the development of plans: these are Strategic Objectives No. 4, 7 and 8.

In summarising all of the anticipated impacts, it can be seen that the implementation of the Strategic Objectives will generally have insignificant, indirect positive impacts in non-radioactive aspect on fish and therefore it is not anticipated that these impacts will result in positive consequences on fish in non-radioactive aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In the implementation of all the tasks and measures foreseen in the Action Plan, no negative impacts in non-radiation aspect are expected in relation to the fish fauna.

For most measures in the Plan, it is not possible to make an unequivocal assessment of their expected impact on this component due to their being mostly administrative in nature, but also due to their more general wording and the absence of specific parameters for the implementation of the measure:

- Change in the WSFSF licensing. *(under Objective I. Safe management of spent nuclear fuel);*
- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF. *(under Objective II. Responsible and safe management of RAW);*

- Activities Under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of BAS ITR-2030 research reactor*).

Measures related to minimizing the generation of RAW, increasing the safety of storage and management of liquid and solid historic RAW, safe and efficient DC, etc., are expected to have a positive, local, long-term and permanent, indirect impact on the fish fauna, but given the long-term storage of RAW, the effect of the impact will not be significant:

- Reducing to a minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Preparation of documents for issuing a license for DC. Safe and efficient DC, Safe management of RAW from previous activities. *(under Objective II. Responsible and safe management of RAW);*
- Ensuring the safe and efficient decommissioning. Temporary storage of received RAW and their subsequent transportation, conditioning and disposal. *(under objective V. Decommissioning of Units 1-4 of Kozloduy NPP).*

The prospect of an increase in the amount of SNF, as a result of the planned expansion of the storage facilities, may have a negative impact on fish, but if safety requirements are met, this is not expected.

All other tasks and activities have no impact on fish in non-radiation aspect.

No consequences to fish are expected from the implementation of the tasks and measures, as no impacts are expected from the implementation of most of them or an estimate of their impacts cannot be given, but the implementation of some tasks and measures, including minimizing the generation of RAW, improving the safety of the storage and management of liquid and solid historical RAW, safe and effective DC, etc., are expected to have positive, local, permanent and long-lasting impacts on fish fauna that would not be direct and would not be significant and would not lead to positive consequences on fish in a non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

Strategic Objectives directly aimed at the sustainable and safe storage of RAW, the minimization of its quantity and the construction of new, reliable long-term storage facilities (Strategic Objectives No. 2 and No. 3), as well as the commissioning of the first stage of the NRRAW and the construction of the second and third stages of the NRRAW (Strategic Objectives No. 5 and No. 6) are expected to have significant secondary, positive, permanent and long-term cumulative impacts in terms of radiation in relation to fish fauna, and the minimization of the interim storage periods of SNF is expected to have an insignificant positive impact (Strategic Objective No. 1) and all these impacts will not be direct and will be local.

Indirect positive impacts are also expected from the Objectives of securing and maintaining sustainable financial and human resources (Strategic Objective No. 9) and conducting a policy of openness and transparency (Strategic Objective No. 10). In terms of duration, they will be long-term, given the nature of RAW and the prospect of their use.

The development of plans (Strategic Objective No. 4), long-term design and construction of the DGR

(Strategic Objective No. 7), Provision of financial resources for the construction of the DGR through the creation of a new target fund (Strategic Objective No. 8) are some of the objectives in the updated Strategy, which could not be assessed at this stage.

In summarizing all of the anticipated impacts, it is apparent that implementation of the Strategic Objectives would generally result in significant and insignificant beneficial impacts to fish in radiation aspect, and all of these impacts would not be direct and will be local, therefore these impacts are not expected to result in positive consequences in radiation aspect to fish.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In the implementation of all the tasks and measures foreseen in the Action Plan, no negative impacts in radiation aspect are expected in relation to the fish fauna, and therefore no negative consequences are expected in radiation aspect.

Measures related to minimizing the generation of RAW, increasing the safety of storage and management of liquid and solid historic RAW, safe and efficient DC, etc., are expected to have an indirect, local, long-term, permanent and cumulative positive impact on the fish fauna, but given the long-term storage of RAW, the effect of the impact will not be significant:

- Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation and conditioning, Preparation of the documentation for issuing a DC licence. Safe and efficient DC, Safe management of RAW from previous activities. *(under Objective II. Responsible and safe management of RAW);*
- Ensuring the safe and efficient decommissioning. Temporary storage of received RAW and their subsequent transportation, conditioning and disposal. *(under objective V. Decommissioning of Units 1-4 of Kozloduy NPP);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities. *(under Objective VII. Adequate financial and human resources).*

The measure related to the Construction of the NRRAW for low and medium-level waste is expected to have a significant, long-term, indirect and local permanent positive impact on fish in a radiation aspect (*under objective II. Responsible and safe management of RAW).*

Some of the tasks and measures are purely administrative in nature, therefore their implementation is not expected to affect the fish component in the foreseeable future - they are related to the development of plans, exploration of opportunities, preparatory activities, etc.:

- Change in the WSFSF licensing. *(under Objective I. Safe management of spent nuclear fuel;*
- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF. *(under Objective II. Responsible and safe management of RAW);*
- Activities under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*

- Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of BAS IRT-2030 research reactor*).

All other tasks and measures have no impact on fish in radiation aspect.

Construction of the NRRAW for low- and intermediate-level waste is expected to have an indirect significant, long-term, permanent positive impact, and implementation of certain tasks and measures, including minimizing the generation of RAW, enhancing safety in the storage and management of historical liquid and solid RAW, safe and effective DC, etc., is expected to have a positive, long-term, permanent impact on fish fauna that will not be significant and will be local, and will also not be direct, and therefore no positive consequences on fish are expected in radiation aspect.

Fauna - Amphibians and reptiles

In non-radiation aspect

At the level of Strategic Objectives

An indirect, local, positive impact is expected from the implementation of Strategic Objective No. 3 Sustainable reduction of SNF quantities, as well as from the application of expert knowledge and involvement of the public in the discussion and decision-making regarding the management of SNF and RAW (Strategic Objectives No. 9 and No. 10), which would lead to an improvement in the management of SNF and RAW and, from there, to a reduction of the impacts on the environment, including on amphibians and reptiles.

In the implementation of some of the Objectives directly aimed at the sustainable and safe storage of RAW, such as minimizing the terms for interim storage of SNF and the processing of the entire amount of SNF generated (Strategic objectives No. 1 and No. 2), and building new, reliable long-term storage facilities (Strategic Objectives No. 5 and No. 6) no impact is expected in a non-radiation aspect: The process is constant over time, so no change of state is expected.

Some of the objectives in the draft of an updated Strategy are of a purely administrative nature, while others do not have sufficient detailing of the tasks, which is why the assessment of the impact is impossible for the component amphibians and reptiles in the foreseeable future - they are related to the Development of plans (Strategic Objective No. 4), Design and Construction in the long term of the DGR (Strategic Objective No. 7), Provision of financial resources for the construction of the DGR (Strategic Objective No. 8).

In summarising the anticipated impacts, it can be seen that the implementation of the Strategic Objectives as a whole would have a significant and insignificant positive impact in non-radioactive aspect on amphibians and reptiles, all of these impacts will be local, will not be direct and therefore these impacts are not expected to result in positive consequences in non-radioactive aspect on amphibians and reptiles.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In the implementation of all the tasks and measures foreseen in the Action Plan, no negative impacts in non-radiation aspect are expected in relation to the amphibians and reptiles, therefore no negative consequences are expected.

For most measures in the Plan, it is not possible to make an unequivocal assessment of their expected

impact on the amphibians and reptiles component due to their being mostly administrative in nature, but also due to their more general wording and the absence of specific parameters for the implementation of the measure. These are:

- Change in the WSFSF licensing. *(under Objective I. Safe management of spent nuclear fuel*
- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF. *(under Objective II. Responsible and safe management of RAW)*
- Activities Under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3)*
- Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of BAS IRT-2030 research reactor*)

Measures related to minimizing the generation of RAW, increasing the safety of storage and management of liquid and solid historic RAW, safe and efficient DC, etc., are expected to have a positive, long-term and permanent, local impact on the amphibians and reptiles, but given the long-term storage of RAW, the effect of the impact will not be significant:

- Reducing to a minimizing the generation of RAW and Increasing safety in the storage and management of liquid and solid historical RAW, Preparation of documents for issuing a license for DC. Safe and efficient DC, Safe management of RAW from previous *(under objective II. Responsible and safe management of RAW);*
- Ensuring the safe and efficient decommissioning. Temporary storage of received RAW and their subsequent transportation, conditioning and disposal. *(under objective V. Decommissioning of Units 1-4 of Kozloduy NPP).*

All other tasks and activities have no impact on amphibians and reptiles in non-radiation aspect.

Positive consequences on amphibians and reptiles are not expected from the implementation of the tasks and measures, as the expected positive, long-term and permanent local impacts on amphibians and reptiles from the implementation of some tasks and measures, including minimising the generation of RAW, enhancing the safety of the storage and management of liquid and solid historical RAW, safe and effective DC, etc., would not be direct and would not be significant and would not result in positive consequences on amphibians and reptiles in non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

Strategic Objectives directly aimed at the sustainable and safe storage of RAW, the minimization of its quantity and the construction of new, reliable long-term storage facilities (Strategic Objectives No. 2 and No. 3), as well as the commissioning of the first stage of the NRRAW and the construction of the second and third stages of the NRRAW (Strategic Objectives No. 5 and No. 6) and Design and Construction in the long term of the DGR (Strategic Objective No. 7) are expected to have significant indirect, local, positive impacts in radiation aspect on amphibians and reptiles, while the minimization of the duration of the interim storage of SNF is expected to have an insignificant indirect, local, positive impact (Strategic Objective No. 1).

Some of the objectives in the draft of an updated Strategy are of a purely administrative nature, and there is not sufficient detailing of the tasks, which is why the assessment of the impact on the

component amphibians and reptiles is impossible for the foreseeable future - they are related to the development of plans (Strategic Objective No. 4) and provision of financial resources (Strategic Objective No. 8 Provision of financial resources for the construction of the DGR).

Positive indirect, permanent, local and long-term impacts are also expected from the Objectives of securing and maintaining sustainable financial and human resources (Strategic Objective No. 9) and conducting a policy of openness and transparency (Strategic Objective No. 10). In terms of duration, they will be long-term, given the nature of RAW and the prospect of their use.

In summarising the anticipated impacts, it can be seen that the implementation of the Strategic Objectives would generally have significant and insignificant, local, positive impacts in radiation aspect on amphibians and reptiles, all of these impacts would not be direct and therefore these impacts are not expected to result in positive consequences on amphibians and reptiles in radiation aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In the implementation of all the tasks and measures foreseen in the Action Plan, no negative impacts in radiation aspect are expected in relation to the amphibians and reptiles, therefore no negative consequences are expected.

Measures related to minimizing the generation of RAW, increasing the safety of storage and management of liquid and solid historic RAW, safe and efficient DC, etc. are expected to have an indirect, local, positive impact on the amphibians and reptiles, but given the long-term storage of RAW, the effect of the impact will not be significant:

- Minimizing the generation of RAW and Increasing safety in the storage and management of liquid and solid historical RAW, Preparation of documents for issuing a license for DC. Safe and effective DC, Safe management of RAW from previous activities and Ensuring the safe and effective storage of RAW in the facilities for temporary storage of RW and their subsequent transportation, conditioning and disposal (*under objective II. Responsible and safe management of RAW);*
- Ensuring the safe and efficient decommissioning. Temporary storage of received RAW and their subsequent transportation, conditioning and disposal. *(under objective V. Decommissioning of Units 1-4 of Kozloduy NPP);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities. (*under objective VII. Adequate financial and human resources).*

The measure related to the Construction of the NRRAW for low and medium-level waste is expected to have an indirect, significant, long-term, permanent positive and cumulative impact (*under objective II. Responsible and safe management of RAW).*

For most measures in the Plan, it is not possible to make an unequivocal assessment of their expected impact on the amphibians and reptiles component due to their mostly administrative in nature, but also due to their more general wording and the absence of specific parameters for the implementation of the measure. These are:

- Change in the WSFSF licensing. *(under Objective I. Safe management of spent nuclear fuel);*
- Development of a long-term plan for the construction of a repository for the interim storage

of vitrified HLW and other RAW from the processing of SNF. *(under Objective II. Responsible and safe management of RAW);*

- Activities Under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of BAS IRT-2030 research reactor*).

All other tasks and activities have no impact on amphibians and reptiles in radiation aspect.

No consequences for amphibians and reptiles are expected from the implementation of the tasks and measures, as the implementation of some tasks and measures, including minimizing the generation of RAW, enhancing safety in the storage and management of liquid and solid historical RAW, safe and effective DC, and the tasks under Objective II. Responsible and safe management of RAW are expected to have a positive, mostly local, insignificant, long-term and permanent impact on amphibians and reptiles that would not be direct and would not result in positive consequences to amphibians and reptiles in radiation aspect.

Fauna - Mammals

In non-radiation aspect

At the level of Strategic Objectives

The defined ten Strategic Objectives include wide-ranging activities and tasks resulting in limiting the likelihood of environmental pollution and, hence, to the reduction of impacts on fauna, including on mammals.

In non-radiation aspect, no impact on the fauna is expected in the achievement of Strategic Objectives No. 1, 2, 3, 9 and 10, including on mammals.

The absence of details on the specific tasks for achieving Strategic Objectives 4 and 7 does not allow to assess the impact in a non-radiation aspect at this stage.

Strategic Objectives No 5, 6 and 8 have no expected impacts in non-radiation aspect too, since they concern either only the provision of financial resources, or the stage of the implementation of the tasks does not imply the occurrence of impacts on the fauna.

Insignificant negative direct and indirect, local, short-term and reversible impact in non-radiation aspect may occur during the construction of the two stages of the NRRAW (Strategic Objective No. 6), related to the construction activities.

No negative consequences on mammals are expected from the implementation of the Strategic Objectives, as the potential negative impacts on mammals in non-radiation aspect from the construction of the NRRAW would be short-term, local, temporary and insignificant and would be reversible and therefore would not lead to negative consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

At this stage, the absence of details with regard to the planning and the specific tasks and territorial scope of the implementation of the following tasks and measures does not allow us to assess the impact in a non-radiation aspect:

- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*

- All tasks and measures included in *Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3;*
- Conducting activities for the decommissioning of WSFSF (*under objective VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In a non-radiation aspect, an insignificant indirect, temporary and short-term negative impact with a limited territorial scope (local) is expected - within the site:

- during the preparatory activities for the decommissioning for partial release of RAW on the territory of SD „PRRAW-Novi Han", extraction of RAW and dismantling of the underground facilities, and restoration of the vacated areas toward the measure Preparation of documents for issuing a DC license. Safe and effective decommissioning, (*under Objective II. Responsible and safe management of RAW*).

