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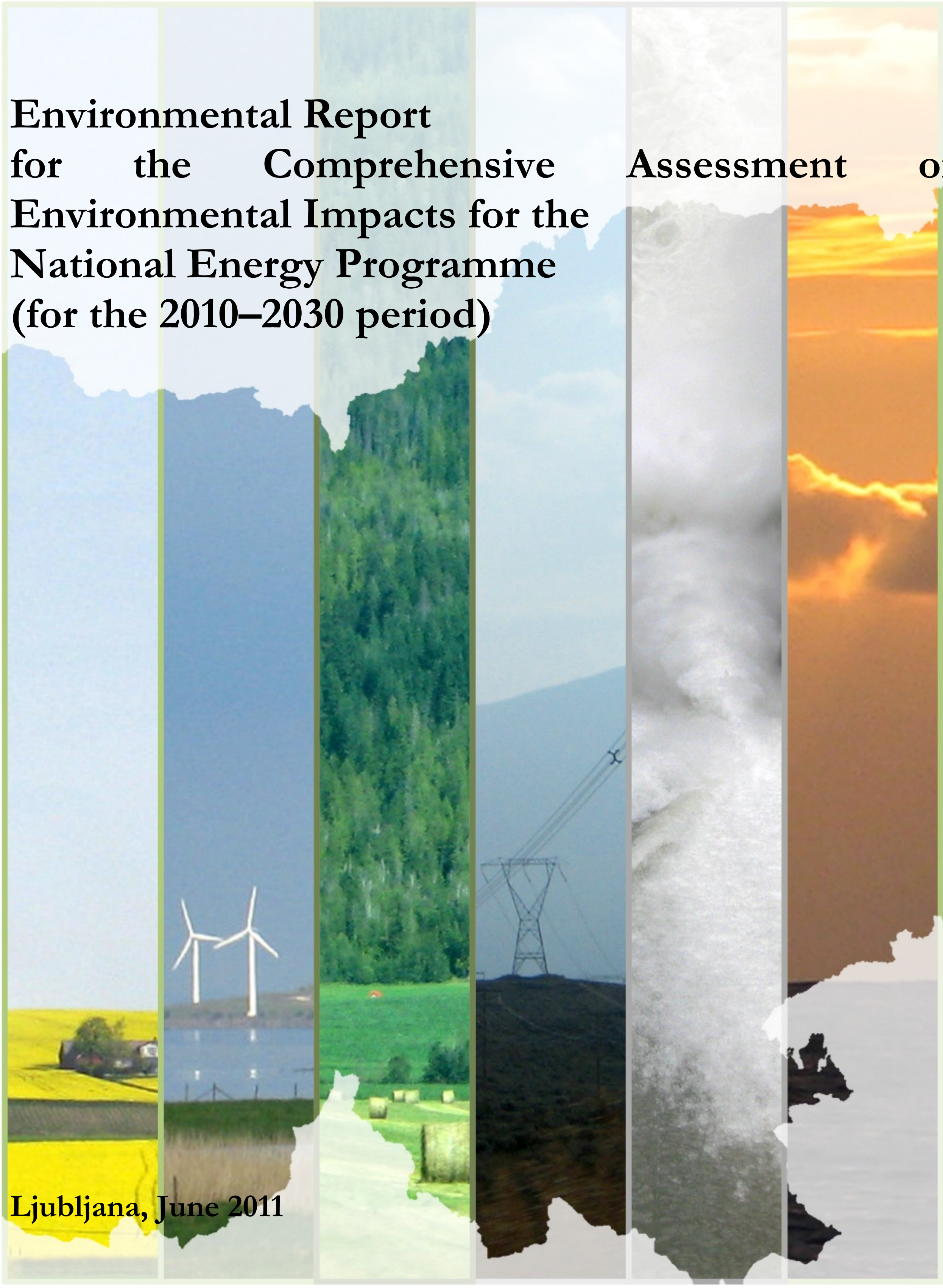

Environmental Report for the Comprehensive Assessment of Environmental Impacts for the National Energy Programme (for the 2010–2030 period)

Ljubljana, June 2011

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TABLE OF CONTENTS

TABLE OF APPENDICES

TEXTUAL APPENDICES:

GRAPHIC APPENDICES

Appendix 1: Presentation of Actual Soil Use

Appendix 2: Representation of Surface Watercourses and Water Protection Areas

Appendix 3: Representation of Natura 2000 sites and the IBA Areas

Appendix 4: Representation of Protected Areas

Appendix 5: Representation of EPO and Valuable Natural Features

Appendix 6: Representation of Cultural Heritage Units

Appendix 7: Representation of the Areas of Outstanding Landscape and Landscape Areas with Distinctive Features on the National Level

Appendix 8: Representation of Protective Forests and Forest Reserves

Appendix 9: Representation of Areas with Expected Valuable Natural Features

Appendix 10: Presentation of Interventions (Measures) Treated in the Report

ABBREVIATIONS AND SYMBOLS

EE AP	Energy Efficiency Action Plan
RER AP	Renewable Energy Resources Action Plan
GPP AP	Green Public Procurement Action Plan
EARS	Environmental Agency of the Republic of Slovenia
CCS	carbon dioxide capture and geological storage
CEIA	comprehensive environmental impact assessment
PSPP	pumped storage power plant
DH	district heating
WBDH	wood biomass district heating
NMRMP	National Mineral Resource Management Programme
EMR	electromagnetic radiation
EC	European Council
LFO	light fuel oil
EA	Energy Act
SMARS	Surveying and Mapping Authority of the Republic of Slovenia
HPP	hydroelectric power plant
NPP	nuclear power plant
WBI	wood biomass boiler
WB	wood biomass
LCA	life cycle assessment of GHG emission
LEA	local energy agency
LEC	local energy concept
ME	Ministry of Economy
sHPP	small hydroelectric power plant
MAFF	Ministry of Agriculture, Forestry and Food
MESP	Ministry of the Environment and Spatial Planning
NEP	National Energy Programme
NSPRD	National Strategic Plan for Rural Development 2007-2013
WMP	Water Management Plan
NMVOC	non-methane volatile organic compounds
OP BIOW	Operational programme on elimination of wastes with objective to reduce the quantity of biodegradable disposal wastes
OP ETID	Operational programme of environmental and transport infrastructure development 2007-2013
OP GHG	Operational programme for limiting greenhouse gas emissions until 2012
OPNEC	Operational programme for complying with national emission ceilings for atmospheric pollutants - Revision on Operational programme for complying with national emission ceilings for atmospheric pollutants from 2005
RES	renewable energy sources
RDP	Rural Development Programme of the Republic of Slovenia 2007-2013
VCM	Velenje Coal Mine
EIA	environmental impact assessment for activities affecting the environment
ReNEP	Resolution on the National Energy Programme
ReNFP	Resolution on the National Forest Programme
RCH	Register of cultural heritage
THM	Trbovlje – Hrastnik Mine
DS	distribution substation
EDSO	electricity distribution system operator
SOIEDN	System operation instructions for electricity distribution network
TSO	transmission system operator
SDSS	Spatial Development Strategy of Slovenia
CHP	combined heat and power (generation)
SORS	Statistical Office of the Republic of Slovenia
GHG	greenhouse gas
LPG	liquefied petroleum gas
EUE	efficient use of energy
NG	natural gas

1 Summary

Upon the preparation of the National Energy Programme (NEP), a comprehensive environmental impact assessment procedure (CEIA) needs to be carried out in accordance with the Environmental Protection Act, and – within the scope of the CEIA – the procedure for assessment of the acceptability of the impacts on protected areas caused by the plans, in accordance with the Nature Conservation Act. The purpose of both these assessments, which are laid down by law is to prevent or, at least, significantly reduce activities that can have significant adverse impacts or consequences on the environment and protected areas, whereby the principles of sustainable development, comprehensiveness and prevention are realised. Within the environmental impact assessment procedure, impacts are determined based on the Environmental Report. The procedure is conducted by the ministry responsible for the environment. Within the scope of the said procedure, the cooperation of all state bodies and organisations responsible for individual sectors, as well notification and public participation, are all provided for.

In accordance with the Decree laying down the content of an environmental report and on the detailed procedure for the assessment of the effects of certain plans and programmes on the environment, the Environmental Report defines, describes and evaluates the impacts of the implementation of the National Energy Programme on the environment (natural resources, air, waters, climatic factors), conservation of nature, cultural heritage, and landscape, as well as the inhabitants and human health. The Appendix for assessing the acceptability of impacts on protected areas is enclosed as a separate document.

The starting points for the preparation of the Environmental Report are the environmental objectives of the programme, evaluation criteria, and the methodology for the determination and evaluation of the impacts of the programme on the environment, the conservation of nature and human health. The evaluation criteria and methods for the determination and evaluation of the impacts of the implementation of the programme on the environment have been selected so as to enable the maximum extent of determination and adequate evaluation of the material effects of the programme on the achievement of environmental objectives.

The Environmental Report defines the state of the environment, identifies the relevant environmental objectives, indicators, and the method for taking objectives into consideration when preparing the programme. National and European strategic documents on the environment represented the basis for the definition of the relevant environmental objectives.

A detailed specification of the contents of the Environmental Report was stipulated in the public discussion, and the Report on the Determination of the Scope of the Environmental Report is enclosed (Appendix 2).

The Environmental Report assesses the proposed National Energy Programme of the Republic of Slovenia for the 2010–2030 Period – draft produced by the Jožef Stefan Institute in May 2011. The assessed measures are outlined in Appendix 5, which also defines the material environmental impacts of the measures.

1.1 Review of the Impacts of NEP Sub-Programmes on Individual Aspects of the Environment

Natural resources

The implementation of NEP sub-programmes significantly affects: non-renewable coal reserves; the soil, because of waste creation during the combustion of solid fossil fuels; renewable forest biomass, because of its use for energy generation; and the best agricultural land because of the use of land.

Soil

The soil in Slovenia is highly diverse. Because the factors for the creation and development of soil are very diverse, the soil itself reflects substantial ecological variety. This diversity is simultaneously reflected in the use of soil. The diverse interweaving of forests and agricultural land is typical of Slovenia. The land category designated as 'building land' amounts to 22.7%, i.e. almost one-third of all Slovenian territory. With 58% (including brushwood), forests are the prevailing category of ground cover in Slovenia. There is not enough available data on brownfield areas which are the results of industrial activities (deserted quarries, disposal sites for industrial waste, including waste from energy sector, deserted industrial areas).

The soil in Slovenia is generally rich in organic matter; due to relatively carbonaceous basic soil composition and the minor impact of ambient air pollution in recent periods, the consequences of acidification due to gas emissions which cause acidification or eutrophication are not observed on land which has not been built on. The relatively good state of the soil is the consequence of the fact that intensive industrial activity, which would cause an extensive degradation of soil because of waste production, was not implemented on so-called building land. But, as a rule, it can be observed that there are areas in the surroundings of larger fossil fuel-fuelled thermal power plants which are degraded either due to the processing of mineral resources for energy generation or the disposal of residues from their use for energy generation.

Coal reserves

The assessment of the impact of the use of coal for energy generation on non-renewable coal reserves that are the only fossil fuel available in Slovenia can be based on data on the utilisation of brown coal and lignite, which represented 15.3% of the primary energy balance in the country in 2008. Recoverable brown coal reserves in the Trbovlje-Hrastnik (RTH) mine are estimated at 26 million tonnes of lignite and 168 million tonnes in Velenje. The Act amending the Act Regulating the Gradual Closure of the Trbovlje-Hrastnik Mine and Developmental Restructuring of the Region Act has extended the extraction of coal for sale in the mentioned mine into the year 2010, after which, coal will is expected to be extracted in Slovenia only in the Velenje coalmine to supply lignite exclusively for the Šoštanj Thermal Power Plant for the generation of electricity and heat.

Forest

More than half of the land territory of the country is covered by forests, while other natural vegetation (natural pastures, wetlands, aquatic areas and areas with little or no vegetation) accounts for 4%, 35% of the surface being intended for farming, and slightly more than 3% representing man-made areas. The surface area of forests is increasing, however, only in those places where forests are already plentiful from the point of view of landscape variety and landscape appearance. Up until 2008, most instances of forest clearance were the result of the construction of infrastructural structures such as motorways and long-distance power lines, buildings and structures intended for other purposes (quarries, landfills, dumps).

Forest biomass as the classic combustion of wood in individual heating systems, industrial boilers for energy purposes or modern individual or group devices for heating and process heat constitutes one of the greatest potentials for the use of RES in Slovenia. Biomass used as an RES currently represents 8% in the consumption of energy by end-users, primarily for heating households and as supplementary fuel in the industry. In 2008, the utilisation of this energy source rose significantly in the generation of electricity and heat, because of the commencement of wood biomass co-combustion. The potential sources of wood biomass are fuel wood from forests, wood biomass from agricultural land that is overgrown with forest, and wood residues from the wood processing industry.

Wood reserves in forests have increased twofold in the last 50 years, whereby we must also consider the increase in the surface area that is overgrown with forest. Another important fact to consider is that the increment of wood reserves in Slovenian forests binds more than 7 million tonnes of CO_2, thus removing it from the air each year.

When establishing the system of wood utilisation, it has to be ensured that the generation of all forms of energy, even from biofuels, utilises primarily by-products from wood processing (from all stages of wood production and processing) and wood obtained from products at the end of their life-cycle. This type of the wood utilisation system is the only sensible one from the point of view of the entire national economy, as it improves the efficiency of the wood processing industry and thereby directly enhances the competitiveness of this branch of industry, which is the result of the decrease in CO_2 emissions and the positive economic and environmental benefits associated with such a decrease and which in turn increase the economic efficiency of the entire Slovenian economy.

Review of the impacts on natural resources by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.
- **Energy use in traffic;** the impact is insignificant, grade A.
- **Renewable energy sources;** electricity generation at wind farms is insignificant (grade A) from the point of view of its impact on natural resources, provided measures aimed at the prevention of soil erosion are provided for when selecting sites for wind farms. Energy generation structures are sited as a priority outside the areas of the best agricultural land (grade B). The use of forest biomass for energy purposes is acceptable for the environment (grade C) from the point of view of the scope planned in the NEP, because the planned quantity of forest biomass intended for energy purposes corresponds with the available wood reserve in forests, and because it has been envisaged that the use of forest biomass for energy purposes will be subordinate to the use of forest biomass in the wood processing industry.
- **Local energy supply;** the impact is insignificant, grade A.
- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.
- **Electricity generation;** handling ash (fly ash, gypsum and slag) created in the generation of electricity from solid fossil fuels is acceptable from the point of view of impacts on natural resources and therefore assessed as insignificant (grade C), provided waste ash is recycled (construction materials production) or provided the platform and objectives stipulated in the Operational Programme for the **Disposal of Waste** and the prescribed conditions and methods for disposal are observed during its disposal.
- **Transmission of electricity and the electricity distribution network;** the impact is insignificant, grade A**.**
- **Natural gas supply;** the impact is insignificant, grade A.
- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** in the medium term and prior to the construction of a new nuclear power plant (NPP), permanent and safe disposal of low and intermediate level radioactive waste (LIRAW) needs to be provided for, as well as a proposal drawn up for the handling of high level radioactive waste (HLRAW). Provided the above condition is met, the generation of electricity from nuclear energy is assessed as insignificant (grade C) from the point of view of impact on natural resources.

Air

Despite the fact that pollution by PM_{10} particles and ozone is decreasing in Slovenia, urban inland areas, where lengthy temperature inversions form during winter are seeing the limit values of PM_{10} particles being exceeded; this is mostly caused by road traffic; in valleys with little wind, the pollution is caused by discharges from combustion installations and industrial sources. Remote transport from the Po valley in Italy contributes significantly to ozone pollution in the Primorska region.

The discharge of compounds that cause acidification or eutrophication, as well as ozone precursors, is decreasing and does not exceed limit values. Projections up to the year 2020 indicate a further decrease in pollutant discharges into the air to below the prescribed target values. It needs to be mentioned that projections for nitrogen oxide (NO_x) concentrations remain quite uncertain due to the influence of transit traffic.