The impact will be expressed in a temporary change of the existing environmental conditions in the habitats of mammals in the affected area as a result of dismantling and other technological activities, and will be short-term, temporary and local and insignificant.

All other tasks and activities have no impact on mammals in non-radiation aspect.

No adverse consequences on mammals are expected from the implementation of the tasks and activities, as the described potential negative impacts will be indirect, short-term, temporary and local and insignificant, and will not result in negative consequences on mammals in a non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

The defined ten Strategic Objectives include wide-ranging activities and tasks resulting in limiting the likelihood of environmental pollution and, hence, to the reduction of impacts on fauna, including on mammals. The overall assessment of the achievement of Objectives No. 1, 2, 3, 9 and 10 is for an insignificant positive, long-term and indirect local impact on mammals.

The absence of details on the specific tasks for achieving Strategic Objectives No. 4 and 7 does not allow us at this stage to assess the impact in a radiation aspect.

Strategic Objectives No. 5 and No. 8 have no expected impacts in radiation aspect, since they concern either only the provision of financial resources, or the stage of the implementation of the tasks does not imply the occurrence of impacts on the fauna.

No negative consequences on mammals are expected from the implementation of the Strategic Objectives, as the potential negative impacts on mammals from the construction of the NRRAW would be local and insignificant and therefore would not result in negative consequences, and the expected positive, long-term and indirect local impacts on mammals would also not be significant and therefore no positive consequences on mammals are expected in radiation aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Almost all tasks involving the implementation of specific activities for the management of SNF and RAW, as well as the provision and maintenance of sufficient human resources for the fulfilment of duties with their safe management have an indirect long-term permanent and local positive impact in radiation aspect , and will ensure the protection of the environment from radionuclide contamination and will ensure a minimum frequency of operational safety-related events:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, Periodic renewal of the license for the operation of WSFSF after 2034, Transportation of SNF from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing according to current practices and existing

contracts, Transportation of SNF from WWER-1000 for long-term storage and processing in accordance with the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing, Licensing of the expansion of the DSFSF for the storage of SNF from WWER-1000, selection of containers for dry storage (*under Objective I. Safe management of spent nuclear fuel);*

- Improving efficiency in the separation of RAW according to their radiation, physical and chemical characteristics and achieving compliance with the RAW acceptance criteria, Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, and Safe management of RAW from previous activities. *(under Objective II. Responsible and safe management of RAW);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities (*under objective*. *VII. Adequate financial and human resources).*

At this stage, the absence of details with regard to the planning and the specific tasks and territorial scope of the implementation of the following tasks and measures does not allow us to assess the impact in a radiation aspect:

- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*
- All tasks and measures included in *Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under Objective VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

All other packages of measures and tasks related to the safe management of SNF and RAW at the site of Kozloduy NPP and PRRAW-Novi Han and to administrative activities have no impact on mammals and therefore no consequences are expected.

Positive consequences on mammals are also not expected from the implementation of the tasks and measures, since the implementation of the tasks involving the implementation of specific activities for the management of SNF and RAW, as well as the provision and maintenance of sufficient human resources to perform the duties, is expected to have a positive, long-lasting and permanent local impact on mammals, which would not be direct and would not lead to positive consequences on mammals in radiation aspect.

Fauna - Birds

In non-radiation aspect

At the level of Strategic Objectives

An indirect, local, long-term positive impact in non-radiation aspect might be expected from the provision of staff with the necessary expertise and qualifications to better deal with the management of SNF and RAW, as well as involving the public in discussion and decision-making on SNF and RAW management issues in the implementation of Strategic Objectives No. 9 and No. 10.

In non-radiation aspect, an insignificant local indirect temporary negative impact is possible with

regard to birds due to disturbance resulting from transport activities, but it is negligible.

During the construction of the NRRAW, an insignificant secondary negative impact is expected during the construction, when the birds are chased away, as well as indirectly on individual birds in the immediately adjacent territories (NRRAW site). When implementing the mitigating measures proposed in the EIAR of the NRRAW, the impact will be weak in degree, without significant change in the number of faunal complexes in the area and without significant fragmentation of habitats. (Strategic Objective No 6.)

The absence of details on the specific tasks for achieving Strategic Objectives No. 2, 4, 7 and 8 does not allow us at this stage to assess the impact.

No impact on birds is expected when implementing Strategic Objectives No. 1, 3 and 5.

No negative consequences on birds are expected from the implementation of the Strategic Objectives, as the potential negative impacts on birds from transport activities and from the construction of the NRRAW will be insignificant, local, secondary and indirect and therefore will not lead to negative consequences, and the expected positive, long-term and indirect impacts on birds will also not be significant and therefore no positive consequences on birds are expected in a non-radiation aspect.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

An insignificant, local, indirect, temporary short-term and reversible negative impact on birds is expected as a result of disturbance resulting from the transport activities during the implementation of tasks, measures and actions related to the transportation of SNF:

- Transportation of SNF from WWER-440 from the WSFSF and the DSFSF for long-term storage and processing according to current practices and existing contracts, Maintaining readiness for removal of SNF from WWER-440 for long-term storage and processing according to a transport scheme through third countries, Transportation of SNF from WWER-1000 for long-term storage and processing according to the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing according to the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing (*under objective I. Safe management of spent nuclear fuel*);
- DC activities (*under Objective IV. Decommissioning of BAS IRT-2030 research reactor*).

According to the Environmental Impact Assessment Report (EIAR) of the NRRAW, an insignificant secondary short-term negative impact is expected during the construction, when the birds are chased away, as well as indirectly on individual birds in the immediately adjacent territories of the “Radiana” site. When implementing the mitigating measures proposed in the EIA of the NRRAW, the impact will be small, without significant change in the number of faunal complexes in the area and without significant fragmentation of habitats. These impacts are related with the following measure: Construction of NRRAW for low and medium level waste and Preparation of documents for issuing a license for decommissioning. Safe and effective decommissioning (*under Objective II. Responsible and safe management of RAW*).

The absence of details about the specific tasks to achieve the following measures does not allow us to make an assessment for:

- Activities under Appendix 6 and Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MLW and SCRS categories 2b and 3);*

- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In the implementation of the rest of the tasks and measures, no impact is expected on birds, therefore no consequences on birds are expected.

No negative consequences on birds are expected from the implementation of the tasks and activities, as the described possible negative impacts will be indirect, secondary short-term, temporary and local and insignificant and will not lead to negative consequences on birds in non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

A direct and indirect, long-term and permanent positive impact in radiation aspect is expected on birds from reducing the terms for interim storage of SNF and reducing the amount of SNF at the site. The impact will be both local within Kozloduy NPP site and regional and will not be significant when implementing Strategic Objectives No. 1 and No. 3.

The absence of details on the specific tasks for achieving Strategic Objectives No. 2, 4, 7 and 8 does not allow us at this stage to assess the impact.

A permanent, long-term, secondary, indirect, local positive impact in radiation aspect is expected from stimulating scientific research and the provision of personnel with the necessary expertise and qualifications to better deal with the management of SNF and RAW, as well as from involving the public in the discussion and decision-making regarding the management of SNF and RAW in the implementation of Strategic Objectives No. 9 and No. 10.

No impact on birds is expected in radiation aspect when implementing Strategic Objectives No. 5 and No 6.

Overall, the implementation of the Strategic Objectives of the draft updated Strategy will have a insignificant, mainly indirect and secondary, local, positive impact in radiation aspect, therefore no positive consequences on birds in non-radiation aspect are expected.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In general, the implementation of the Action Plan will have an insignificant positive effect in radiation aspect direct and indirect, long-term and permanent insignificant local secondary positive impact on birds in radiation aspect from:

- Maintaining the WSFSF in a safe condition, Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, and periodic renewal of the license after 2034, Selection of dry storage containers that meet higher modern requirements; (*under I. Safe management of spent nuclear fuel);*
- Reduction of SNF quantities during the performance of tasks, measures and actions related to the transportation of SNF from the Kozloduy NPP site, Reducing to a minimum the generation of RAW; Implementation of a program to improve efficiency in the separation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Implementation of the modernization program, ensuring the safe and efficient storage of RAW in the facilities for temporary storage at State Enterprise RAW and in the implementation of effective technology for extraction and conditioning of the solid phase from the liquid concentrate, Development and implementation of plans and projects to achieve safe

management of RAW from previous activities; (*under objective II. Responsible and safe management of RAW);*

- Packaging in the implementation of the program for deep borehole disposal, (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Reduction of the RAW volume for disposal and decontamination of premises and buildings at the decommissioning of Units 1-4 of Kozloduy NPP toward Ensuring the safe and efficient decommissioning. Temporary storage of received RAW and their subsequent transportation, conditioning and disposal. *(under objective V. Decommissioning of Units 1-4 of Kozloduy NPP);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, as well as for the implementation of the decommissioning activities.

Insignificant, local, short-term and reversible negative radiation impact is expected in radiation aspect:

- When carrying out the preparatory activities for the decommissioning for partial release of RAW on the territory of SD „PRRAW-Novi Han", as well as during the extraction of RAW and dismantling of the underground facilities (*under Objective II. Responsible and safe management of RAW).*

The absence of details about the specific tasks to achieve the following measures does not allow us to make an assessment for:

- Activities under Appendix 6 and Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MLW and SCRS categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

In the implementation of the rest of the tasks and measures, no impact is expected on birds.

No consequences on birds are expected from the implementation of the tasks and measures, as the negative impacts on birds will be insignificant, local, short-term and reversible and will not lead to negative consequences, and the expected positive impacts on birds will be direct and indirect, long-term and permanent, insignificant local and secondary, and are therefore not expected to lead to positive consequences in radiation aspect.

Protected Areas and Protected Territories

In non-radiation aspect

At the level of Strategic Objectives

An indirect, insignificant local positive impact is expected from the implementation of Strategic Objective No. 3 Sustainable reduction of SNF quantities, as well as from the application of expert knowledge and involvement of the public in the discussion and decision-making regarding the management of SNF and RAW (Strategic Objectives No. 9 and No. 10), which would lead to an improvement in the management of SNF and RAW and, from there, to a reduction of the impacts on the environment, including on Protected Areas and Protected Territories.

In the implementation of some of the Objectives directly aimed at the sustainable and safe storage of RAW, such as minimizing the terms for interim storage of SNF and the processing of the entire amount of SNF generated (Strategic Objectives No. 1 and No. 2), and building new, reliable long-term storage facilities (Commissioning of the first stage of the NRRAW and the construction of the

second and third stages of the NRRAW - Strategic Objectives No. 5 and No. 6) no impact is expected in a non-radiation aspect: The process is constant over time, so no change of state is expected.

Some of the objectives in the draft of an updated Strategy are of a purely administrative nature, or there is not sufficient detailing of their implementation, which is why the assessment of their impact is impossible - they are related to the Development of plans (Strategic Objective No. 4), Design and Construction in the long term of the DGR (Strategic Objective No. 7), Provision of financial resources for the construction of the DGR through the DGR through the creation of a new target fund (Strategic Objective No. 8).

In summarising the expected impacts, it can be seen that the implementation of the Strategic Objectives as a whole will have an indirect, insignificant, local positive impact in non-radiation aspect on the PA and PT, and therefore it is not expected that these impacts could lead to positive consequences in non-radiation aspect on the PA and PT.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

A great part of planned tasks and measures are not expected to have a non-radiation impact on PA and PT and the species and habitats in them.
The Action Plan under the updated Strategy foresees tasks and measures, the implementation of which can be expected to have an insignificant indirect, temporary and short-term, local negative impact on PA and PT and the species and habitats in them, mainly related to the Construction of the NRRAW for low and medium-level waste (*under objective II. Responsible and safe management of RAW).*
The prospect of an increase in the amount of SNF, as a result of the planned expansion of the storage facilities, may also have a negative impact, but if safety requirements are met in the course of their operation, this is not expected.
An insignificant secondary, indirect and local positive impact is expected from the implementation of:

- Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Development of the documentation for issuing a DC licence. Safe and efficient DC, Safe management of RAW from previous activities *(under objective II. Responsible and safe management of RAW);*
- Ensuring safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP).*

Due to the administrative nature of some measures or insufficient data, at this stage it is not possible to assess their impact on the protected areas, but also due to their more general wording and the absence of specific parameters for the implementation of individual measures. Such are those related to

- Change in the WSFSF license (*under objective I. Safe management of spent nuclear fuel);*
- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*
- Construction of DGR. Activities under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*

- Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of BAS IRT-2000 research reactor*).

No negative consequences on the PAs and PTs are expected from the implementation of the objectives and measures, as the implementation of some objectives under Objective II. Responsible and safe management of RAW, where negative impacts are expected to occur in non-radiation aspect, these impacts would be indirect, temporary and short-term, and also insignificant and local and would not lead to negative consequences on the PAs and PTs and their species and habitats in non-radiation aspect. Positive consequences are also not expected to occur as the implementation of some tasks and measures where positive impacts are expected to occur would be insignificant, local secondary and indirect and therefore not expected to result in positive consequences in non-radiation aspect on the PAs and PTs and their species and habitats.

In radiation aspect

At the level of Strategic Objectives

Strategic Objectives directly aimed at the sustainable and safe storage of RAW, the minimization of its quantity and the construction of new, reliable long-term storage facilities (Strategic Objectives No. 2 and No. 3), as well as the commissioning of the first stage of the NRRAW and the construction of the second and third stages of the NRRAW (Strategic Objectives No. 5 and No. 6) and Design and Construction in the long term of the DGR (Strategic Objective No. 7) are expected to have significant positive long term and permanent impacts in radiation aspect with regards to the species and their habitats, which are subject to protection in the PA and PT.

Minimizing the terms for interim storage of SNF is expected to have an insignificant positive long-term and permanent impact (Strategic Objective No. 1).

Positive impacts are also expected from the Objectives of providing and maintaining sustainable financial and human resources (Strategic Objective No. 9) and conducting a policy of openness and transparency (Strategic Objective No. 10). In terms of duration, they will be long-term and permanent, given the nature of RAW and the prospect of their use, but are not expected to be significant.

The development of plans (Strategic objective No. 4) and the provision of financial resources for the construction of the DGR through the creation of a new target fund (Strategic objective No. 8) are some of the objectives in the updated Strategy, which are entirely administratively in nature. Their implementation is not expected to affect the PA and PT in the short- and medium-term. Most of them are not directly related to latter, especially considered in non-radiation aspect.

In summarising the anticipated impacts, it can be seen that the implementation of the Strategic Objectives will generally have significant and insignificant positive impact in radiation aspect on the PA and the PT, all of which are likely to result in insignificant long-term and permanent positive consequences in radiation aspect on the PA and the PT and species and habitats.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

The Action Plan under the updated Strategy does not foresee tasks and measures, the implementation of which can be expected to have a negative impact on PA and PT and the species and habitats in them, therefore no negative consequences are expected.

An insignificant indirect long-term and permanent positive impact is expected from the implementation of:

- Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the

facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Construction of the NRRAW for low and medium level waste. Development of the documentation for issuing a DC licence. Safe and efficient DC, Safe management of RAW from previous activities *(under objective II. Responsible and safe management of RAW);*

- Ensuring safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP).*

A great part of planned tasks and measures are not expected to have an impact in radiation aspect on PA and PT and the species and habitats in them.

Due to the administrative nature of some measures in the Action Plan, as well as their more general wording and absence of specific parameters, it is not possible to assess their impact on the protected areas at this stage:

- Change in the WSFSF license (*under objective I. Safe management of spent nuclear fuel);*
- Development of a long-term plan for the construction of a repository for the interim storage of vitrified HLW and other RAW from the processing of SNF (*under objective II. Responsible and safe management of RAW);*
- Construction of DGR. Activities under Appendix 6 and Packaging (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3).*

Preparatory activities for decommissioning and DC activities (*under objective IV. Decommissioning of the BAS IRT-2000 research reactor*).

Positive consequences are also not expected to occur, as the implementation of some tasks and measures where positive impacts are expected to occur will be indirect, insignificant, secondary, and therefore not expected to result in positive consequences in radiation aspect on the PAs and PTs and their species and habitats.

9.3.8. Cultural and historical heritage

At the level of Strategic Objectives

At the level of Strategic Objectives, subject to compliance with the provisions of the Cultural Heritage Act and, more specifically, the conduct of archaeological surveys prior to the construction activities, no negative impacts on cultural heritage sites are expected.

For some of the objectives, there is not enough detailed information at this stage and an assessment cannot be conducted - Strategic Objectives No. 2, No. 4 and No. 7.

For the remaining Strategic Objectives - No. 1, 3, 5, 6, 8, 9 and 10, no impacts on the cultural and historical heritage are expected.

No consequences for cultural heritage are expected from the implementation of the Strategic Objectives, as no impacts are expected from the implementation of most of the Strategic Objectives, and no impacts can be predicted for the rest.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Indirect positive impacts are expected from tasks and measures that reduce the amount of stored SNF, and therefore minimize the risks of environmental pollution - these are, as follows:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for SNF storage after 2024 for a new period of 10 years and Maintaining the WSFSF in a safe condition. Periodic renewal of the WSFSF operation license after 2034 (*under objective I. Safe management of spent nuclear fuel).*

Negative impacts at the level of measures can only be expected during the construction of the NRRAW as a result of affecting currently unknown cultural heritage sites, and include the following measures and tasks:

- Ensuring safe and efficient storage of RAW in the facilities for the temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Construction of the NRRAW for low and medium level waste *(under II. Responsible and safe management of RAW);*
- Ensuring safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP).*

The other measures lack detailing and the expected impacts cannot be assessed at this stage - these are:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3).*

In the implementation of the rest of the tasks, no impact is expected on cultural and historical heritage sites.

No consequences on the cultural and historical heritage are expected from the implementation of the tasks and measures, because:

- negative impacts on cultural heritage are possible during the construction period of the NRRAW, which are assessed in the EIA as not significant and will not lead to negative consequences;
- the implementation of some tasks and measures is expected to result in positive, long-term and permanent impacts, which will be indirect and not significant and therefore not expected to result in positive consequences.

9.3.9. Waste

In non-radiation aspect

At the level of Strategic Objectives

In non-radiation aspect, during the implementation of Strategic Objectives No. 1, 2, 3, 4, 8, 9 and 10, no impact is expected from non-radioactive waste, since these objectives are not related to activities that generate waste.

The implementation of Strategic Objectives No. 5, 6 and 7 is related to the generation of non-radioactive waste, therefore the expected impact can be defined as insignificant negative, direct and indirect, local, short-term and long-term and reversible on the components of the environment.

No consequences from non-radioactive waste are expected from the implementation of the Strategic Objectives, as the implementation of most of the Strategic Objectives is not related to waste

generating activities, and the possible negative impacts associated with the generation of non-radioactive waste from the implementation of three of the Strategic Objectives are local, insignificant and reversible, and are therefore not expected to lead to negative consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

For the most part, the tasks and measures set at the level of Strategic Objectives in the Action Plan are not related to the generation of non-radioactive waste. Therefore, in non-radiation aspect, no impact on the components of the environment is expected.

When implementing the tasks and measures related to the generation of non-radioactive waste, an insignificant negative impact is expected on the components of the environment, which will be both direct and indirect, as well as short-term and long-term, local and reversible - for the following tasks:

- Construction of NRRAW for low and medium level waste and Development of documents for issuing a decommissioning license. Safe and effective decommissioning (*under II. Responsible and safe management of RAW);*
- DC activities (*under Objective IV. Decommissioning of BAS IRT-2000 research reactor);*
- Ensuring safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP);*
- Conducting the decommissioning activities (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and the WSFSF*).

For a small number of the measures there is no detailing and the expected impacts cannot be assessed at this stage - these are:

- Activities under Appendix 6 (*under Objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3).*

No consequences from non-radioactive waste are expected from the implementation of the tasks and measures, as the implementation of most of the tasks and measures are not associated with the generation of non-radioactive waste, and the implementation of those associated with the generation of non-radioactive waste is expected to have insignificant local impacts, which are also reversible and therefore not expected to lead to negative consequences.

In radiation aspect

At the level of Strategic Objectives

In radiation aspect, upon implementation of Strategic Objectives No. 2, 4, 5, 6, 7, 8, 9 and 10, related to RAW management, a significant permanent and long-term cumulative positive impact is expected, which will be both direct and indirect, short-term and long-term, local and regional. With the implementation of the Strategic Objectives, the safe and responsible management of all types of radioactive waste will be ensured - from generation to disposal, the management of RAW in a way that does not allow the transfer of an excessive burden on future generations is guaranteed.

The set Strategic Objectives No. 1 and 3 are not related to the management of RAW, therefore no impact of RAW on the components of the environment is expected.

The implementation of the Strategic Objectives is expected to have positive consequences for radioactive waste, as the implementation of most of the Strategic Objectives is expected to have a significant permanent and long-term, local and regional cumulative positive impact on RAW, which

would also lead to positive consequences not only for RAW but also for the environment and the health of the population.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

The implementation of the tasks and measures related to RAW management will have a positive impact in radiation aspect, which will be both direct and indirect, short-term and long-term, permanent and cumulative. Timely implementation of the set tasks and measures will lead to minimizing the volume and activity of radioactive waste, as well as reducing RAW to a safe passive form for storage and disposal in the shortest possible terms, realistically achievable, after their generation.

Positive impacts of high significance, permanent and long-term, local and regional are expected upon the implementation of:

- All tasks and measures under *objective II. Responsible and safe management of RAW, III Disposal of HLW, MARAW and SCRS, categories 2b and 3, IV. Decommissioning of BAS IRT-2000 research reactor, and V. Decommissioning of Units 1-4 of Kozloduy NPP;*
- Development of a preliminary concept for the decommissioning of Units 5 and 6 of Kozloduy NPP, Development of a decommissioning plan for Units 5 and 6 of Kozloduy NPP (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities. *(under VII. Adequate financial and human resources).*

Positive impacts of low significance, permanent and long-term, local and regional are expected upon the implementation of:

- Provision of a long-term mechanism for accumulation of funds, Methodology for determining the costs of financing the DC of Units 5 and 6 of Kozloduy NPP, Investment Strategy for the financial assets of the Decommissioning of Nuclear Facilities (DCNF) fund, the RAW fund and the target fund for the construction of the DGR, and Sufficient accumulated resources in the funds *(under VII. Adequate financial and human resources*).

In the implementation of the rest of the tasks and measures, no impact is expected.

Positive consequences are expected from the implementation of the tasks and measures related to the management of RAW, as the implementation of most of them is expected to have positive local and regional impact of high and low significance in radiation aspect, which would also lead to positive consequences not only with regard to RAW, but also with regard to the environment and the health of the population.

9.3.10. Harmful physical factors

In non-radiation aspect

At the level of Strategic Objectives

In the implementation of a large number of the Strategic Objectives, no impacts are expected in non-radiation aspect, i.e. no change is expected compared to the previous impacts of noise, vibrations and non-ionizing radiation - these are Strategic Objectives No. 1, 2, 3, 5 and 6.

Indirect, local positive impacts of low significance are expected in non-radiation aspect upon the implementation of:

- Strategic Objectives No. 9 and No. 10, in view of supporting the process of processing the generated waste from SNF in compliance with regulatory requirements and the best available techniques, and with qualified human resources and involving the public in the discussion and decision-making regarding the management of SNF and RAW in order to improve their management and minimize the risk of radioactive contamination.

As regards the implementation of three of the Strategic Objectives, this assessment is currently not possible due to insufficient detailing of the tasks - these are: Strategic Objectives No. 4, 7, and 8.

No consequences are expected from the implementation of the Strategic Objectives, as the implementation of most of the Strategic Objectives is expected to have no non-radiation impacts, i.e. no change in the existing impacts from noise, vibration and non-ionising radiation is expected or can be predicted, and the possible positive impacts in non-radiation aspect from the implementation of two of the Strategic Objectives are indirect, local and of low significance and are not expected to lead to positive consequences.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

When implementing a large number of the planned tasks and measures, including the implementation of specific activities for the safe management of SNF and RAW, as well as administrative activities, i.e. activities related to the exploration of possibilities, preparatory activities and development of a preliminary concept, no impact is to be expected in radiation aspect.

Upon implementation of the packages with measures related to:

- Construction of NRRAW for low and medium level waste and Preparation of documents for issuing a license for decommissioning. Safe and effective decommissioning of SD „PRRAW-Novi Han". *(under II. Responsible and safe management of RAW)*
- Decommissioning activities for BAS IRT-2000 research reactor *(under IV. Decommissioning of BAS IRT-2000 research reactor)*
- Ensuring safe and efficient decommissioning. Temporary storage of the received RAW and their subsequent transportation, conditioning and disposal (*under V. Decommissioning of Units 1-4 of Kozloduy NPP)*

an insignificant negative, temporary and short-term, local reversible impact in non-radiation aspect is expected during the implementation of these activities.

At this stage, the absence of details with regard to the planning and the territorial scope of the following tasks does not allow making an assessment of the impact in non-radiation aspect of:

- implementation of the concept of deep borehole disposal of HLW, MARAW and SCRS, categories 2b and 3 (*under* III. *Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- as well as Decommissioning of WSFSF, and Change in the WSFSF license (*under VI. Decommissioning of Units 1-4 of Kozloduy NPP and WSFSF*).

The implementation of the tasks and measures is not expected to result in consequences from the harmful physical factors: noise, vibration and non-ionising radiation, as the implementation of most of the tasks and measures is not associated with the generation of harmful physical factors, and the implementation of those associated with the generation of harmful physical factors is expected to result in insignificant impacts, which are also local and reversible, and therefore not expected to result

in negative consequences in non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

The expected impacts at the level of Strategic Objectives come down to entirely positive, permanent, long-term direct and indirect, local and regional cumulative impacts of low to high significance in radiation aspect.

Positive impacts of low significance are expected upon the implementation of:

- Strategic Objectives No. 1, 3 and 10, given the improvement of the management of generated waste from SNF and minimization of the risk of radioactive contamination, as well as involving the public in the discussion and decision-making regarding the management of SNF and RAW.

Positive impacts of high significance are expected upon the implementation of:

- Strategic Objectives No. 2, 5 and 6, as a result of processing the entire amount of SNF generated, commissioning the first stage of the NRRAW and construction of the second and third stages of the NRRAW;
- as well as Strategic Objectives No. 9 and 10, as they are expected to support the process of processing of the generated waste from SNF in compliance with regulatory requirements and the best available techniques and qualified human resources and will thus reduce to a minimum the risk of an increase in atmospheric radioactivity and the gamma radiation background in the affected areas.

With the implementation of three of the Strategic Objectives, positive impacts in the radiation aspect are also expected in the future, but this assessment is currently not possible due to insufficient detailing of the tasks (to date, there is still no concept developed in detail) - these are: Strategic Objectives No. 4, 7 and 8.

The expected impact is positive, local and regional, with a low to medium degree of significance and is associated with permanent positive changes in the existing state of the environment in radiation aspect. As a result, positive permanent and long-lasting environmental and public health consequences are expected.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

Almost all tasks and measures involving the implementation of specific activities for the safe management of SNF and RAW, as well as the provision and maintenance of sufficient human resources for the fulfilment of obligations associated with their safe management have a direct and indirect, permanent, local and regional, long-term and cumulative positive impact in radiation aspect, as they will ensure the protection of the environment from radionuclide contamination and ensure a minimum frequency of operational safety-related events.

Upon implementation of the packages with measures and tasks related to:

- Exploring the possibilities for transportation and processing of SNF from WWER-1000 in EU countries with technological capabilities, change in the WSFSF license, and Updated assessment of the storage capacity for dry storage of SNF in WWER-1000 (*under I. Safe*

management of spent nuclear fuel)

- Preparatory activities for the decommissioning of BAS IRT-2000 research reactor *(under IV. Decommissioning of BAS IRT-2000 research reactor)*
- Development of a preliminary concept for the decommissioning of Units 5 and 6 of Kozloduy NPP, Development of a decommissioning plan for Units 5 and 6 of Kozloduy NPP, Development of a preliminary concept and plan for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF)*

no impact is expected, as they include entirely administrative activities, i.e. they are related to the exploration of possibilities, preparatory activities and development of a preliminary concept.

At this stage, there are no planning details and specific data for the following measures, which does not allow an assessment of the impact in radiation aspect:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3)*
- Conducting activities for the decommissioning of the WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

The implementation of the tasks and measures related to the safe management of SNF and RAW, as well as the provision and maintenance of sufficient human resources to perform the duties related to their safe management, are expected to have positive consequences, as their implementation is expected to have a positive local and regional cumulative impact of high and low significance in radiation aspect, which would also lead to positive permanent and long-lasting consequences for the environment and the health of the population.

9.3.11. Material assets

At the level of Strategic Objectives

The overall impact on Material assets at the level of Strategic Objectives is long-term positive, as the Strategic Objectives are related to the further development of the nuclear infrastructure in the country, as well as increasing its quality and safety.

The impact of some strategic objectives has been assessed as 'slightly Positive' as follows: Strategic Objectives No. 1, 5 and 6.

With the implementation of two of the Strategic Objectives, positive impacts are also expected in the future, but this assessment is currently not possible due to insufficient detailing of the tasks (to date, there is still no concept developed in detail) - these are: Strategic Objectives No. 4 and No. 7.

No impact is expected from the implementation of the remaining Strategic Objectives (these are Strategic Objectives No. 2 and 3, 8, 9 and 10) which are not related to further development of nuclear infrastructure for management of RAW, therefore no impact is expected.

A positive cumulative impact is expected, with a low to medium degree of significance, and is associated with visible and lasting positive changes in the existing state of material assets (the nuclear infrastructure of the Republic of Bulgaria). As a result, positive permanent and long-lasting consequences are also expected in terms of material assets.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

At the level of tasks and measures under the Strategic Objectives in the Action Plan, there are both positive and zero impacts on material assets.