In future, Slovenia will have to find more efficient solutions in all sectors that affect air quality, with the emphasis on intersectoral cooperation in the fields of transport and energy. The objectives which ensure the quality of ambient air will have to be included in the system of spatial planning at municipality level, and the field of economic instruments strengthened in terms of the “polluter pays” principle.

In addition to the increased PM_{10} concentrations, increased ozone concentrations occasionally occur throughout Slovenia. These exceed the target and long-term regulated values at all measuring points relevant to the evaluation of ozone concentration. The largest number of events of the exceeded action value for human health protection is recorded during the summer in the Primorska region and in high mountain areas.

The results of measurements of pollutant impacts reveal that, compared to other areas in Europe, Slovenia records very few events where the introduction of acid pollutants exceeds the critical value, whereas the country is potentially more prone to eutrophication. Gas emissions which cause acidification and eutrophication decreased by almost 50% in the period between 2002 and 2007, mainly because of the reduction in $S0_2$ emissions. The reduction is particularly the result of lower discharges from thermal power plants, the introduction of liquid fuels with lower sulphur content, use of high-quality fuels, and the implementation of regulations governing substance emissions into the air from industrial sources of pollution.

For the purpose of monitoring the consequences of pollution caused by the implementation of NEP measures, four indicators for substance emissions and one for the quality status of ambient air have been proposed, namely:
- emissions of sulphur dioxide, nitrogen oxides, ammonia and non-methane volatile hydrocarbons;
- ambient air pollution with PM_{10} and $PM_{2.5}$.

Review of the impacts on air by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.

- **Energy use for traffic;** biofuel use is insignificant (grade A) provided mitigation measures targeting ambient air pollution are implemented by restricting road transport using biofuels and liquid fossil fuels. The introduction of energy-efficient vehicles and tyres helps achieve environmental objectives in the field of air quality in the medium term, which is why the impacts of this measure are assessed as grade A, because this measure accounts for a significant share of the improvement of ambient air quality status. The impacts of the use of electric battery-powered vehicles, plug-in hybrid vehicles and compressed or liquefied hydrogen powered vehicles (with internal combustion engines or fuels cells) are assessed as grade A, as the measure contributes significantly to the improvement of ambient air quality in the urban environment. The impacts of the introduction of LPG- and CNG-powered vehicles are assessed as grade A, because the introduction of these fuels represents an opportunity for air improvement, particularly in an urban environment.

- **Renewable energy sources;** the impacts of heat and electricity generation from wood biomass are assessed as acceptable from the point of view of ambient air quality (grade C) provided it is ensured that biomass combustion techniques are employed, whereby the concentration of total dust in flue gases does not exceed 20 mg/m^3.

- **Local energy supply;** improves ambient air quality and contributes to the reduction in national pollutant emissions (grade A).

- **Combined generation of heat and electricity from NG;** the impacts on air are assessed as positive (grade A), provided that this combined generation replaces other liquid or solid fossil fuel-fuelled plants for heat and electricity generation, as this represents an improvement of ambient air quality and reduces the national emissions of certain pollutant (NO_x, PM, SO_2).

- **Electricity generation;** the impacts of the generation of electricity from fossil fuels are environmentally acceptable (grade C) provided that it is ensured that emissions of SO_2, NO_x and $PM_{2.5}$ in the 2000–2020 period exhibit an approximately similar trend of reduction as that envisaged for the energy generation sector in the EU25 in accordance with the Thematic Strategy on Air Pollution in the EU. The impacts of heat and electricity generation in large CHP units that burn wood biomass are assessed as acceptable from the point of view of ambient air quality (grade C) provided it is ensured that biomass combustion techniques are employed, whereby the concentration of the total dust in flue gases does not exceed 20 mg/m^3.

- **Transmission of electricity and the electricity distribution network;** the impact is insignificant, grade A**.**

- **Natural gas supply;** the impact is insignificant, grade A.

- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** with regard to the impact on air, the measures implemented as part of the nuclear energy sub-programme are assessed as grade A, because emissions from the NPP do not have a significant impact on ambient air quality status.

<u>Water</u>

Despite the fact that Slovenia has above-average water discharges, irregular local precipitation patterns and diversity of runoff conditions result in varying availability of water. The objectives of the environmental policy are hence directed particularly to the provision of reliable and secure water supplies for the population; the promotion of its sustainable use; the preservation of a good quantitative, chemical and ecological status; the reduction in harmful water activities; and the mitigation of the effects of drought on the availability of water resources. The reduction in water discharges of Slovenian rivers projected to occur due to climate change can affect the generation of electricity from renewable sources and make it more difficult to achieve the environmental objectives of the EU Climate and Energy Package.

The use of water in recent years, i.e. from 2002 to 2008, fluctuated by around 12%. The largest consumer of water is the energy sector, with 600 to 800 million m^3 (for cooling alone, whereby the use of water for the generation of electricity in hydroelectric power plants is not included), which is followed by households, industry, mining, and agriculture, with less than one million m^3 of consumed water. According to the indicator of the use of water resources, Slovenia ranks among the European countries with the lowest utilisation of water resources.

An increase in water use is expected in the future in both river basin districts. The construction of new hydroelectric power plants is expected by the end of 2015 in the river basin district of the Danube River, and in 2013, the beginning of construction of several dry retarding basins for protection from flooding, the development of fish farming and fisheries, increased use of water for irrigation, etc. An increase in demand is also expected in the river basin district of the Mediterranean Sea, particularly for drinking water for supplying the increasing number of permanent and temporary population (increase in maritime traffic and nautical tourism).

An important fact as regards the impacts of NEP sub-programmes on waters is that 31% of surface water bodies do not achieve a good ecological status, with two water bodies (1%) being classified in the very poor status category, seven (5%) in the poor and 39 (25 %) in the moderate ecological status category. Environmental targets are achieved by 78 water bodies (50%), 11 (7%) of which are classified in the very good status category, and 67 (43%) in the good status category. The status of water bodies that are candidates for heavily modified water bodies (19 heavily modified water bodies) has been assessed for rivers, but not for retarding basins.

Review of the impacts on water by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.

- **Energy use in traffic;** the impact is insignificant, grade A.

- **Renewable energy sources;** a significant impact on waters is caused by the sHPPs, geothermal power plants, geothermal heating systems and heat pumps.

  The construction of new sHPPs is carried out in accordance with the limitations and conditions defined for water bodies in the WMP, whereby the modification of the hydro-morphological status of a surface water body needs to be justified for each sHPP, in accordance with the procedures that must be observed for exceptions stipulated in Article 4(7) of Directive 2000/60/EC.

  Mitigation measures relate to the selection of the technique of surface water use for the generation of electricity at sHPPs. Priority is given to so-called derivation methods of water use for the generation of electricity at an sHPP, or the run-of-the-river method of water use in an sHPP, provided sHPPs are situated on existing dams that constitute elements of water infrastructure intended for retaining or directing the flow of water. Overhauls of existing sHPPs with the intention of reducing hydro-morphological impacts and increasing the efficiency of electricity generation in existing sHPPs have priority over the construction of new sHPPs.

  The impacts of sHPPs on water are insignificant (grade C) provided mitigation measures are implemented that relate primarily to the acceptable scope of modifications of the hydro-morphological status of a water body and the observation of the procedures for the planning of these changes, in accordance with the instructions for the use of exceptions as laid down in Article 4(7) of Directive 2000/60/EC.

  Electricity generation in geothermal power plants and of heat in geothermal heating systems as a measure of the renewable energy sources sub-programme are insignificant (grade C) from the point of view of impacts on water, provided that reinjection of the medium for the transfer of geothermal heat is ensured.

  The envisaged use of heat pumps in the scope envisaged by the renewable energy sources sub-programme requires the issue of special regulations for the protection of groundwater that would stipulate the technical conditions for the exploitation of heat from aquifers. These regulations should primarily stipulate the properties of pipelines and media for the transfer of heat from an aquifer, as well as the obligation to remove pipelines from aquifers after heat pumps are no longer in use. The use of heat pumps for the heating of spaces is assessed as acceptable (grade C) from the point of view of impacts on water, provided that it is ensured that the installation and operation, as well as the decommissioning of heat pumps that use heat from aquifers, is carried out in a controlled fashion and in accordance with special regulations.

- **Local energy supply;** the impact is insignificant, grade A.

- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.

- **Electricity generation;** the impact of electricity generation from fossil fuels is insignificant (grade C) from the point of view of the impacts on water, provide that it is ensured that the cooling of energy generation facilities for the generation of electricity is implemented with cooling systems in which water acts as a secondary cooling medium that is mostly recirculated.

The construction of new HPPs is carried out in accordance with the limitations and conditions defined for water bodies in the WMP, whereby the modification of the hydro-morphological status of a surface water body needs to be justified for each HPP in accordance with the procedures that must be observed for exceptions stipulated in Article 4(7) of Directive 2000/60/EC. Priority is given to so-called run-of-the-river HPPs over accumulation HPPs. If these guidelines are observed, the generation of electricity in hydroelectric power plants is environmentally acceptable (grade C) from the point of view of the impacts on waters, provided that the construction of HPPs is a permissible modification of the hydro-morphological status of a surface water body.

- **Transmission of electricity and the electricity distribution network;** the impact is insignificant, grade A**.**

- **Natural gas supply;** the impact is insignificant, grade A.

- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** from the point of view of the impacts on waters, the nuclear energy sub-programme is insignificant (grade C), provided that mitigation measures of periodic cleaning of the cooling system of an existing NPP are ensured, as well as more frequent operation with cooling cells, which would ensure that – when the discharge of the Sava River falls below 100 m^3/s - there will be no possibility for river temperature to rise by more than 3 K, or alternatively less if the water in the basin of the Brežice HPP is more vulnerable to the occurrence of eutrophication due to the biomass content in the Sava River.

  The new NPP may not use cooling water from the Sava River for once-through cooling (OTC).

Nature

In spite of its modest size, Slovenia has an abundant diversity of species, with a large number of species in a small territory. On a global scale, it has one of the most biotically diversified underground systems, and with more than 58% of forest cover (with well-preserved species), it is one of the most forested countries in Europe. In 2009, protected natural areas, which include protected areas and Natura 2000 sites, accounted for 39.7% of Slovenian territory.

There are 3,266 various indigenous taxa of tracheophytes and phanerogams described for Slovenia; their basic character is defined with Alpine and Central European floristic elements and Pannonian, Dinaric and Mediterranean species. The abundance of species is related mainly to the diversity of habitat types. There are between 13,000 and 15,000 species registered in Slovenia; 4,000 of these are endemic animal species. The abundance of species is particularly numerous in invertebrate groups; and among vertebrate groups, an important (vital) portion of the population of some European or the world's most endangered charismatic species (wolf, bear, lynx) is present in this area.

Three indicators have been proposed for monitoring the status of nature and biotic diversity:

- change of the status of conservation of species and habitat types from the Report according to Article 17 of the Habitats Directive (92/43/ECC),
- change of the conservation status of species in SPAs and in the territory of the whole of Slovenia from the Report according to Article 12 of the Conservation of Wild Birds Directive (79/409/ECC),

- scope and nature of interventions in **important nature protection areas**: Natura 2008 Areas (SCI, SPA and SPA annexes), Ecologically Important Areas, Protected Areas, Valuable Natural Features, Ramsar Wetlands, Biosphere Reserves, UNESCO's World Heritage and Important Bird Areas.

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures. The monitoring of the status should be performed by qualified experts, biologists, who have several years of experience in drawing up environmental reports and monitoring.

The greatest negative impact is expected in the event that interventions are sited and subsequently carried out in protected areas, the Natura 2000 sites, areas with valuable natural features, and in the habitats of protected and endangered species. So as to avoid a significant impact, interventions are to be planned outside these areas, and if this is not possible, adequate mitigation measures are to be put in place, as well as alternative habitats ensured as appropriate. Siting interventions in protected areas is acceptable under the condition that such interventions are permitted by legislation, while objectives and regimes for the protected area need to be provided for during planning.

Cumulative and synergistic impacts on nature and biotic diversity can be caused primarily by the successive placement of hydroelectric power plants.

Review of the impacts on nature and biotic diversity by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.

- **Energy use in traffic;** the impact is insignificant, grade A.

- **Renewable energy sources; the** construction of wind farms in important nature protection areas can permanently, directly and indirectly affect the integrity and connectedness of these areas. An especially serious impact can be expected in important bird areas (SPA). When siting wind farms, it is necessary to pay special attention to birds, bats and large mammals, to identify their potential migratory corridors – avoiding them, irrespective of the status of the area. In the event that wind farms are sited in protected areas, a thorough assessment of the impacts on qualification species and habitat types will have to be performed. The act on the protection and conservation of the vital part of the protected area or area with valuable natural features must be observed in protected areas and areas with valuable natural features. In order to adequately assess the potential impact of wind farms, especially on animals, the most appropriate method for this would be to gradually site individual units (wind turbines) in physical space and, simultaneously, intensively monitor and assess the impacts. Based on concurrent results, we could then with fewer complications and less opposition determine the final scope of the wind farm. Implementation is acceptable, provided mitigation measures pertaining to the recording of the existing state and the siting of individual interventions in the physical space (grade C) are observed. The impact of the construction of an sHPP is exhibited as a permanent and direct destruction of aquatic and riparian habitats, prevention of passage over a watercourse for aquatic organisms, especially fish, and the modification of the water regime, because of the too extensive water abstraction from the watercourse during low discharges (it is necessary to ensure an ecologically acceptable discharge). When selecting locations for sHPPs, the recommended strategic guidelines are to be observed. Implementation is acceptable, provided mitigation measures are observed that pertain to ensuring the conservation of the existing water regime and watercourse dynamics, as well as to enabling migration to aquatic organisms.

- **Local energy supply;** the impact is insignificant, grade A.

- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.

- **Electricity generation;** the construction/overhaul and operation of an HPP causes an extensive direct and long-distance impact on the functioning, integrity and properties of the important nature conservation areas, because of the extent of the interventions associated with the HPP. The most extensive impact is caused by the change to the aquatic habitat in the population of aquatic organisms and wild animals that have habitats in water and alongside it (channel, banks, gravel bars). It is important that they are planned so that they do not affect the distinctive features of important nature conservation areas and their biotic diversity; the conservation of qualification species and HT in the Natura 2000 sites is ensured; the conservation of protected and endangered species is ensured; the passage is enabled and the connectedness of watercourses is established for fish and other aquatic organisms; river dynamics, bed-load discharges or sediment deposition are preserved to the greatest possible extent; and the negative consequences because of the loss of habitats are mitigated through the replacement of lost surface areas. If planning guidelines are observed, the implementation of the sub-programme is acceptable (grade C).

- **Transmission of electricity and the electricity distribution network; the** construction of a transformer station, long-distance power line or cable conduits in an important nature conservation area causes the permanent degradation and fragmentation of space. Power lines constitute a permanent obstacle for birds. In the event of the laying of electrical cables in the ground, there is no impact on birds, but there can be adverse impacts on habitat types and habitats, especially if the route proceeds through a continuous forest stand, wetland or important plant species habitat. In order to avoid negative impacts, it is recommended that the course of long-distance power lines is planned outside protected areas, Natura areas, and areas with valuable natural features, as well as outside of continuous forest stands; also, several long-distance power lines should be routed through the same corridor or at least alongside existing infrastructure corridors, and the installation of 'bird-friendly' pylons planned. In order to prevent the negative impact on birds, long-distance power lines are not to be sited in SPA and IBA areas, especially if these areas are used by larger concentrations of birds to overwinter, if these are migratory corridors, or if the corridor is a migration corridor for large birds. If planning guidelines are observed, the implementation of the sub-programme is acceptable (grade C).