The positive impacts are related to the improvement of the existing state of the nuclear infrastructure. Positive impacts with a low degree of significance are expected from the implementation of the following tasks and measures:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for SNF storage after 2024 for a new period of 10 years *(under I. Safe management of spent nuclear fuel)*
- Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal, Construction of the NRRAW for low and medium level waste *(under II. Responsible and safe management of RAW)*

At this stage, the absence of planning details and specific activities and territorial scope in:

- Activities under Appendix 6, Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MARAW and SCRS categories 2b and 3)*
- Conducting activities for the decommissioning of the WSFSF (*under VI. Decommissioning of Units 1-4 of Kozloduy NPP and WSFSF)*

do not allow us to assess the impact in a non-radiation aspect.

With the implementation of the remaining measures and tasks, no impact is expected, as they either include entirely administrative activities, which are related to the exploration of possibilities, assessments, preparatory activities and the development of a preliminary concept, or are not expected to have an impact on material assets.

The overall assessment of the impact on material assets at the level of tasks and measures under the Strategic Objectives in the Action Plan is "slightly positive" and therefore no consequences are expected as a result of these impacts.

9.3.12. Population, human health

In non-radiation aspect

At the level of Strategic Objectives

In non-radiation aspect, the impact on the population at the level of Strategic Objectives is expected to be:

- significant and positive for Strategic Objectives No. 9 and 10;
- insignificant and positive for Strategic Objective No. 3;
- neutral for Strategic Objectives No. 1, 5 and 8.

The absence of details on the specific tasks for achieving Strategic Objectives 4 and 7 does not allow to assess the impact in a non-radiation aspect at this stage.

Insignificant negative direct and indirect, local, short-term and reversible impact in non-radiation aspect may occur during the construction of the two stages of the NRRAW (Strategic Objective No.

6), related to the construction activities.

Impacts on the population at the level of Strategic Objectives can be defined as significant and insignificant, positive, permanent, long-term, direct and indirect, therefore positive permanent and long-term, population health consequences can be expected, which will not be significant.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

For the most part, the tasks and measures set under the Strategic Objectives in the Action Plan are not related to the generation of harm and "no impact is expected" on the population.

The absence of details about the specific tasks to achieve the measures described below does not allow an assessment to be made:

- Activities under Appendix 6 and Planning and implementation of a concept for deep borehole disposal *(under Objective III. Disposal of HLW, MLW and SCRS categories 2b and 3);*
- Conducting activities for the decommissioning of WSFSF (*under VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF*).

A significant positive long-term and permanent local impact is expected from the implementation of:

- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities (*under objective. VII. Adequate financial and human resources).*

All other tasks and activities have no impact on the population in non-radiation aspect.

An insignificant negative impact is possible on workers during the construction (building) of the planned sites, which is defined as direct and indirect, short-term, local and of low significance.

In general, the implementation of the majority of the tasks and measures is not expected to have an impact on the population and therefore no consequences for the health of the population are expected in non-radiation aspect.

In radiation aspect

At the level of Strategic Objectives

Impacts on people (population and workers) at the level of Strategic Objectives are relevant for the responsible, safe and effective management of SNF and RAW, at all stages of SNF management and for all types of RAW - from generation to disposal. This is crucial with a view to reducing possible harmful effects on the environment and, respectively, on the health and safety of the population. The envisaged Strategic Objectives enable the fulfilment of current requirements for safety in the handling and management of radioactive materials, for sustainable reduction and optimization of RAW, for proper processing and storage, as well as their disposal.

The Strategic Objectives of the strategy determine the guidelines for reducing the radiation risk for the population and workers from SNF and RAW, maintaining the good practices in SNF and RAW management and their optimization.

In radiation aspect, no negative impacts can be identified on the population. The defined ten Strategic Objectives include wide-ranging activities and tasks resulting in limiting the likelihood of environmental pollution and, hence, to the reduction of impacts on the population. The overall assessment of the achievement of Strategic Objectives No. 1, 3, 9 and 10 is for a significant positive,

local, permanent and long-term, local and regional impact on the population.

Strategic Objectives No. 2, 5, 6 and 8 have no expected impacts, since they concern either only the provision of financial resources, or the stage of the implementation of the tasks does not imply the occurrence of impacts on the population.

For Strategic Objectives No. 4 and No. 7, it is not possible to assess the impact in terms of radiation.

Strategic Objectives No. 9 and No. 10 are considered important for the population and of great social importance. They are related to the provision, training and development of personnel qualified and prepared for work on the permanent improvement of the radiation risk related to the management of SNF and RAW.

In general, the impacts on the population at the level of Strategic Objectives can be defined as positive, permanent, long-term, direct and indirect, local and regional, therefore positive permanent and long-term consequences for the health of the population can also be expected.

At the level of tasks and measures under the Strategic Objectives in the Action Plan

In general terms, the impacts on the population are positive, long-term and permanent, direct and indirect, local and regional, which makes it possible to permanently improve the radiation risk associated with the management of SNF and RAW.

A direct and indirect, long-term and permanent positive impact on the population and human health is expected from the implementation of the tasks and measures related to the permanent improvement of the radiation risk associated with the management of SNF and RAW. Some of the measures are foreseen for the more distant future, and are still in the process of an idea or a project, and it is not possible to give an assessment about them at the moment, but by their design they are expected to also have a positive effect (impact) on the population:

- Maintaining the WSFSF in a safe condition. Renewal of the WSFSF license for the storage of SNF after 2024 for a new period of 10 years, Transportation of SNF from WWER-440 from the WSFSF and the DSFSF, Maintaining readiness for the removal of SNF from WWER-440, Exploring the possibilities for removal and processing of SNF from WWER-1000, Transportation of SNF from WWER-1000 for long-term storage and processing in accordance with the current practice, Transportation of SNF from WWER-1000 for long-term storage and processing (*under objective I. Safe management of spent nuclear fuel*);
- Improving the efficiency in the separation of RAW, Minimizing the generation of RAW, Increasing safety in the storage and management of liquid and solid historical RAW, Ensuring the safe and efficient storage of RAW in the facilities for temporary storage of State enterprise RAW, and their subsequent transportation, conditioning and disposal and Safe management of RAW from previous activities. *(under Objective II. Responsible and safe management of RAW);*
- Packaging (*under objective III. Disposal of HLW, MARAW and SCRS, categories 2b and 3);*
- Provision of sufficient and qualified personnel for the implementation of SNF and RAW management activities, and Provision of sufficient and qualified personnel for the implementation of the DC activities (*under objective VII. Adequate financial and human resources)* These measures are defined as important for the population and of great social significance.

All other tasks and activities have no impact on the population in radiation aspect.

The implementation of the draft updated Strategy will contribute to the improvement of the health and hygiene and, in particular, the radiation aspects and the living environment of the population and is expected to have a direct and indirect, local and regional and permanent long-term positive impact on the population and human health and also to long-term and permanent positive effects on the health of the population.

9.3.13. Summarised assessment of expected impacts at Strategic Objectives level - in non-radiation aspect

Summarised assessment of expected impacts on all environmental components and factors at Strategic Objectives level - in non-radiation aspect is displayed the following Table 39.

Table 39 - Summarised assessment of expected impacts at Strategic Objectives level - in non-radiation aspect

Strategic objectives	Ambient air	Climate factors	Surface water	Groundwater	Subsoil	Soils	Landscape	Flora	Fauna	PA and PT	Cultural heritage	Waste	Harmful physical factors	Material assets	Population and health
1. Minimisation of SNF interim storage periods	0	+2	+1	0	0	0	+1	0	0	0	0	0	0	+1	0
2. Reprocessing of the whole quantity of SNF generated by WWER-440 and WWER-1000	-1	+2	0	=	=	=	=	=	0/=	0	=	0	0	0	=
3. Sustainable reduction of SNF quantities stored at Kozloduy NPP site	-1	+2	0	0	+1	0	+1	-1	0/ +1	+1	0	0	0	0	+1
4. Preparation of a long-term plan for the construction of a repository for interim storage of returned vitrified HLW and other RAW from SNF reprocessing	0	+2	=	=	=	=	=	=	=	=	=	0	=	=	=
5. Commissioning of the first stage of the NRRAW by the end of 2025	0	+2	-1	0	-1	-1	-1	0	0	0	0	-1	0	+1	0-pop./ -1-work.
6. Construction of the second and third stages of NRRAW in the medium term	0	+2	-1	0	-1	-1	-1	-1	0/ -1	=	0	-1	0	+2	0-pop./ -1-work.
7. DGR design and construction in the long term	=	+2	=	=	=	=	=	=	=	=	=	-1	=	=	=
8. Ensuring financial resources for DGR construction by establishing a new target fund	0	+2	0	0	0	0	0	0	0/=	=	0/=	0	=	0	0
9. Ensuring and maintaining sustainable financial and human resources	0	+2	+1	+1	0	0	0	+1	+1	+1	0	0	+1	0	+2
10. Pursuing a policy of openness and transparency and involving the public in discussions and decision-making on SNF and RAW management	0	+2	+1	+1	0	0	0	+1	+1/=	+1	0	0	+1	0	+2

9.3.14. Summarised assessment of expected impacts at Strategic Objectives level – in radiation aspect

Summarised assessment of expected impacts on all environmental components and factors at Strategic Objectives level - in radiation aspect is displayed the following Table 40.

Table 40 - Summarised assessment of expected impacts at Strategic Objectives level - in radiation aspect

Strategic objectives	Ambient air	Surface water	Groundwater	Soils	Flora	Fauna	PA and PT	Waste	Harmful physical	Population and health
1. Minimisation of SNF interim storage periods	+1	+1	0	+1	+1	+1	+1	0	+1	+2
2. Reprocessing of the whole quantity of SNF generated by WWER-440 and WWER-1000	+1	+1	=	=	=	=/ +1/ +2	+2	+2	+2	=
3. Sustainable reduction of SNF quantities stored at Kozloduy NPP site	+1	+1	+1	+1	+1	+1/ +2	+2	0	+1	+2
4. Preparation of a long-term plan for the construction of a repository for interim storage of returned vitrified HLW and other RAW from SNF reprocessing	+1	=	=	=	+1	=	=	+2	=	=
5. Commissioning of the first stage of NRRAW by the end of 2025	+2	0	0	0	0	0/ +2	+2	+2	+2	0-pop./ -1-work.
6. Construction of the second and third stages of NRRAW in the medium term	+2	0	0	0	0	0/ +2	+2	+2	+2	0-pop./ -1-work.
7. DGR design and construction in the long term	+2	=	=	=	0	=/+2	+2	+2	=	=
8. Ensuring financial resources for DGR construction by establishing a new target fund	+1	0	0	0	0	=/0	=	+2	=	0
9. Ensuring and maintaining sustainable financial and human resources	+1	+1	+1	0	+1	+1	+1	+2	+2	+2
10. Pursuing a policy of openness and transparency and involving the public in discussions and decision-making on SNF and RAW management	+1	+1	+1	0	+1	+1	+1	+2	+1	+2

9.3.15. Summarised assessment of expected impacts at the level of tasks and measures by strategic objectives in Action Plan - in non-radiation aspect

Summarised assessment of expected impacts on all environmental components and factors at the level of tasks and measures under strategic objectives in the Action Plan - in non-radiation aspect is displayed in Table 41.

Table 41 - Summarised assessment of expected impacts at tasks and measures level – in non-radiation aspect

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Subsoil	Soils	Landscape	Flora	Fauna	PA and PT	Cultural heritage	Waste	Harmful physical factors	Material assets	Population and health
I. Safe management of spent nuclear fuel															
Responsible and safe management of SNF at Kozloduy NPP site															
Maintaining WSFSF in safe condition. Renewal of WSFSF licence for SNF storage after 2024 for a new 10-year period	0	0	+1	+1	0	0	+1	0	0	0	+1	0	0	+1	0
Maintaining WSFSF in safe condition. Periodic renewal of WSFSF operating licence after 2034.	0	0	0	0	0	0	0	0	0	0	+1	0	0	0	0
Safe management of SNF at Kozloduy NPP site - realistic scenario															
SNF transportation from WWER-440 from WSFSF and DSFSF for long-term storage and reprocessing as per current practices and existing contracts	0	0	-1/ 0	0	0	0	+1	-1	-1/ 0	0	0	0	0	0	0
Maintaining readiness for SNF transportation from WWER-440 for long-term storage and reprocessing under a transport scheme via third countries	0	0	0	0	0	0	0	-1	-1/ 0	0	0	0	0	0	0
Exploring SNF transportation and reprocessing options from WWER-1000 in EU countries with technological capabilities (France)	=	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SNF transportation from WWER-1000 for long-term storage and reprocessing as per current practice	0	0	0	0	0	0		-1	-1/ 0	0	0	0	0	0	0
Safe management of SNF at Kozloduy NPP site - optimistic scenario															
SNF transportation of from WWER-1000 for long-term storage and reprocessing as per current practice.	0	0	0	0	0	0	+1	-1	-1/ 0	0	0	0	0	0	0
SNF transportation from WWER-1000 for long-term storage and reprocessing.	0	0	0	0	0	0	0	-1	-1/ 0	0	0	0	0	0	0
Safe management of SNF at Kozloduy NPP site															
Licensing of DSFSF extension for SNF storage from WWER-1000, selection of containers for dry storage	0	0	0	0	0	0	+1	0	0	0/ -1	0	0	0	0	0
Amendment to WSFSF licence	0	0	0	0	0	0	0	0	0/=	=	0	0	0	0	0
Safe management of SNF at Kozloduy NPP site															

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Subsoil	Soils	Landscape	Flora	Fauna	PA and PT	Cultural heritage	Waste	Harmful physical factors	Material assets	Population and health
Updated assessment of the capacity of WWER-1000 dry spent fuel storage facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
II. Responsible and safe management of RAW															
Responsible and safe management of HLW at Kozloduy NPP site															
Reconciliation of methodology for determining the quantity and characteristics of RAW from reprocessing SNF from WWER-440 and WWER-1000	0/ +1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reconciliation of methodology for determining the quantity and characteristics of RAW from reprocessing SNF from WWER-1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preparation of a long-term plan for the construction of a repository for interim storage of vitrified HLW and other RAW from SNF reprocessing	=	0	0	0	0	0	0	=/0	0/=	=	0	0	0	0	0
Safe management of low- and intermediate-level active RAW from Kozloduy NPP Units 5 and 6															
Improvement of efficiency in separating RAW by its radiation, physical and chemical characteristics, and achieving compliance with RAW acceptance criteria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimization of RAW generation	=	0	0	0	+1	0	0	0/ +1	0/ +1	+1	0	0	0	0	0
Enhancing safety in the storage and management of liquid and solid historical RAW	0	0	-1	+1	+1	0	+1	0/ +1	0/ +1	+1	0	0	0	+1	+
Achieving and maintaining sustainability in RAW management															
Ensuring safe and efficient RAW storage in the interim storage facilities of SE RAW and its subsequent transportation conditioning and disposal	=	0	0	0	+1	-1	-1	0	0	+1	0	0	0	+1	0
Construction of NRRAW for low- and intermediate-level waste	0	0	-1	0	-1	-1	-1	-1	0/ -1	-1/ 0	-1	-1	-1	+1	0 –pop -1-work.
DC of SD "PRRAW-Novi Han" by a combination of delayed dismantling and option for personnel access to the facility															
Preparation of documents for issuing DC licence. Safe and effective DC	0	0	-1	0	0	0	0	0	-1/0 /+1	+1	0	-1	-1	0	0 –pop -1-work.
Safe management of RAW from previous activities	0	0	+1	0	+1	0	+1	0	0/+ 1	+1	0	0	0	0	0
III. Disposal of HLW, MARAW and SCRS cat. 2b and 3															
DGR Construction															
Activities under Annex 6	=	0	=	=	=	=	=	=	=	=	=	=	=	=	=
Borehole disposal of spent and closed radioactive sources (SCRS)															

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Subsoil	Soils	Landscape	Flora	Fauna	PA and PT	Cultural heritage	Waste	Harmful physical factors	Material assets	Population and health
Planning and implementation of a borehole disposal concept	=	0	=	=	=	=	=	0	=/0	0	=	0	=	=	=
Packing	0	0	0	=	0	=	+1	=/0	=/0	=	0	0	0	0	0
IV. DC of BAS IRT 2000 research reactor															
DC of BAS IRT 2000 research reactor															
Preparatory activities for DC	0	0	0	0	0	0	0	=/0	0/=	=	0	0	0	0	0
DC activities	0	0	0	0	0	0	0	=/0	-1/ 0/=	=	0	-1	-1	0	0 –pop -1-work.
V. Decommissioning of Units 1-4 of Kozloduy NPP															
DC of units by continual dismantling															
Ensuring safe and effective DC. Temporary storage of generated RAW and its subsequent transportation, conditioning and disposal	0	0	-1	0	-1	-1	-1	+1	- 1/0 /+1	+1	0	-1	-1	0	0 –pop -1-work.
VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF															
Decommissioning of Units 5 and 6 of Kozloduy NPP															
Development of pre-concept for DC of units 5 and 6 of Kozloduy NPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Development of DC plan for Units 5 and 6 of Kozloduy NPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC of WSFSF															
Development of pre-concept and plan for DC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Execution of DC activities	0	0	=	=	=	=	=	=/0	=/0	0	0	-1	=	=	=
VII. Adequate financial and human resources															
Ensuring a long-term mechanism to accumulate funds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methodology for determining the costs of financing DC of Units 5 and 6 of Kozloduy NPP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Strategy for investment of financial assets of NFDF, RAW fund and DGR construction target fund	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sufficient funds accumulated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ensuring and maintaining sufficient human resources by the licensee to fulfil its safety obligations in SNF and RAW management and DC															
Ensuring sufficient and qualified personnel for implementation of SNF and RAW management activities	0	0	+1	+1	0	0	0	+1	0/ +1	0	0	0	+1	0	+2
Ensuring sufficient and qualified personnel for implementation of DC activities	0	0	+1	+1	0	0	0	+1	0/ +1	0	0	0	+1	0	+2

9.3.16. Summarised assessment of expected impacts at the level of tasks and measures by strategic objectives in the Action Plan – in radiation aspect

Summarised assessment of expected impacts on all environmental components and factors at the level of tasks and measures under strategic objectives in the Action Plan - in radiation aspect is displayed in Table 42.

Table 42 - Summarised assessment of expected impacts at the level of tasks and measures- in radiation aspect

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Soils	Flora	Fauna	PP and PT	Waste	Harmful physical factors	Population and health
I. Safe management of spent nuclear fuel											
Responsible and safe management of SNF at the Kozloduy NPP site											
Maintaining WSFSF in safe condition. Renewal of WSFSF licence for SNF storage after 2024 for a new 10-year period	+2	0	+1	+1	+1	+1	+1/ 0	0	0	+1	+2
Maintaining WSFSF in safe condition. Periodic renewal of WSFSF operating licence after 2034	+2	0	0	0	0	+1	+1/ 0	0	0	+1	0
Safe management of SNF at the Kozloduy NPP site - realistic scenario											
SNF transportation from WWER from WSFSF and DSFSF for long-term storage and processing as per current practices and existing contracts	+1/ 0	0	-1	0	+1	+1	+1/ 0	0	0	+1	+2
Maintaining readiness for SNF transportation from WWER-440 for long-term storage and processing under a transport scheme via third countries	+1/ 0	0	0	0	0	+1	+1/ 0	0	0	+1	+2
Exploring SNF transportation and reprocessing options from WWER-1000 in EU countries with technological capabilities (France)	+1/ 0	0	+1	0	0	0	0	0	0	0	+2
SNF transportation from WWER-1000 for long-term storage and processing as per current practice	+1/ 0	0	+1	0	+1	+1	+1/-1/0	0	0	+1	+2
Safe management of SNF at the Kozloduy NPP site - optimistic scenario.											
SNF transportation of from WWER-1000 for long-term storage and reprocessing as per current practice.	+1	0	+1	0	0	+1	+1/ 0	0	0	+1	+2
SNF transportation of from WWER-1000 for long-term storage and processing	+1	0	+1	0	+1	+1	+1/ 0	0	0	+1	+2
Safe management of SNF at the Kozloduy NPP site											
Licensing of DSFSF extension for storage of SNF from WWER-1000, selection of containers for dry storage	+1	0	0	0	0	+1	+1/ 0	0	0	+1	0
Amendment to WSFSF licence	+1	0	0	0	0	0	0/=	=/0	0	0	0
Safe management of SNF at the Kozloduy NPP site											
Updated assessment of the capacity of DSFSF for SNF from WWER-1000	+1	0	0	0	0	0	0	0	0	0	0

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Soils	Flora	Fauna	PP and PT	Waste	Harmful physical factors	Population and health
II. RAW responsible and safe management											
HLW responsible and safe interim storage at Kozloduy NPP											
Reconciliation of methodology for determining quantity and characteristics of RAW from processing SNF from WWER-440 and WWER-1000	+1	0	0	0	0	0	0	0	+2	+1	0
Reconciliation of methodology for determining the quantity and characteristics of RAW from processing SNF from WWER-1000	+1	0	0	0	0	0	0	0	+2	+1	0
Preparation of a long-term plan for the construction of a repository for interim storage of vitrified HLW and other RAW from SNF processing	+1	0	0	0	0	0	=/0	=	+2	+1	0
Safe management of low- and intermediate-level active RAW from Units 5 and 6 of Kozloduy NPP											
Improvement of efficiency in separating RAW by its radiation, physical and chemical characteristics, and achieving compliance with RAW acceptance criteria	+1	0	0	0	+1	+1	+1/ 0	0	+2	+1	+2
Minimization of RAW generation	+1	0	+1	0	0	+1	+1	+1	+2	+2	+2
Enhancing safety in the storage and management of liquid and solid historical RAW	+1	0	-1	+1	+1	-1	+1	+1	+2	+2	+2
Achieving and maintaining sustainability in RAW management											
Ensuring safe and efficient RAW storage in the interim storage facilities of SE RAW and its subsequent transportation, conditioning and burial	+2	0	0	0	+1	+1	+1	+1	+2	+2	+2
Construction of NRRAW for low and intermediate level waste	+2	0	0	0	+1	0	0/ +2	+1	+2	+2	0
DC of SD "PRRAW-Novi Han" by a combination delayed dismantling and option for personnel access to the facility.											
Preparation of documents for issuing DC licence. Safe and effective DC	0	0	-1	0	0	-1	-1/ 0/+1	+1	+2	+1	0-pop - 1-work.
Safe management of RAW from previous activities	0	0	+1	0	+1	+1	+1	+1	+2	+2	+2
III. Disposal of HLW, MARAW and SCRS category 2b and 3											
DGR Construction											
Activities under Annex 6	+2	0	=	=	=	=	=	=	+2	=	=
Borehole disposal of spent and closed radioactive sources (SCRS)											
Planning and implementation of a borehole disposal concept	+2	0	=	=	=	=	=/0	0	+2	=	=
Packing	+2	0	+1	=	+1	+1	=/+1	=	+2	+2	+2
IV. DC of BAS IRT 2000 research reactor											
DC of BAS IRT 2000 research reactor											
Preparatory activities for DC	0	0	0	0	0	0	0/=	=	+2	0	0
DC activities	0	0	0	0	0	0	0/=	=	+2	+1	0-pop -1-

Strategic goals, tasks and measures for each objective	Ambient air	Climate factors	Surface water	Groundwater	Soils	Flora	Fauna	PP and PT	Waste	Harmful physical factors	Population and health
											work.
V. Decommissioning of Units 1-4 of Kozloduy NPP											
DC of units by continual dismantling											
Ensuring safe and effective DC. Temporary storage of generated RAW and its subsequent transportation, conditioning and burial	0	0	+1	0	-1	-1/ +1	-1/0/+1	+1	+2	+1	0-pop -1-work.
VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF											
Decommissioning of Units 5 and 6 of Kozloduy NPP.											
Development of pre-concept for DC of units 5 and 6 of Kozloduy NPP	+1	0	0	0	0	0	0	0	+2	0/ +2	0
Development of plan for DC of Units 5 and 6 of Kozloduy NPP	+1	0	0	0	0	0	0	0	+2	0/ +2	0
DC of WSFSF.											
Development of pre-concept and plan for DC.	+1	0	0	0	0	0	0	0	0	0	0
Execution of DC activities	0	0	=	=	=	=	=/0	0	0	=	=
VII. Adequate financial and human resources											
Ensuring a long-term mechanism to accumulate funds.	+1	0	0	0	0	0	0	0	+1	0	0
Methodology for determining the costs of financing the DC of Units 5 and 6 of Kozloduy NPP.	+1	0	0	0	0	0	0	0	+1	0	0
Strategy for investment of financial assets of NFDF, RAW fund and DGR construction target fund	+1	0	0	0	0	0	0	0	+1	0	0
Sufficient funds accumulated	+1	0	0	0	0	0	0	0	+1	0	0
Ensuring and maintaining sufficient human resources by the licensee to fulfil its safety obligations in SNF and RAW management and DC.											
Ensuring sufficient and qualified personnel for implementation of SNF and RAW management activities	+1	0	+1	+1	0	+1	+1	0	+2	+1	+2
Ensuring sufficient and qualified personnel for implementation of DC activities.	+1	0	+1	+1	0	+1	+1	0	+2	+1	+2

9.4.Summary conclusion

The implementation of the draft of an updated Strategy will have a comprehensive, beneficial effect on the environment and human health.

The Strategic Objectives and the Tasks and Measures in the Action Plan of Alternative 2 are more specific, refined and linked to current strategic documents in the area.

At the level of strategic objectives

The ten strategic objectives identified include wide-ranging activities and tasks leading to the reduction of the potential for environmental pollution and the reduction of impacts on the population, and in general the impacts on the environment and the population can be defined as beneficial, permanent, long-term, direct and indirect, cumulative.

In non-radiation aspect

In **non-radiation aspect**, the implementation of most of the Strategic Objectives (Strategic Objectives 1 to 6) is not expected to have impacts on all components, with insignificant positive permanent and long-term, local impact expected on climate factors, material assets, surface water, landscape, PAs and PTs, and population and human health in the implementation of some of these 6 Strategic Objectives. Strategic Objectives 9 and 10, related to the provision, training and development of personnel trained and prepared to work on the sustainable improvement of the radiation risk associated with SNF and RAW management, are assessed as important for the environment and especially for the population and of great social importance, and they are expected to have a beneficial, direct and indirect, long-term and permanent impact, which will be mostly local, as well as regional.

Two of the strategic objectives (Strategic Objectives 7 and 8) are expected to have beneficial impacts in non-radiation aspect in the future, but this assessment is not possible at present due to insufficient detail in the objectives.

Minor local, indirect, temporarily reversible negative environmental impacts of low significance are possible due to dust and emissions from transport activities during the implementation of tasks, measures and actions mostly related to SNF transportation or construction of NRRAW, and the impacts will be negative but reversible, short-term and temporary, local and it will not be significant.

No environmental consequences are expected from the implementation of the Strategic Objectives, as no impacts are expected from the implementation of most of the Strategic Objectives, and the possible negative impacts, as well as the possible positive impacts from the implementation of some of them, are negligible, reversible, short-term, temporary, and mostly local, which would not lead to consequences in non-radiation aspect on the environment and the health of the population. Due to the small scale and insignificance of the expected positive and negative impacts, no transboundary impacts are expected in non-radiational aspect when implementing the Strategic Objectives.

In radiation aspect

In **radiation aspect,** most of the Strategic Objectives (Strategic Objectives 1 to 6) are related to minimising the SNF interim storage period, reprocessing of the whole amount of SNF generated, sustainable reduction of SNF quantities at Kozloduy NPP site and construction of appropriate storage and reprocessing facilities, and they have a fully beneficial, direct and indirect, local and regional,

long-term and permanent and cumulative impact on the environment and human health.

Beneficial radiation impacts are expected in the future with the implementation of two of the strategic objectives (Strategic Objectives 7 and 8), but this assessment is not possible at present due to insufficient detail in the tasks (to date, no detailed concept has been developed yet).

It is also expected that there will be an indirect permanent, short-term and long-term beneficial impact from providing staff with the necessary expertise and skills to better deal with SNF and RAW management, as well as from involving the public in the discussion and decision-making on SNF and RAW management (Strategic Objective 9 Ensuring and maintaining sustainable financial and human resources and Strategic Objective 10. Pursuing a policy of openness and transparency and involving the public in discussions and decision-making on SNF and RAW management).

Implementation of the Strategic Objectives is likely to result in consequences for air, climate, the PAs and PTs and species and habitats, waste, harmful physical factors, material assets, and the population and its health, as the implementation of many of the Strategic Objectives is expected to result in positive impacts, direct and indirect, with low and high significance (mostly low), local and regional (mostly local), permanent and long-term, cumulative, that would result in positive consequences in radiation aspect. These consequences are expected to be indirect, permanent and long-term and not significant.

As the assessed positive impact on the environment and human health in radiological aspect is expected to be mainly of low significance and of small territorial extent, no positive transboundary impacts are expected to occur.

At the level of tasks and measures under strategic objectives in the Action Plan

In non-radiation aspect

In **non-radiation aspect,** no impacts are expected from the implementation of most of the tasks and measures under strategic objectives in the Action Plan, with minor positive, predominantly indirect, local, long-term and permanent impacts, that will not lead to consequences, expected from the implementation of some tasks and measures on material assets, surface and groundwater, landscape, cultural heritage, PAs and PTs, and population and human health.