- **Natural gas supply;** the construction of a gas pipeline causes the direct fragmentation and reduction of the habitat; the impact can be long-distance, primarily if the route proceeds over wetlands. The impact is expressed as a loss of the wet meadow habitat of hydrophilous species and a reduction in the scope of HT associated with the higher moisture content in the soil. In order to avoid negative impacts, it is recommended that the course of the gas pipeline is planned, if at all possible, outside of important nature conservation areas, whereas it is compulsory to plan the route outside wetlands. If planning guidelines are observed, the implementation of the sub-programme is acceptable (grade C).

- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** an existing NPP and the new NPP are not situated in an important nature conservation area. The greatest impact of electricity generation from nuclear energy affects the aquatic environment (use of water from the Sava River for cooling). Because of the modified water regime in the area of the Brežice HPP retarding basin, it is necessary to ensure the implementation of measures for the prevention of the occurrence of eutrophication in the Brežice HPP basin, so that the heat effects from the existing NPP do not have a significant impact on biotic communities. The new Krško NPP should not use water from the Sava River as cooling water. If planning guidelines are observed, the implementation of the sub-programme is acceptable (grade C).

Cultural heritage

Slovenia and its regions are characterised by diverse and scattered heritage, as well as the occurrence of certain features 'in series', e.g. religious buildings, wooden ethnological architectural heritage, cultural landscape and heritage elements related to historical events. The Register of Slovene Cultural Heritage at the Ministry of Culture (RKD, August 2010) includes 31,259 units of heritage, 22,014 of which were of architectural heritage, 1,361 units of urban heritage, 225 units of cultural landscape, 238 units of garden architectural heritage, 4,164 units of memorial heritage, 3,088 units of archaeological heritage, 40 units of historical landscape and 129 units of other heritage. The heritage areas cover an area of 2,456 km^2 or approximately 12% of Slovenian territory.

The proposed indicator for monitoring the status of cultural heritage is:

- the cultural heritage “at risk” level (according to the English Heritage Risk Scale).

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures. The monitoring of the status should be implemented by qualified experts from the field of cultural heritage protection.

Cumulative and synergistic impacts on cultural heritage can be caused by measures that have a systemic character and which can manifest themselves throughout the entire architectural heritage stock, such as the measures for efficient energy use and measures for the utilisation of energy from solar power plants and solar hot water panels.

Review of the impacts on cultural heritage by individual sub-programme:

- **Efficient energy use;** measures for the improvement of the efficiency of buildings can affect the protected features of architectural heritage buildings. The implementation of the sub-programme is insignificant, provided mitigation measures are observed (grade C) i.e. the observance of the conservation platform in the renovation of buildings.

- **Energy use in traffic;** the impact is insignificant, grade A.

- **Renewable energy sources;** the impacts of the construction of wind farms are the consequence of a physical intervention during construction and the appearance of the farms in the characteristic image of the structures and areas of cultural heritage in the wider milieu. A large portion of potential areas for the construction of wind farms encompasses areas without cultural heritage or with a low density of cultural heritage structures and areas. Within the potential areas where wind farms could be constructed, there are individual areas and structures of cultural heritage that should and could be taken into account in the detailed siting of wind farms. Within the scope of detailed planning, prior archaeological investigations will be performed and adjustment to the solutions made as appropriate. The impacts of the measure are insignificant, provided mitigation measures are observed, namely those that pertain to the optimisation of the siting of individual structures and devices, as well as accompanying infrastructure in individual planning phases in a manner ensuring that individual heritage units are not affected - as a rule, by avoiding them - which includes the area of influence of the heritage (grade C). The impacts of small hydroelectric power plants are manifested in the destruction of, or damage to the structures and areas of cultural heritage or individual elements that warrant protection. The fundamental protection platform is that the locations for sHPPs must avoid protected areas and structures of cultural heritage, while the solutions must observe the preservation of protected heritage features. The impacts of the measure are insignificant, provided these mitigation measures are observed (grade C). The installation of solar power plants and solar hot water panels on buildings and in the area of cultural heritage could represent a devaluation of the protected features of heritage. Spatial planning acts should provide for spatial implementation conditions in such a way that the siting of solar power plants and solar hot water panels does not affect the protected features of structures and areas of cultural heritage. The impacts of the measure are insignificant, provided these mitigation measures are observed (grade C).

- **Local energy supply;** the impact is insignificant, grade A.

- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.

- **Electricity generation;** the impact of small hydroelectric power plants is manifested in the destruction of or damage to the structures and areas of cultural heritage or individual elements that warrant protection. The density of areas and structures of cultural heritage in the envisaged area of impoundments in the mid-stream section of the Sava River and the Mura River is relatively small. The impacts will primarily be the result of interventions in the protected bridges and several archaeological areas along the Sava River, and a mill in the archaeological area along the Mura River. When siting is performed for interventions, smaller and fringe portions of archaeological areas could be flooded, while impacts could occur in the wider area because of the rising groundwater level and construction. The fundamental protection platform is that the locations for sHPPs must avoid protected areas and structures of cultural heritage, while the solutions must observe the preservation of protected heritage features. The impact on archaeological heritage is impossible to assess in detail in the strategic phase of environmental impact assessment. Within the scope of detailed planning of HPPs and the accompanying infrastructure, prior archaeological investigations, as may be foreseen, will be required, as well as adjustments to the solutions made as appropriate, in addition to the performance of protective excavations. The impacts of the sub-programme are assessed as insignificant, provided mitigation measures are observed, namely those pertaining to the observance of the cultural heritage protection platform during the detailed planning and construction (grade C).

- **Transmission of electricity and the electricity distribution network;** the impacts of the construction of long-distance power lines on the cultural heritage are manifested as the destruction of, damage to or undermining of the integrity of structures and areas of cultural heritage or elements that warrant protection. During detailed siting, it is necessary to take into account the structures and areas of cultural heritage – as a rule, in a manner that does not allow for interventions in the structures and areas to be performed. The impacts of sub-programmes are insignificant, provided mitigation measures pertaining to the optimisation of routes for power lines and technical solutions are observed (grade C).

- **Natural gas supply;** gas pipeline routes can, as a rule, avoid areas and structures of natural heritage, or be routed in a manner that does not affect protected features. Destruction of, or damage to archaeological remains can occur along the gas pipeline; however, the impact cannot be assessed in the strategic phase of environmental impact assessment. The routes should avoid known archaeological areas, and the findings of previous archaeological investigations are to be observed during detailed planning and subsequently construction. The impacts of sub-programmes are insignificant, provided mitigation measures pertaining to the optimisation of the routes are observed (grade C).

- **Liquid fuels;** during the construction of new storage capacities inside existing industrial locations, interventions in architectural and technical heritage which requires adequate handling can occur.

The impacts of the sub-programme are insignificant, provided mitigation measures are observed (grade C).

- **Nuclear energy;** assuming that the construction of a new power plant alongside the area of the existing NPP takes place, we do not expect direct impacts on areas and structures of cultural heritage, as there are no registered heritage units in the probable area where the plant is to be sited. The impact of the sub-programme is insignificant (grade B). The impacts on archaeological heritage are impossible to assess in detail in the strategic phase of environmental impact assessment. Preliminary archaeological investigations will be performed to this end, probably in the following planning phases.

Climatic factors

In Slovenia, GHG emissions in the base year were 20.35 million tonnes of $C0_2$ equivalent; an 8% reduction means that emissions in Slovenia between 2008 and 2012 must not exceed an average of 18.73 million tonnes of $C0_2$ equivalent per year.

Almost one-third of Slovenian GHG emissions are the result of electricity and heat generation. In traffic, which accounted for 26% in 2007 and was the second largest source of GHG emissions, the share is still increasing, and according to some indicators, is currently uncontrollable, among other reasons because of transit traffic. In comparison to the base year of 1986, emissions have increased by 174%; this is mostly the result of the increase in personal and freight (particularly transit) transport. Due to road traffic, total GHG emissions have been increasing in the last two years by more than one per cent per annum, which nullifies efforts to reduce GHG emissions in all other sectors.

Most alarming is the increase in emissions from transit traffic passing through Slovenia, which increased noticeably after Slovenia's accession to the EU. On the basis of an estimate of the fuel sold to foreigners, $C0_2$ emissions in transit amounted to 490,000 tonnes in 2004, which is 12% of total traffic emissions.