The measures considered to be important for the environment and especially for the population and of great social importance are the following: Ensuring and maintaining sufficient human resources by the licensee to fulfil its safety obligations in SNF and RAW management and DC *(under Objective VII. Adequate financial and human resources)* related to ensuring sufficient and qualified personnel for implementation of SNF and RAW management activities and for DC activities that are expected to have a positive, direct and indirect, local, long-term and permanent impact which will not be significant.

No environmental consequences in non-radiation aspect are expected to occur as a result of the implementation of the tasks and measures under the strategic objectives in the Action Plan, as the possible positive and negative impacts will not be significant and will not be direct, and therefore they will not result in consequences for the environment.

Transboundary impacts in a non-radiational aspect are also not expected when implementing the tasks and measures under the strategic objectives in the Action Plan due to the small scope and insignificance of the expected positive and negative impacts.

In radiation aspect

Almost all tasks and measures involving the implementation of specific activities for SNF and RAW safe management (mainly under *Objective I. Safe management of spent nuclear fuel and Objective II. Responsible and safe management of RAW*), the sustainable reduction of the quantities of SNF at Kozloduy NPP site and the construction of appropriate storage and processing facilities, as well as the provision and maintenance of sufficient human resources to meet the obligations of their safe management, have a direct and indirect, short-, medium- and long-term, permanent beneficial impact **in radiation aspect** on the components and factors of the environment and human health, as they will ensure the protection of the environment from contamination with radionuclides and ensure a minimum frequency of safety-related operational events. A beneficial cumulative impact of low and medium significance is also expected, associated with lasting positive changes in the existing radiation status of the environment and the population. This impact is not expected to result in transboundary impacts on the territory of other countries.

As a result of these impacts, it is also possible that there will be positive consequences on ambient air, climate, waste, harmful physical factors and population and human health from the implementation of the tasks and measures under the strategic objectives in the Radiation Action Plan, which are expected to be mainly indirect, local, permanent and long-lasting and not significant.

In the implementation of some measures and tasks, no impact is expected as they involve purely administrative activities, i.e. they are related to feasibility studies, preparatory activities and pre-concept development,

which does not allow to assess the impact in a radiation aspect.

A local, temporary, reversible negative impact which will not be significant on the environment is expected from:

- all transport schemes, with impacts dispersed along the road corridor *(under Objective I. Safe management of spent nuclear fuel);*
- Construction of NRRAW for low- and intermediate-level waste *(under Objective II. Responsible and safe management of RAW);*
- dismantling and reclamation at DC of the BAS IRT 2000 research reactor *(under Objective IV. DC of BAS IRT 2000 research reactor);*
- reclamation of soils around Units 1-4 and restoration of their sites *(under Objective V. Decommissioning of Units 1-4 of Kozloduy NPP);*
- dismantling and reclamation at DC of WSFSF until reaching the final "brownfield" condition *(under Objective VI. Decommissioning of Units 5 and 6 of Kozloduy NPP and WSFSF).*

It can be summarised that the implementation of certain measures and tasks will be associated with insignificant negative impacts on the environment (mainly on soil, air, flora and fauna components) during construction, dismantling and reclamation works are expected due to air pollution and noise and waste generation. This impact is expected to be local, within the construction sites and facilities, temporary and reversible and insignificant.

Due to the insignificance, small territorial scope and reversibility of the possible negative impacts

during the implementation of some of the tasks and measures under the strategic objectives in the Action Plan, they are not expected to lead to negative consequences on the environment and human health in radiation aspect.

No negative transboundary impacts in radiological aspect are expected from the implementation of the tasks and measures under strategic objectives in the Action Plan due to the local and not significant extent of the potential negative impacts.

Some of the tasks and measures qualify as measures contributing to environmental objectives (beneficial impact on climate change, adaptation to climate change, sustainable use and protection of water resources, transition to a circular economy, prevention and control of pollution, protection of aquatic biodiversity and aquatic ecosystems), pursuant to Art. 9 of Regulation 2020/852.

9.5.Transboundary impact

In accordance with the Convention on Environmental Impact Assessment in a Transboundary Context and the Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context, the draft of the updated Strategy falls under item 2 of Art. 4: Field of application in relation to plans and programs, which sates the following: Strategic environmental assessment shall be carried out for plans and programs which are prepared for agriculture, forestry, fisheries, energy, industry, including mining, transport, regional development, waste management, water management, telecommunications, tourism, spatial planning or land use, and which provide the framework for coherence for the future development of projects listed in Annex I and any other project listed in Annex II requiring an environmental impact assessment.

The draft of the updated Strategy falls within Annex I: List of projects pursuant to Art. 4, para. 2, item 3: Installations intended solely for the production or enrichment of nuclear fuels, for reprocessing of spent nuclear fuels or for the storage, disposal or reprocessing of radioactive waste.

9.5.1. Summarised conclusions regarding the possible presence of transboundary environmental and human health impacts in the developed and adopted EIA Reports

Over the last few years, a number of environmental and population impact assessments have been carried out on the operation of power units and new facilities at Kozloduy NPP site and around it. The impact of Units 5 and 6 has been the subject of a number of EIA reports over the years – starting from EIAR on Unit 5 and 6 Modernisation Program, 1998; EIAR on Kozloduy NPP, 1999; EIAR on the Repository for SNF Dry Storage, 2006; EIAR on Units 1-4 Decommissioning, 2013; EIAR on FPI, 2014; EIAR on New Nuclear Power Build (NNPB) Construction at Kozloduy NPP Site, 2015, and the most up-to-date environmental impact assessment in EIAR on NRRAW, 2016.

Thus, at Kozloduy NPP site and in the surrounding area:

- A National Repository for Disposal of Low- and Intermediate-level Radioactive Waste (NRRAW) is under construction, for which EIAR has been developed and approved by the MoEW by Decision No. 7-7/2016. In this report, an environmental impact assessment in a transboundary context has also been carried out in accordance with the procedure envisaged in the applicable Bulgarian legislation, specifically Art. 8, para. 1 of the Environmental Protection Act and Art. 25 of the Ordinance on the condition and procedures for carrying out

EIA, as well as in accordance with the Convention on EIA in a Transboundary Context (Espoo Convention). The EIAR concludes that the impact on humans and the environment on the territory of the Republic of Bulgaria and Romania from the construction and operation and closure of the Repository for Disposal of Conditioned RAW Containers, is well below the limits set by national and international requirements. The radiological effects on humans and the environment during operation and closure have been assessed as negligible, including through mathematical modelling and based on existing experience from the operation of identical facilities in other countries;

- Kozloduy NPP Units 1 to 4 are being decommissioned, for which an EIAR has been prepared and approved by the MoEW by Decision No 8-6/2013. In this Decision, the environmental and human impacts considered as a result of the decommissioning of Kozloduy NPP Units 1-4 during the decommissioning preparatory stage, Stage 1, Stage 2 of decommissioning and the closure and reclamation stage are assessed as very low. The radiological impacts are reduced to a significantly lower level compared to the final shutdown of the units and are substantially reduced compared to the impacts during the operational lifetime of the units. The radiological impacts tend to be reduced to even lower levels through the consistent implementation of the ALARA principle, which has been successfully applied in all previous activities carried out at Kozloduy NPP site. No transboundary radiological impacts are expected. The non-radiological impacts of the decommissioning activities of Units 1-4, such as the generation of non-radioactive waste and emissions of harmful substances, are assessed to be very low and of local significance and also limited in time. No transboundary non-radiological impacts are expected;
- A Facility for Plasma Incineration (FPI) of Waste with a High Volume Reduction Factor has been constructed and has been subject to EIA Report which was approved with EIA Decision No. 2-2/2014. The Decision states that, as a result of the summarised assessments of all possible impacts on environmental components and factors, no transboundary impacts are expected as a result of the construction, operation and decommissioning of FPI within the 30-km zone of Kozloduy NPP, both on Bulgarian territory and transboundary on the territory of neighbouring Romania.

In these EIA procedures, Romania was the country that identified itself as affected and expressed its willingness to participate in the EIA procedure. In accordance with the requirements of the Convention on EIA in a transboundary context, consultations have been conducted in a transboundary context, including making EIA reports publicly available. Also, a public discussion was held in Romania for EIA of national repository for disposal of low- and intermediate-level radioactive waste (NRRAW).

In addition, a transborder procedure was conducted for IP for "Extension of the lifetime of Units 5 and 6 of Kozloduy NPP", which was concluded by Decision No. 6-ПР/2014 on the assessment of the need for carrying out an environmental impact assessment. Romania expressed interest in participating. The Romanian Ministry of Environment and Climate Change sent comments in connection with the notification sent on the part of Bulgaria. In response, Bulgaria provided the necessary information and documentation to Romania. The conclusion of the assessment, based on the transboundary procedure carried out, is that extending the operation of Units 5 and 6 does not substantially alter the operating regime of the nuclear power plant over the years and will not lead to

a change in the conclusions about the non-existence of an assessable radioecological impact from the operation of Kozloduy NPP on the population and the environment in the area, both on Bulgarian and Romanian territory. No cumulative radioecological impact is expected from the continued operation of Units 5 and 6. The nature of the investment proposal "Lifetime extension of Units 5 and 6 of Kozloduy NPP" does not foresee the construction of a new facility on site, therefore no change in the transboundary impact assessments of Kozloduy NPP is expected. The assessment of environmental impact of the operation of Units 1 to 6 was subject to EIA in 1999, and the conclusions of no significant impact remain unchanged. No transboundary impact is expected from the operation of Units 5 and 6 and the other facilities at Kozloduy NPP site.

The conclusions on the non-existence of transboundary impacts are also confirmed in the EIA of the IP "Construction of a new nuclear power plant of the latest generation at Kozloduy NPP site", approved by Decision No. 1-1/2015 of the Ministry of Environment and Water. In this EIA procedure, Romania is the country that identified itself as affected and expressed its willingness to participate in the EIA procedure. In accordance with the requirements of the Convention on EIA, consultations have been conducted in a transboundary context, including public discussions in Romania. The conclusion of the assessment is that:

- No non-radiological impacts on environmental components and factors are expected;
- No radiological impacts are expected on water, land and soil, subsoil, land use, mineral diversity, biodiversity, environment and cultural resources; areas inhabited by protected, important and sensitive flora and fauna species; picturesque areas; areas and sites of historical and cultural significance, sites protected by international or national law, as well as on the health of personnel and population;
- The contribution of the new nuclear power build (NNPB) to the radiation background in the vicinity of the town of Kozloduy due to external radiation exposure is negligible even when cumulated with the existing nuclear facilities at Kozloduy NPP site. The cumulative impact on the environment in a radiation aspect is assessed as negligible; no cumulative impact is expected in a non-radiation aspect;
- No transboundary impact is expected;
- During all three phases of the implementation of the IP: construction, operation and decommissioning, no transboundary impact has been identified on the Romanian territory within the 30-km zone around Kozloduy NPP.

It is evident from the above review that in all the transboundary EIA Report procedures carried out, it was concluded that no significant transboundary impact on the environment and human health on the territory of other countries is expected.

In terms of environmental and human health impacts in a transboundary context, the facilities for SNF and for RAW envisaged in the draft updated Strategy may be relevant as follows:

SNF

In Bulgaria, SNF is generated by units 5 and 6 of the Kozloduy NPP, and in the past also by units 1 to 4 of the nuclear power plant. SNF management practices in Bulgaria are related to the storage of SNF from WWER-1000 in the near-reactor aging pools and in WSNFS (Wet Spent Nuclear Fuel Storage Facility), and from WWER-440 - in WSNFS and in DSNFS (Dry Spent Nuclear Fuel Storage

Facility), which are in operation and for which the relevant operating licences have been issued. These facilities have been assessed in the EIA reports described above and it has been concluded that no transboundary impacts on the environment and human health are expected on the territory of other countries.

No new SNF management facilities are envisaged in the draft updated strategy, no increase, but on the contrary a decrease in the amount of SNF on the Kozloduy NPP site is foreseen, so their impact, including transboundary impact, is also expected to decrease.

RAW

The existing facilities for the management of RAW include: a facility for the treatment and storage of RAW at Kozloduy NPP, including the Facility for the Treatment and Conditioning of Radioactive Waste with High Volume Reduction Factor at Kozloduy NPP; facilities for the interim storage of RAW from Units 5 and 6 and the Specialised Division "Permanent Repository for Radioactive Waste - Novi Han". The facilities foreseen in the draft updated Strategy are: the National Repository for Radioactive Waste ("NRRAW") and the StBK packaging facility of the State Enterprise RAW, both of which have undergone an Environmental Impact Assessment, including in a transboundary context.

The EIA Report for NRRAW provides an environmental analysis of the alternative technological solutions for the construction of the NRRAW, proposes a number of measures and recommendations to minimise the impact of the site on the environment and to ensure the full safety of the personnel and the population in the area during the construction, operation and closure of the NRRAW in radiological and non-radiological aspects. With effective management of the NRRAW, no significant negative impacts on the environment are expected and the safety measures envisaged will ensure that no health risks are posed to the site workers and the population in the area. The impact on the individual environmental components and the factors affecting them is assessed as insignificant with a territorial scope of impact within the boundaries of the investment proposal site and the immediate surroundings both during construction and during normal operation and after closure of the NRRAW.

The area of potential impact is limited to the protected area of the NRRAW. This area is not accessible to the public. The area of potential impact does not cross the national borders of Bulgaria and no transboundary impact is expected.

9.5.2. Summarised conclusions about the likelihood of existence of transboundary impacts on the environment and human health based on the analyses and impact assessments in the EAR

The EAR assesses impacts at the level of Strategic Objectives and at the level of tasks and measures under the Strategic Objectives in the Action Plan (including the territorial scope of the impacts), and also summarises in section 9.4 the expected impacts and the potential for consequences for the environment and human health from these impacts, as well as the potential for transboundary impacts. Thus, the assessment of transboundary impacts at the level of Strategic Objectives and at the level of targets and measures under the Strategic Objectives in the Action Plan is as follows:

At the level of Strategic Objectives

In non-radiation aspect - Regarding the impact at the level of Strategic Objectives, it has been assessed that the expected positive and negative impacts are local in scope and not significant, no

effects on the environment and the health of the population are expected and no impacts on the territory of other countries are expected.

In radiation aspect - No negative impacts are expected in radiation aspect and therefore no transboundary negative impacts are expected when implementing the Strategic Objectives.

Due to the predominantly low significance, as well as the small scope of the expected **positive impact**, no impacts are expected to occur in other countries.

At the level of targets and measures under the strategic objectives in the Action Plan

In non-radiation aspect - No transboundary impacts in non-radiation aspect are expected in the implementation of the tasks and measures under the strategic objectives in the Action Plan due to the small scope and insignificance of the expected positive and negative impacts.

In radiation aspect

The assessed direct and indirect, short, medium and long term, permanent positive impact on the environment and human health when implementing some of the tasks and measures under the strategic objectives in the Action Plan is also likely to lead to minor positive effects on ambient air, climate, waste, harmful physical factors and population and human health with a small scope, and these impacts are not expected to extend to the territory of other countries.