The Operational Programme to Reduce GHG Emissions (OP TGP-1) defines the key instruments and obligations of individual sectors, which through their consistent implementation will enable an 8% reduction in emissions in Slovenia by 2012.

By adopting European legislation within the framework of the EU Climate and Energy Package, the importance of measures adopted with this Operational Programme additionally increases, because the consistent implementation of the planned measures for the fulfilment of the Kyoto Protocol is an urgent condition for the fulfilment of obligations under the Climate and Energy Package.

The EU Climate and Energy Package in the EU trading sector, which includes all Slovenian electricity generation from fossil fuels, envisages a total reduction in CO_2 emissions of 21%; while according to Decision 406/2009/EC on "the minimum contribution of Member States to meeting the GHG emission reduction commitment of the Community for the period from 2013 to 2020", the non-trading sector allows Slovenia a maximum +4 % increase in CO_2 emissions by 2020 with respect to the base period of 2005–2006.

Review of the impacts on climatic factors by individual sub-programme:

- **Efficient energy use;** the impacts of efficient energy use are assessed as positive (grade A) in terms of climatic factors, provided that the carbon footprint of the materials used for the implementation of the measure does not exceed 25% of total GHG emissions in the entire life cycle of the measure. Such measures for the efficient energy use sub-programme actually represent an opportunity to improve the state of the environment. Measures in which the carbon footprint of materials used makes up a significant share of GHG emissions in the entire life cycle of the measure (over 50%) are not acceptable in terms of the impacts on climatic factors, as their synergistic impact on renewable resources is too great.

- **Energy use in traffic;** from the point of view of impacts on climatic factors, the:

  - impact of the use of 1st generation biofuels (vegetable oils converted into biofuel) in conventional internal combustion engines is assessed as insignificant (grade C) because it helps reduce GHG emissions vis-à-vis emissions from fossil fuels by a maximum of 30 to 40%, while it has an adverse synergistic impact on the use of available agricultural land for food production,
  - impact of the introduction of energy efficient vehicles and tyres helps achieve environmental targets in terms of the reduction of GHG emissions over the medium term, which is why this measure is assessed as positive (grade A),
  - the impact of the use of electric battery-powered vehicles, hybrid vehicles and compressed or liquefied hydrogen-powered vehicles (with internal combustion engines or fuel cells) is assessed positively (grade A) because these measures contribute significantly to meeting environmental targets in the area of GHG emissions,
  - the impact of the use of electric battery-powered vehicles, plug-in hybrid vehicles and LPG- and CNG-powered vehicles is assessed as insignificant (grade A) because it has no effect on the achievement of environmental objectives in the area of climatic factors.

- **Renewable energy sources;** the impacts of the measures of the renewable energy sources sub-programme are assessed positively (grade A) because they represent an opportunity for the improvement of the state of the environment in the area of climatic factors.

- **Local energy supply;** the impact is assessed positively, grade A.

- **Heat and electricity combined generation from NG;** the impact is assessed positively, grade A.

- **Electricity generation;** the impact of electricity generation from fossil fuels is insignificant (grade C) from the point of view of impacts on climatic factors, provided it is ensured that electricity generation contributes to the mitigation of climate change at least in the range that is planned for the purpose of meeting the objectives stipulated in the EU Climate and Energy Package regarding emissions of green house gases from industrial and energy generation plants included in the European trading scheme for GHG emission rights (at least a 21% reduction in GHG emissions by 2020).

  The impacts of electricity generation in HPPs and large CHP units that burn wood biomass are assessed positively (grade A).

- **Transmission of electricity and the electricity distribution network;** the impact is insignificant, grade A.

- **Natural gas supply;** the impact is insignificant, grade A.

- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** the impact is assessed positively, grade A.

Landscape

Landscapes in Slovenia are very diverse in terms of morphological features, which is the result of natural conditions, variegated morphology, various climatic zones, and also human activity, especially in the use of space, historical development and the variety of cultural milieus. The principal feature of Slovenian landscapes is their vast variety and diversity of landscape patterns. In Slovenia, we distinguish five basic landscape areas, primarily determined by their climatic and geological profiles – the Alpine, pre-Alpine, sub-Pannonian, karst landscape of the Slovenian interior, and the Coastal landscape.

The Spatial Development Strategy of Slovenia defines 71 landscape areas with distinctive features at the national level. These areas include distinctive and representative parts of the Slovenian landscape with well-preserved landscape elements. The total surface area of these areas is 3,410 km^2. Several municipal spatial planning acts also define landscape areas with distinctive features at the local level. Exceptional Slovenian landscapes constitute a selection of rare and unique Slovenian landscapes that stand out with one or more features of particular importance. 93 exceptional landscapes have been defined, with a total surface area of 233 km^2.

The following indicators are suggested for monitoring the state of the landscape:

- preservation of landscape features,
- preservation and integrity of landscape areas with distinctive features at the national level, and exceptional landscapes.

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures. The monitoring of the status should be carried out by qualified experts from the field of landscape protection.

Cumulative and synergistic impacts on landscape can be caused by sub-programmes, the effects of which can occur over the entire territory of the country and – in the event of an extensive scope and spatial coincidence of various interventions – can significantly degrade the general appearance of the Slovenian landscape. These sub-programmes are the renewable energy sources sub-programme, the electricity generation sub-programme, and the electricity transmission and distribution sub-programme.

Review of the impacts on landscape by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.

- **Energy use in traffic;** the impact is insignificant, grade A.

- **Renewable energy sources; wind farms** significantly alter the appearance of the landscape. They are usually characterised as a disruptive element in the landscape image. The defined potential areas for wind farms do not encroach on exceptional landscapes. Landscape areas with distinctive features on the national level are also excluded from these areas. The impacts of the measure are assessed as insignificant, because of mitigation measures (grade C). These measures pertain to the optimisation of the siting of individual structures and plants for the utilisation of wind energy, or the accompanying infrastructure within individual potential areas for the construction of wind farms in the subsequent planning phases in a manner that will enable distinctive landscape features within individual areas to be preserved to the greatest extent possible, and that changes to the landscape image be as small as possible or such that the landscape image of areas with wind farms remains coherent. The impact of **small hydroelectric power plants** can become prominent if its scope and inadequate solutions lead to a general degradation of riparian landscapes. In the event that a feature of the landscape is taken into account during the siting and planning of wind farms, the impacts of the measure can be assessed as insignificant because of the implementation of mitigation measures (grade C). **Solar power plants and solar hot water panels** sited in the landscape significantly alter and, as a rule, devalue the appearance of the landscape. The impacts of the measure are assessed as insignificant because of the implementation of mitigation measures, or because of the observance of conditions (grade C), i.e. appropriately defined spatial implementation conditions in spatial planning acts both with regards to the suitable (im)permissibility of solar hot water panels and with regards to their design. Solar power plants and solar hot water panels should be installed only in structures or in a way that does not represent an independent spatial arrangement in the landscape, but rather so that it is a part of a comprehensive spatial arrangement (e.g. infrastructural structure), and exceptionally in areas with degraded landscape as part of the rehabilitation. The utilisation of wood biomass from forests in **wood biomass-fuelled heating systems** can affect the features of the forest landscape and the introduction of new agricultural cultures in the agricultural landscape, as well as changes to the pattern of cultivated fields, which can consequently affect the features of the landscape. The impacts of the measure are assessed as insignificant (grade C) provided that observance is ensured of the mitigation measures that encompass the further use of forest biomass that corresponds to the status of wood reserves, the increment of wood reserves in forests, and the observance of the principle of a comprehensive arrangement of the cultural landscape.

- **Local energy supply;** the impact is insignificant, grade A.

- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.