No negative transboundary radiological impacts are expected from the implementation of the tasks and measures under the strategic objectives in the Action Plan due to the local extent and the non-significance of the potential negative impacts.

Based on the above, it can be concluded that no transboundary impacts on the environment and human health in the territory of other countries are expected from the implementation of the strategic goals and targets and measures under strategic objectives in the Action Plan.

In accordance with the Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context, an analysis and assessment of the impact of the assumptions of the draft of an updated Strategy on the environment and human health, including other countries, has been carried out against the criteria for identifying the likelihood of significant impact.

Table 43 - Criteria for assessment of presumed transboundary impact

No.	Criteria for identification of possible significant impacts on the environment, including health impact under Annex III of the Protocol on Strategic Environmental Assessment to the EIA Convention in a transboundary context	Analysis and assessment of the presumed transboundary impact of the draft of an updated Strategy under the relevant criteria
1	The compliance of the draft of an updated Strategy in terms of integrating environmental, including health considerations, in particular to support sustainable development.	Based on the analysis of the assumptions of the draft of an updated Strategy against other relevant plans and programs and against national, European and international documents setting environmental targets, the draft of an updated Strategy takes into account and integrates environmental, including health considerations.

No.	Criteria for identification of possible significant impacts on the environment, including health impact under Annex III of the Protocol on Strategic Environmental Assessment to the EIA Convention in a transboundary context	Analysis and assessment of the presumed transboundary impact of the draft of an updated Strategy under the relevant criteria
2	The extent to which the plan of an updated Strategy provides a framework for projects and other activities either in terms of location, nature, size and operating conditions, or through the allocation of resources.	The strategic objectives of the draft of an updated Strategy set the framework for the development of projects and other activities, with a local scope of the implementation of the assumptions, respectively a local scope of the impact on the environment and human health.
3	The extent to which the plan of an updated Strategy has an impact on other plans and programs, including those in the hierarchy	The draft of an updated Strategy complies with, derives from, is consistent with and is not in conflict with the national and European strategic, planning and programming documents with which it is correlated (as per the analysis under item 3 of the EAR)
4	Environmental, including health issues related to the plan of an updated Strategy	The draft of an updated Strategy and its Strategic Objectives are focused on sustainable development, also linked to the resolution of existing environmental and health issues within its scope.
5	The nature of environmental impacts, including health impacts such as likelihood, duration, frequency, reversibility, magnitude and distribution (e.g. geographical area or population likely to be affected).	Environmental and human health impacts are expected mainly for the construction phases in relation to the individual tasks and measures envisaged to be financed, such as the construction of the second and third phases of the NRRAW, as well as the DC of Kozloduy Units 1-4. The nature of the environmental impacts, including health impacts, are assessed in the approved EIA reports in which Romania identified itself as an affected country. The impacts on environment and the population considered in the EIA Decisions are assessed as very low, reversible and of local significance, and also limited in time - the duration is small
6	Risks to the environment, including human health	The conducted analysis of expected impacts concludes that no serious or significant risks to the environment and the health of the population in Bulgaria, as well in other countries are predicted from the
7	The extent to which the draft of an updated Strategy would affect valuable or sensitive areas, including landscapes with recognised national or international protected status	The analysis carried out in the EAR has established that the Strategic Objectives envisaged in the draft updated Strategy, as well as the tasks and measures under the Strategic Objectives in the Action Plan, are not expected to affect such areas and landscapes, both in Bulgaria and in other countries.
8	Transboundary nature of impacts • Likelihood of occurrence of impact • Type of impact • Magnitude (degree of impact) • Duration	Based on the analysis of the expected impacts from the implementation of the draft updated Strategy, it has been assessed that positive and negative impacts are likely to occur, which will be direct and indirect, with predominantly low to high impact, short and long term, permanent

No.	Criteria for identification of possible significant impacts on the environment, including health impact under Annex III of the Protocol on Strategic Environmental Assessment to the EIA Convention in a transboundary context	Analysis and assessment of the presumed transboundary impact of the draft of an updated Strategy under the relevant criteria
	• Frequency • Reversibility • - Territorial scope of impact	and temporary, reversible and predominantly local in scope. Regarding the potential transboundary impact, it is assessed that: • at the level of the Strategic Objectives, both in radiation and non-radiation aspects, no negative and positive transboundary impacts are likely to occur; • at the level of tasks and measures under the strategic objectives in the Action Plan - no transboundary impacts are expected to occur either Transboundary radiological and non-radiological impacts on other countries are not expected

No significant transboundary impacts on the environment and human health in the territory of other countries are expected from the implementation of the strategic goals and tasks and measures under strategic objectives in the Action Plan.

10. The measures envisaged to prevent, mitigate and compensate as far as possible the adverse effects of the implementation of the draft of an updated Strategy on the environment

10.1. Measures to be reflected in the final draft of an updated Strategy

As the implementation of the draft of an updated Strategy is expected to have mainly beneficial impacts, with no significant negative impacts from specific eligible measures, it is not necessary to include measures in the final version of an updated Strategy.

10.2. Measures to be carried out in the implementation of the draft of an updated Strategy

10.2.1. Climate change

For resilience to the effects of climate change and adaptation to changes that have already occurred, the following measures should be implemented:

- implementation of projects for the improvement of technical infrastructure and construction of facilities for the prevention of natural disasters - floods, landslides, fires, etc.;
- Introduction of energy efficiency measures in the administrative and production buildings on both sites to reduce energy costs, which has a direct effect on reducing greenhouse gas emissions;

- landscaping around Kozloduy NPP and PRRAW-Novi Han - will mitigate the pressure on microclimate conditions and contribute to the adaptation to the changes that have already occurred in the areas of the two sites.

10.2.2. Ambient air quality (AQ)

In relation to AQ, the following measures should be undertaken when implementing an updated Strategy:

- strict transportation rules, especially when passing through populated areas

Expected result: avoidance of traffic accidents or congestion of conventional traffic

- avoidance of unintentional emissions during construction

Expected result: Prevention of pollution of environmental components

- Compliance with rules and regulations and technical design specifications and working solutions to prevent releases of gaseous or aerosol radionuclides into the environment and an increase in the gamma radiation background in the affected areas
- Interim storage of SNF within minimum timeframes should be carried out in strict compliance with the technological rules and regulations

Expected result: Prevention of pollution of environmental components.

- During construction works, no spillage of fuels and lubricants shall be allowed from the construction and transport equipment used. Prevention from deterioration of adjacent terrains as a result of spills and transfer through rain and groundwater of fuel and lubricants.

Expected result: Prevention of pollution of environmental components.

10.2.3. Water

In relation to water, the following measures should be undertaken when implementing the draft of an updated Strategy:

- Maintaining water management and purification systems in good operational condition

Expected result: Prevention of pollution of environmental components

- Ongoing analysis of monitoring results and promptly implementing of corrective action in case of identified non-compliances and deterioration trends in water quality and quantity.

Expected result: Prevention of pollution of environmental components.

- Compliance with the prohibitions and restrictions stipulated in the Water Act, including the requirements of Article 118a and 118c of the Water Act, according to which, in order to protect groundwater from pollution, activities that may lead to direct and indirect discharge of pollutants into groundwater are prohibited.

Expected result: Water pollution prevented.

- Compliance with the provisions of Article 156a(1) of the Water Act, according to which it is necessary at each stage of the planning, design, construction and maintenance of the planned facilities to provide for and implement measures to prevent water pollution.

Expected result: Prevention of water pollution.

10.2.4. Subsoil

No measures are required.

10.2.5. Soils

- Compliance with the regulatory requirements set out in Regulation 26,

Expected result: Environmental protection

- When construction is carried out, the humus is to be collected and stored in appropriate locations and then used in the reclamation of disturbed areas.

Expected result: Conservation and effective use of the humus formed during the habitat successions.

10.2.6. Landscape

No measures are required.

10.2.7. Biodiversity

Initial excavation and clearing of construction sites from vegetation during construction of the two phases of the NRRAW, as well as activities to restore vacated land and pre-construction preparation should start outside the fauna breeding season (01.04.-15.06.).

Expected result: Conservation of fauna.

10.2.8. Cultural and historical heritage

No other measures are necessary besides the provisions of the Cultural Heritage Act.

10.2.9. Waste

The management of the generated non-radioactive waste needs to be carried out in compliance with the requirements of the Waste Management Act and its regulations, as well as the introduction of separate collection of "green" waste.

Expected result: Environmental protection and efficient use of waste.

10.2.10. Harmful physical factors

No measures are required.

10.2.11. Material assets

- Coordination of all projects related to the construction of the three phases of the NRRAW with the owners of infrastructure that may be affected by the implementation of the project, on the territory of Radiana site and beyond;
- During the construction phase, it is necessary to implement appropriate construction management procedures in a timely and quality manner in order to repair and compensate for damage to infrastructure, private and public property, utility lines, water supply, sewerage, irrigation/drainage systems, etc.

Expected result: Preserving material assets.

10.2.12. Population, human health

Measures to ensure the safety and health of the population:

- Active communication with the of EC on SNF management issues and providing support for national SNF and RAW management plans;
- Implementation of the National Strategy for Human Resources Development in the Nuclear Sphere 2022-2032, provision of employment, qualification and maintenance of qualification programs, which is a condition for safe operation of Kozloduy NPP, construction of new nuclear power builds and new repositories for RAW and SNF, slowing down the processes of DC, and SNF and RAW management;
- Compliance with the legislation and the established measures based on the ALARA Principle for radiation protection of the population when carrying out the activities envisaged under the Strategy;
- Ensuring the safety of the population during SNF and RAW transportation and management – prevention of accidents or incidents during SNF transportation, organisation and control;
- Ensuring for the population compliance with the population dose limit of 0.1 mSv/a;
- Informing the public – ensuring a sustainable policy of transparency and openness, creating an atmosphere of intolerance towards non-implementation of planned activities and measures, ensuring public support for the implementation of projects for RAW storage or disposal, etc.

Expected result: Protection of life and health of the population.

Measures to ensure health and safety for those working with SNF and/or RAW:

- Ensuring safe and healthy working conditions at the working sites;
- Radiation protection at workplaces - compliance with the ALARA principle, provision of personal protective equipment, individual dosimetric control;
- Ensuring protective barriers and other means to isolate workers or reduce the possibility of radiation exposure;
- Providing safe remote control of the transportation of containers (packages of RAW) into the reception area, the buffer zone and placement in the cell;
- Providing radiation monitoring systems and setting appropriate alarm thresholds;
- Ensuring the necessary radiation protection in the design and implementation of the facilities envisaged in the Strategy;
- Ensuring for workers compliance with dose limits or dose limits for workers - 6 mSv/a per worker throughout operation (dose limit);
- Ensuring periodic preventive medical check-ups of personnel (task of the Occupational Health Service (OHS) contractor serving the workers on-site).

Expected result: Protection of the life and health of workers handling SNF and/or RAW.

11. Description of the rationale for selecting the alternatives under consideration and the methods for carrying out environmental assessment, including the difficulties in collecting the necessary information, such as technical deficiencies and lack of know-how

11.1. Rationale for selecting the alternatives under consideration

The draft of an updated Strategy is being developed in the context of the availability of up-to-date strategic and programming documents for the environmental sector in the country, at European and international level. Without the implementation of the draft of an updated Strategy, equal to the choice of the ‘zero alternative’, the trends in the state of the environmental components and factors will evolve depending on the manner and degree of implementation of the relevant existing strategies, planning and programming documents, and the expectations and prospects are for improvement of their state.

The ‘zero option’, defined as the 'status quo', represents an alternative in accordance with Directive 2001/42/EC and is discussed in Section 5 of this document (Potential development of environmental aspects without implementing the draft of an updated Strategy).

The draft of an updated Strategy is developed in compliance with the requirements of EU Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of SNF and RAW, taking into account and not conflicting with the objectives of existing documents setting environmental protection targets.

Based on the information set out in the draft of an updated Strategy, the following alternatives can be defined:

- Alternative 1 "Zero Alternative": Continuation of the current development processes and trends without implementation of the draft of an updated Strategy;
- Alternative 2: Development provided that the tasks and measures proposed in the draft of an updated Strategy are implemented.

The following table compares Alternative 1 with Alternative 2:

Impact criteria	Alternative 1	Alternative 2
Impact on the environment and health at the level of strategic objectives	To a large extent, the status-quo is expected to be preserved in relation to environmental and human health impacts but a gradual increase in the negative impact is also possible due to: - failure to resolve the problems of SNF transportation for long-term storage and reprocessing and, respectively, increasing the risk to the safety and health of the population;	The impact at the level of strategic objectives on the environment and human health is comprehensively beneficial due to the inclusion in this alternative of additional strategic objectives aimed at: - Minimisation of SNF interim storage periods; - Commissioning of the first stage of the NRRAW and construction of the second and third stages of the NRRAW;

Impact criteria	Alternative 1	Alternative 2
	- increase in the quantity of SNF stored at Kozloduy NPP site; - reduction in the capacity of the interim SNF storage facilities; - delay in activities related to the DGR planning and construction; - delaying/blocking the processing and conditioning of RAW from the operation of Kozloduy NPP and from DC; - suspension/extension of the DC process, etc.	- Design and construction of a long-term DGR and providing financial resources for its construction; - Providing and maintaining sustainable financial and human resources and carrying out research and development activities for more innovative and efficient RAW and SNF management; and thereby reducing the negative impact on the environment, and consequently improving the state of the environment, adapting it to the emerging climate changes and improving the quality of life of the population, which will lead to a balanced and sustainable management of the environment, the development of scientific potential and the qualification of people.
Impact at the level of tasks and measures in the Action Plan	The environmental impact is likely to change gradually in a negative direction from the current situation, as no activities are foreseen under the zero alternative that correspond to the changed objective situation both in political and technological aspects, and the gradual exhaustion of the existing capacities of the facilities for SNF and RAW processing and storage.	The impact is comprehensively positive due to - the inclusion in this alternative of tasks and measures aimed at improving the diversification of SNF reprocessing options according to the political situation (the possibility of reprocessing SNF from Kozloduy NPP not only in the Russian Federation but also in France is envisaged); - it is foreseen to provide transportation of SNF from WWER-1000 for long-term storage and reprocessing and to expand the DSFSF for storage of SNF from WWER-1000; - Another important element of Alternative 2, missing in Alternative 1, is the planning and implementation of a borehole disposal concept; - Alternative 2 also envisages decommissioning of Kozloduy NPP Units 5 and 6, as well as WSFSF.
Degree of compliance with the environmental objectives of the National Development Programme: Bulgaria 2030	No comparison is made between the zero alternative and the objectives of the NDP: Bulgaria 2030	The environmental objectives are generally accounted for and complied with

From the comparison made between Alternative 1 "Zero Alternative" and Alternative 2

"Development provided that the tasks and measures proposed in the draft of an updated Strategy are implemented", it is evident that:

- Alternative 1 is unacceptable as a draft of an updated Strategy is a required document under EU Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of SNF and RAW (It was developed in implementation of Art. 74 of the Safe Use of Nuclear Energy Act (SUNEA) and its by-laws); Draft of an updated Strategy is major document presenting the national policy, principles, objectives and tasks related to the safe and responsible management of all stages of SNF management and all types of RAW - from their generation to disposal, it outlines the implemented and planned practical solutions, their stages and deadlines for implementation, as well as the way of financing them;
- Alternative 1 is also not recommended from the point of view of environmental protection and human health, since the analyses and assessments made in the Environmental Assessment Report clearly show the environmental orientation of Alternative 2 of the draft of an updated Strategy, demonstrating that it will contribute to sustainable management of SNF and RAW and, hence, a reduction of the negative impact on the environment is expected through the implementation of the envisaged tasks and measures to the respective strategic objectives;
- The implementation of Alternative 2 ensures compliance with and implementation of the environmental priorities of the National Development Program: Bulgaria 2030;

The final draft of an updated Strategy represents an alternative option required by Directive 2001/42/EC.