- **Electricity generation;** the siting of hydroelectric power plants as large-scale infrastructural structures, and the implementation of accompanying arrangements, cause extensive changes to the landscape structure, spatial relations and elements of spatial identity. The construction of HPPs in the mid-stream section of the Sava River does not encroach on areas of exceptional landscapes and landscape areas with distinctive features on the national level, but will cause the modification of the river's character. Besides the optimisation of hydroelectric energy generation arrangements, a programmed upgrading of space, especially with recreational content, is of key importance in order to reduce the impacts on the landscape and thus increase the level of acceptability of the intervention. The Mura River, with its flood groves, oxbows, gravel bars, flood forests and preserved cultural landscape is a unique landscape in Slovenian territory. The construction of hydroelectric power plants and the implementation of all accompanying arrangements would cause irreversible and significant alterations to the landscape structure, spatial relations, and elements of spatial identity. Due to the importance of the Mura River, an intensive exploitation of the river for energy generation purposes, or the construction of a chain of power plants is not acceptable. The basis for interventions in the Mura River may only be its rehabilitation, the implementation of comprehensive measures to ensure the desired water regime and the condition of groundwater, as well as the preservation of bottomland forests. Utilisation for energy generation purposes can only be permitted as a parallel part of a comprehensive spatial arrangement. The impacts of the construction of hydroelectric power plants are assessed as insignificant, provided mitigation measures are observed (grade C). The measures pertain to the comprehensive landscape (spatial) arrangement of the area along the river that encompasses the optimisation of locations and the types of barrage, adaptation of the edges of impoundment banks or active shaping of these banks, adaptation of the elevation of the finished individual impoundments, as well as the implementation of other mitigation measures (construction of levees, raising the level of agricultural land, substitute habitats). The impacts of the utilisation of wood biomass in large high-efficiency CHP units are assessed as insignificant, provided mitigation measures (grade C) for the sustainable use of forests and development of agriculture (introduction of new agricultural crops, employment of agrarian operations for a more efficient production) and the principles of comprehensive planning of the cultural landscape are observed.

- **Electricity transmission and distribution;** the appearance of pylons and power lines in the landscape image is one of the most important and lasting impacts of long-distance power lines in general. The level of impact depends on the height?level of the long-distance power line in the landscape image and the visible qualities of the landscape in which the long-distance power line is built. The impacts can become significant if the long-distance power lines become an omnipresent element in the landscape image because of their sheer extent. The impacts of sub-programmes are assessed as insignificant, provided observance is ensured of the mitigation measures (grade C) that encompass the level of optimisation of long-distance power line positioning and the level of measures that remedy the consequences of the intervention in the environment, including the landscape arrangement measures that mitigate the negative impacts caused by the appearance of long-distance power lines in the landscape.

- **Natural gas supply;** in comparison with other line infrastructures, the impacts of gas pipelines on the quality of the landscape are relatively small. Their lasting impact is, as a rule, limited to highly noticeabl,e clear-cut areas in areas with dense high-growing vegetation. The impacts of the sub-programme are assessed as insignificant, provided mitigation measures pertaining to the optimisation of gas pipeline route locations are observed (grade C).

- **Liquid fuels;** the impact is insignificant, grade A.

- **Nuclear energy;** assuming that the construction of a new nuclear power plant alongside the area of the existing NPP occurs, the impact of the sub-programme on landscape is assessed as insignificant (grade B) as the physical space around the existing NPP has no special landscape value.

<u>Health</u>

The impacts on health due to the emission of pollutants into the air, the production of waste, and the use or pollution of water are included in the assessments of the impacts on air, natural resources and water. This Environmental Report specifically addresses the assessments of the impacts on health from ionising radiation generated by the NPP during electricity generation, as well as the impacts caused by exposure of the population to electromagnetic radiation associated with measures for the electricity transmission and distribution network.

In Slovenia, regulations govern the monitoring of electromagnetic fields of low-frequency sources of EMR in the 0 to 10 kHz frequency range and with nominal voltage in excess of 1 kV. Operators of EMR sources must provide for the initial measurements after the start-up of a new or reconstructed source of radiation, and periodic measurements every five calendar years for low-frequency radiation sources.

Measurements show that the loading of the natural and living environments with various electromagnetic radiation does not exceed the prescribed thresholds anywhere. The results of measurements of the background loading of the environment in 2006 and the measurement campaign in Slovenian municipalities in the 2005–2008 period show that the typical loading of the natural and living environments with EMR in Slovenia is small, as the highest values measured 3% of the threshold value.

Review of the impacts on health due to ionising and low-frequency electromagnetic radiation by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.
- **Energy use in traffic;** the impact is insignificant, grade A.
- **Renewable energy sources;** the impact is insignificant, grade A.
- **Local energy supply;** the impact is insignificant, grade A.
- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.
- **Electricity generation;** the impact is insignificant, grade A.
- **Transmission of electricity and the electricity distribution network;** measures of the electricity transmission and distribution sub-programmes are insignificant (grade C) from the point of view of their impacts on health, provided that exposure of the population to EMR in the period of NEP implementation is reduced.

  Reduction of the exposure of the population to EMR must be ensured during the planning of power lines by way of consistently laying new lines underground in the areas of settlement or areas intended for settlement according to spatial plans, all of which also applies to interventions into existing water bodies for reconstruction purposes.

  The reduction of exposure of the population to EMR must also be ensured in the planning of long-distance power lines by siting these power lines outside settlement areas. If this is not possible, long-distance power lines in settlements must be placed underground, regardless of the expenses of such construction, which also applies to the reconstruction of existing long-distance power lines.
- **Natural gas supply;** the impact is insignificant, grade A.
- **Liquid fuels;** the impact is insignificant, grade A.
- **Nuclear energy;** from the point of view of the impact on health, the measures of the nuclear energy sub-programme are assessed as insignificant (grade A) provided the measure for the extent of the impact of the NPP on the health of inhabitants is the share in the dose of natural background radiation received by an inhabitant in the vicinity of the NPP due to the operation of the NPP.

Material assets

The assessment of the impacts on material assets assesses the impacts of NEP measures on existing rights of entities to environmental goods when larger energy generation projects are being sited, especially:

- the potential negative impacts of a NEP measure on the functioning and efficiency of traffic infrastructure,

- the potential disruptions in the provision of services associated with the use of other infrastructure (such as municipal infrastructure),
- the negative impacts on the value of real estate and land, and
- the potential loss of recreational areas or other quality areas affected by the planned NEP measure.

Review of the impacts on material assets by individual sub-programme:

- **Efficient energy use;** the impact is insignificant, grade A.

- **Energy use in traffic;** the impact is insignificant, grade A.

- **Renewable energy sources;** the impact is insignificant (grade A) provided the planning of the use of WB for heating and the planning of electricity generation in CHPs that burn wood biomass ensure that the use of WB for energy generation purposes is subordinate to the use of forest biomass in the wood processing industry and is oriented towards the utilisation of waste forest biomass or lower-grade forest biomass, and the use of solid fuels produced from waste wooden products.

- **Local energy supply;** the impact is insignificant, grade A.

- **Heat and electricity combined generation from NG;** the impact is insignificant, grade A.

- **Electricity generation;** the impact is insignificant (grade A) provided the planning of electricity generation in large CHP units that burn wood biomass ensure that the use of WB for energy generation purposes is subordinate to the use of forest biomass in the wood processing industry, and is oriented towards the utilisation of waste forest biomass or lower-grade forest biomass, and the use of solid fuels produced from waste wooden products.

  Electricity generation in an HPP as a measure of the electricity generation is assessed as irrelevant and awarded grade A from the point of view of impacts on material assets, provided that the meeting of conditions for the multipurpose use of water bodies in the HPP influence area is ensured.

- **Transmission of electricity and the electricity distribution network;** the impact is insignificant, grade A**.**

- **Natural gas supply;** the impact is insignificant, grade A.

- **Liquid fuels;** measures of the liquid fuels sub-programme will be implemented in an existing industrial location, whereby existing infrastructure will be predominantly used; and the area of the new liquid fuels warehouse is not so large as to have an important negative impact on the existing nearby settlement. The impact is insignificant (grade C).

- **Nuclear energy;** measures of the nuclear energy sub-programme will be implemented in the existing location for electricity generation from nuclear energy, whereby existing infrastructure will be predominantly used, while the area of the new NPP is not so large as to have an important negative impact on the existing settlement of the municipality of Krško. The impact is insignificant (grade C).