In order to enhance the quality of the document in relation to the environment, as feedback to the team developing a draft of an updated Strategy, the possibility has been considered for proposing new wording of the Strategic Objectives and the tasks and measures of a draft of an updated Strategy. After the analysis, it was found that there was no need to propose new wording.

11.2. Environmental Assessment Methods

The environmental assessment has been developed in accordance with the requirements of Directive 2001/42/EO of the European Parliament of June 2001 on the assessment of the effects of plans and programs on the environment and the Regulation on the terms and procedure for carrying out environmental assessment of plans and programmes (SG 03/2006). Also, the guidelines and methodologies for strategic environmental assessment published on the European Commission website and on the website of the MoEW have been used.

In accordance with Article 5(4) of Directive 2001/42/EC, a process has been carried out to determine the scope and level of detail of the information to be included in the EA Report. Accordingly, draft terms of reference for the scope and content of the EA have been developed and agreed with the relevant authorities. The comments and suggestions received have been incorporated into the updated (final) terms of reference and have been taken into account in the preparation of the EA Report.

The methods and tools envisaged for the environmental assessment and for the preparation of the environmental assessment report are those set out in the relevant guidelines and manuals, in particular the following documents:

- EC Practical Guide on the implementation of Directive 2001/42/EC on the assessment of the

effects of certain plans and programs on the environment;

- Guidance for Environmental Assessment of Plans and Programs in Bulgaria, 2002, developed by a consortium with the participation of "POVVIK-OOS" OOD with the assistance and under the editorship of the Ministry of Environment and Water, Bulgaria;
- MoEW guidelines in response to a notification and as a result of the consultations on the terms of reference for the scope of the EA.

In order to facilitate identification of interactions between the draft of an updated Strategy and the environment, the EA includes a review of the status quo of the environmental components and factors and assesses them against the Strategic Objectives of the draft of an updated Strategy, as well as relevant tasks and measures envisaged under Strategic Objectives in the Action Plan.

The EA Report analyses and assesses the possible significant environmental impacts, including secondary, cumulative, synergistic/simultaneous, short-, medium- and long-term, permanent and temporary, beneficial and negative impacts of the implementation of the draft of an updated Strategy, which are addressed by individual components (biodiversity, soil, water, air, etc.).

In order to enhance the environmental quality of the draft of an updated Strategy, based on the analysis, recommendations for mitigating the impacts of the Strategic Objectives of the draft of an updated Strategy are set out, including relevant tasks and measures envisaged under Strategic Objectives in the Action Plan.

The assessment of the positive and negative impacts of the Strategic Objectives set out in the draft of an updated Strategy, as well as the tasks and measures, is summarised in the rating matrix included in section 9. In addition to this matrix, a qualitative description is made of the possible beneficial or negative impacts resulting from the Strategic Objectives, as well as the corresponding tasks and measures envisaged under Strategic Objectives in the Action Plan, and the proposed mitigation measures.

In addition, according to the requirements of the Ministry of Health, the possible consequences on all components of the environment and the population have been assessed.

As part of the EA, measures are also proposed in relation to monitoring during the implementation of the draft of an updated Strategy.

The preparation of the EAR has been carried out according to the following methodological approach:

- Familiarisation of the experts with the draft of an updated Strategy for the management of spent nuclear fuel and radioactive waste in Bulgaria and other documentation provided by the Contracting Authority, the opinions on the terms of reference for determining the scope and content of the EAR;
- Analysis of the relationship of the strategic objectives, tasks and measures in the draft of an updated Strategy with other relevant strategies and plans and programs;
- Collection, analysis and processing of up-to-date data on the current state of the environment in the areas within the scope of the draft of an updated Strategy and their possible development without its implementation (assessment of the impact of the so-called ‘zero alternative’);
- Identification and characterisation of areas likely to be significantly affected by the draft of

an updated Strategy;

- Collecting, processing and analysing information on existing environmental issues identified at different levels relevant to the draft of an updated Strategy, including those relating to areas of particular environmental significance, such as protected areas under the Biodiversity Act;
- Analysis of the extent to which the strategic objectives, tasks and measures of the draft of an updated Strategy for spent fuel and radioactive waste management in Bulgaria integrate the relevant objectives and measures for environmental protection included in documents at national and international level;
- Assessment of possible significant impacts of the draft of an updated Strategy for the management of spent nuclear fuel and radioactive waste in Bulgaria on the environment, including biodiversity, population, human health, fauna, flora, soils, water, air, climate factors, material assets, cultural and historical heritage, including architectural and archaeological heritage, landscape and the connections between them; these impacts should include secondary, cumulative, concurrent, short-, medium- and long-term, permanent, temporary, beneficial and negative consequences.
- Measures proposed to prevent, mitigate and compensate as fully as possible the adverse consequences of the implementation of:
    - measures to prevent, mitigate and limit the impacts,
    - measures to monitor and control the impact of the implementation of the draft of an updated Strategy;
- Justified choice of the most appropriate alternative in terms of environmental and human health impacts;
- Preparation of a conclusion in accordance with the requirements of Art. 83, para. 5 for the implementation of the draft of an updated Strategy for spent nuclear fuel and radioactive waste management in Bulgaria.

11.3. Difficulties in collecting the necessary information, such as technical deficiencies and lack of know-how

No insurmountable difficulties have been encountered in the preparation of this EA Report.

12. Measures in connection with monitoring during the implementation of the draft of an updated Strategy

With regards to Kozloduy NPP and in SD PRRAW - Novi Han

As described above, existing and planned nuclear facilities are located in and around Kozloduy NPP and at SD PRRAW - Novi Han. To monitor their impact on the environment and human health, monitoring is carried out as follows:

- Radioecological monitoring is carried out at Kozloduy NPP and at SD PRRAW - Novi Han under regulated long-term programs. The programs are based on the requirements of the legal basis in the field - Art. 130 of the Ordinance on ensuring the safety of nuclear power plants, promulgated SG, issue 66 of 30.07.2004, Art. 118 of the Ordinance on radiation protection in

activities with sources of ionizing radiation, promulgated SG, issue 74 of 24.08.2004, Art. 14, para. 1, item 3 of the Ordinance on the conditions and procedure for identification of special status areas around nuclear facilities and sites with sources of ionizing radiation, promulgated in SG, issue 69 of 06.08.2004, as well as the good international practice and operational experience of RM. The programs are coordinated with the Ministry of Environment and Water (MoEW), the Ministry of Health (MoH) and the Nuclear Regulatory Agency (NRA) and they are in compliance with the international recommendations in this field, incl. Art. 35 of the Euratom Treaty and Recommendation 2000/473/Euratom. In order to ensure independent control, radiation monitoring programmes are implemented by the control bodies EEA/MoEW and NCRRP/MoH.

This monitoring should continue during the implementation of the draft of an updated Strategy.

With regards to NRRAW – A Pre-operational Radiation Monitoring Programme has been approved for the National Repository for Radioactive Waste, whose site Radiana is located in close proximity to the site of Kozloduy NPP. A programme for radiation monitoring during operation and after the shutdown of the NRRAW is to be developed and validated in order to have an operation licence issued for the facility. The measures in the NRRAW's own monitoring plan should follow the requirements of the regulatory framework in this field and also take into account the measures and recommendations set out in Kozloduy NPP Monitoring Plan already in force.

All requirements for environmental management and monitoring are clearly indicated in the regulatory framework for the management of nuclear energy of MoEW, MoH, NRA, therefore, the only clear recommendation can be to comply with its requirements - laws, regulations and orders.

The main requirements for the monitoring during the implementation of the draft of an updated Strategy (for Kozloduy NPP, SD PRRAW - Novi Han and for NRRAW) are listed below in Table 44.

Table 44 - Monitoring during the implementation of the draft of an updated Strategy

Component	Measures	Indicators for monitoring	Unit measure	Period/Authority responsible for implementation and control
Kozloduy NPP and SD PRRAW - Novi Han				
Non-radiation monitoring of ambient air, water, soil, flora	Control of pollutants in the environment	Limit values for air, water and soil quality	Number of analyses performed	The frequency should be according to the developed and approved monitoring plans of Kozloduy NPP and SD PRRAW - Novi Han. **Responsible for implementation** - Kozloduy NPP and SD PRRAW - Novi Han **Control bodies** - Regional Inspectorate for Environment and Water Protection, Executive Environment Agency, Municipality.
Radiation monitoring - radiation gamma background	Radiation gamma background control in the affected areas	Natural levels of gamma radiation background typical of the area	Number of analyses performed	The frequency should be according to the developed and approved monitoring plans of Kozloduy NPP and SD PRRAW - Novi Han. **Responsible for implementation** - Kozloduy NPP and SD PRRAW - Novi Han **Control bodies** - Regional Inspectorate for Environment and Water Protection, Executive Environment Agency,

Component	Measures	Indicators for monitoring	Unit measure	Period/Authority responsible for implementation and control
				Municipality.
Radiation monitoring of ambient air, water, soil, flora	Control of ambient air, water, soil, flora and fauna	Quality standards of air, water, soil, plants	Number of analyses performed	The frequency should be according to the developed and approved monitoring plans of Kozloduy NPP and SD PRRAW - Novi Han. **Responsible for implementation** - Kozloduy NPP and SD PRRAW - Novi Han **Control bodies** – National Centre of Public Health and Analyses, National Centre for Radiology and Radiation Protection, Regional Inspectorate for Environment and Water Protection, Executive Environment Agency, Municipality.
NRRAW, Radiana Site				
Pre-operation radiation gamma background monitoring at RADIANA site	Radiation gamma background monitoring	Equivalent dose rate of gamma radiation	Number of analyses performed	Before commissioning **Responsible for implementation** SD RAW **Control bodies** – National Centre of Public Health and Analyses, National Centre for Radiology and Radiation Protection, Regional Inspectorate for Environment and Water Protection, Executive Environment Agency, Municipality.
Operational non-radiation monitoring at RADIANA site - environment	Control of pollutants in the environment	Limit values for air, water and soil quality	Number of analyses performed	The frequency should be according to the programme for the implementation of the actions set out in the updated EIA Report on NRRAW **Responsible for implementation** - SD RAW **Control bodies** - Regional Inspectorate for Environment and Water Protection, Executive Environment Agency, Municipality.
Operational radiation monitoring at RADIANA site	Radiation gamma background control	Natural levels of gamma radiation background typical of the area	Number of analyses performed	The frequency should be according to the programme for the implementation of the actions set out in the updated EIA Report on NRRAW. Responsible for implementation SD RAW **Control bodies** – National Centre of Public Health and Analyses, National Centre for Radiology and Radiation Protection, Regional Inspectorate for Environment and Water Protection, Executive Environment Agency, Municipality.

13.Conclusion

The draft of an updated Strategy has a direct environmental focus and the Strategic Objectives set therein, as well as the tasks and measures under the Strategic Objectives in the Action Plan, will contribute to improving the state of the environment, as well as the quality of human life.

As a result of the analysis carried out, it can be summarised that the Strategic Objectives and the tasks and measures under the Strategic Objectives set in the Action Plan are eligible for implementation, taking into account the requirements for environmental protection.

When comparing the compliance of the Strategic Objectives proposed in the draft of an updated

Strategy with the priorities of the National Development Programme: Bulgaria 2030, environmental protection requirements and ensuring sustainable development of the region, it has been established that, in general, the proposed Strategic Objectives are expected to contribute to the achievement of the development axes and national priority of the NDP BG 2030. A comparison made with other strategies, plans, programs, reveals that, in general, the draft of an updated Strategy is expected to contribute to their achievement.

The environmental analysis demonstrates that the draft of an updated Strategy will have a predominantly beneficial, long-term, permanent impact on the environment. Negative impacts will occur during the execution of some of the construction, dismantling and remediation activities under the tasks and measures envisaged in the Strategic Objectives in the Action Plan, but during their operation there will be mainly beneficial impacts. It is necessary that the investment projects should be carried out in strict compliance with the environmental requirements, and appropriate measures are foreseen to prevent and mitigate as much as possible the possible negative impacts in section 10 of the EA Report, as well as indicators in section 12 of the Report to monitor the trends in relation to the environmental and human health impacts of the draft of an updated Strategy on the environment and human health. The most favourable option in terms of environmental protection is the one discussed in detail in the Environmental Assessment Report version of the draft of an updated Strategy, and, therefore, we recommend reconciliation of the draft of an updated Strategy.

The overall impact of the draft of an updated Strategy is expected to be beneficial, due to the comprehensive and long-term beneficial results arising from the implementation of the Strategy in terms of spent nuclear fuel and radioactive waste management, leading to the prevention of risks to human health and ensuring sustainable development in accordance with the national environmental quality standards.

The implementation of the draft of an updated Strategy is not expected to have significant negative impacts on the environment and human health, and its implementation is expected to result in an overall positive impact on the environment and human health at regional and national level, subject to the measures proposed in the EA Report.

14.Report on the results of the consultations carried out during the preparation of the Strategy and the environmental assessment

All comments received during the environmental assessment procedure are described in *Annex 3: Reference sheet of the consultations conducted and copies of the opinions received as a result of the consultations on the terms of reference for the scope and content of the EA Report*, as well as how they are reflected in the EA Report and the reasons for doing so.

15.Annexes

The following annexes form an integral part of this report:

15.1. Annex 1: References and sources of information on methods for environmental impact assessment and forecast

15.2. Annex 2: Assessment of impacts at strategic objectives level and at targets and measures level under individual strategic objectives in the Action Plan

15.3. Annex 3: Reference sheet of the consultations conducted and copies of the opinions received as a result of the consultations on the terms of reference for the scope and content of the EA Report

15.4. Annex 4: List of names and signatures of the manager and experts who prepared the EA

15.5. Annex 5: Declarations under Art. 16(1) of the Ordinance on the conditions and procedure for carrying out environmental assessment of plans and programs and diplomas of the experts involved in the elaboration of EA

16.Non-technical summary of the EA of the draft of an updated Strategy.

A non-technical summary of the EA of the draft of an updated Strategy has been prepared as a separate document forming an integral part of this document.