1.2 Evaluation of the Impacts of NEP Scenarios

The evaluation and comparison of impacts includes 6 NEP scenarios that differ from one another in terms of:

- intensity of implementation of EUE and RES measures (designation "REF" for moderate and »INT« for intensive implementation of measures) and
- development of larger units for electricity generation (designation "BAS" for the scenario without new larger units for electricity generation, designation "NPP" for a new NPP and designation "GAS" for the scenario with a new larger unit for electricity generation from natural gas).

The considered NEP scenarios are assessed for the 2010–2030 period. All considered NEP scenarios meet environmental objectives that are defined in this environmental report as relevant environmental objectives for the comprehensive assessment of the impacts of NEP scenarios on the environment, whereby all of the NEP scenarios considered meet the objectives for 2020, as stipulated in the EU Climate and Energy Package adopted in 2008.

1.3 Assessment of the Environmental Acceptability of NEP Scenarios

The ADD_NPP scenario is the most acceptable for the environment with respect to the impacts on the environment in the 2010–2030 period and with respect to the long-term consequences of the implementation of NEP scenarios. The definition of the ADD_NPP scenario as the environmentally most acceptable scenario of NEP measures is derived from the evaluation of environmental impacts that is weighted with respect to the importance of the impact on an individual environmental component. The key advantage of the ADD_NPP scenario is that the generation of electricity from nuclear fuel enables the avoidance of various, scattered and spatially extensive negative impacts of other energy sources.

Despite the evaluation of environmental impacts, there are doubts associated with the proposal for the ADD_NPP scenario that stem from the fact that there is unease associated with the nuclear safety of the NPP and the implementation of long-term storage or removal of high level radio-active waste. The risks associated with nuclear safety and the implementation of the sustainable handling of high level nuclear waste are not included in the evaluation of environmental impacts of NEP measures.

In accordance with the recommendations of the European Council, we should expect an audit of the nuclear safety evaluation procedures both for the existing NPP in Krško and the planned NPP. The announced "stress tests" of nuclear power plants will be carried out for the existing and planned nuclear power plants, while based on the results of these "stress tests", the design or audit of international nuclear safety standards will commence. The high environmental acceptability of the ADD_NPP scenario and the decision within the scope of all NEP scenarios to extend the operation of the existing NPP will have to be confirmed by the results of the nuclear power plant "stress tests" that will be performed in a uniform fashion throughout the EU.

There is no doubt that the final decision on the extension of operations of the existing NPP and the decision on the construction of a new NPP is left – **provided stricter standards in the area of nuclear safety are observed –** to the procedure for the adoption of a safety report and the issuance of a suitable operating licence in accordance with the act governing nuclear safety, and that the issue associated with the handling of high level radioactive waste should be unequivocally resolved simultaneously with the realisation of additional electricity generation from nuclear fuel.

With respect to the environmental acceptability of the scenarios in the 2010–2030, the ADD_NPP scenario is followed by the DOD_GAS and BAS_REF scenarios.

With respect to its environmental impact, the BAS_INT scenario is less acceptable than BAS_REF, unless electricity generation from solid fossil fuels is reduced in the event of a surplus of electricity generated over its consumption in Slovenia as a result of the implementation of efficient energy use measures, or the generation of new electricity from renewable energy sources or new CHP and NG plants. If the surplus of produced electricity over its consumption in Slovenia replaces the generation of electricity from solid fossil fuels, the BAS_INT scenario is the third most acceptable NEP scenario from the point of view of environmental impacts.

The NPP_REF and NPP_INT scenarios are also environmentally acceptable. The scenarios designated "NPP" have a greater impact on air than the BAS_REF and BAS_INT scenarios because of the emission of ionising radiation, which exposes the population to such radiation in the entire life cycle of the NPP, including the life cycle of nuclear fuel. However, under the assumption that the reprocessing of spent nuclear fuel and storage of the remains from such reprocessing as well as the storage of other radio-active materials occurring during the use of nuclear energy will be ensured in the long-term generation of electricity in the NPP has a far lesser long-term impact on air and waters than electricity generation from fossil fuels and, because of the smaller needs for renewable electric energy sources (water, wood biomass) indirectly causes the least long-term impacts on nature and landscape.

As regards environmental impacts, the GAS_REF and GAS_INT are also acceptable because of the adopted environmental objectives, but of all the NEP scenarios, it is these two that place the greatest burden on the environment. The GAS_REF and GAS_INT scenarios cause a greater impact on air and climatic factors than other NEP scenarios, and are also not in accordance with EU guidelines on the further decrease of pressures on climatic and other environmental factors after 2020, i.e. the period for which EU environmental objectives have already been adopted, because of the increase in emissions of pollutants and GHGs in the 2020–2030 period.

1.4 Cross-Border Impact

The cross-border impacts of the implementation of NEP measures have been found to exist for all neighbouring countries: Italy, Austria, Hungary and Croatia.

Cross-border impacts on Austria have been found to occur as a result of:

- the definition of the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura River and
- the envisaged new NPP.

Cross-border impacts on Italy and Hungary have been found to occur as a result of the envisaged new NPP.

Cross-border impacts on Croatia have been found to occur as a result of:

- the definition of the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura River and
- the envisaged new NPP.

The envisaged NEP measures have a significant cross-border impact on the environment of neighbouring Austria as a result of the definition of the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura River, as a result of the direct and long-distance impact on the waters of the Mura River water body, and as a result of the direct and long-distance impact on nature.

Cross-border impacts on the neighbouring countries that were assessed as insignificant include the impacts on Croatia resulting from the construction of the new NPP and from the definition of the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura River.

1.5 Inclusion of the Measures of the Renewable Energy Sources Action Plan in the Assessment of Environmental Impacts

The measures of the Renewable Energy Sources Action Plan (RES AP) are included in their entirety in NEP sub-programmes, which is evident from Table 7 of the Report Determining the Scope of the Comprehensive Assessment of Environmental Impacts that is included in the Environmental Report as Appendix 2.

The RES AP measures are described in greater detail with respect to their inclusion in individual NEP scenarios in Table 39 of this Environmental Report. Individual NEP scenarios have the same measures in the renewable energy sources sub-programme in the 2010–2020 period, for which the RES AP is adopted, as the RES AP measures.

2 Introduction

In accordance with the Energy Act (Official Gazette of the RS, Nos. 27/07, 22/10) (hereinafter: Energy Act), the Ministry of the Economy as the ministry responsible for energy has prepared a draft proposal of the National Energy Programme (hereinafter: NEP) for further consideration in the procedures for its adoption. Because the NEP is ranked among the plans and programmes which have an important impact on the environment, it is necessary before its adoption to ascertain in accordance with Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment and in the process of the comprehensive assessment of environmental impacts (hereinafter: CEIA) the consequences of the environmental impacts of the measures planned within the scope of the NEP, and decide which of these are unacceptable in terms of environmental impacts. This Environmental Report outlines the findings from the assessment of NEP impacts on the environment and is intended for:

- the public discussion associated with the potential impacts on the environment caused by the implementation of sub-programmes or measures from the proposed NEP, including issues associated with the environmental impacts of all reasonable alternatives for the development of the Slovenian energy sector in the 2010–2020 period and the period after 2020 (2010–2030),
- the explanation of the decision of the Government of the Republic of Slovenia on the final NEP proposal,
- the avoidance, mitigation and reduction of the harmful impacts on the environment caused by the implementation of NEP measures whenever possible, as well as reporting and monitoring of harmful environmental impacts if these cannot be avoided because of efforts to attain energy objectives, and
- the assurance of a rapid and effective consultation of competent bodies and the public within the scope of the CEIA regarding any aspect of the impacts caused by the implementation of NEP on the environment, human health and the protection of cultural heritage and landscape that is defined in this Environmental Report or the draft NEP proposal.

2.1 Important Reasons for the Preparation of the NEP Proposal

Climate change and our response to the management of its consequences are important challenges for the environment and the sustainable development of society today, both on the local and global levels. A range of new circumstances in the global environment and within the scope of the European Union require both an assessment of the economic and social aspects and a re-evaluation of the environmental development of energy generation activities and services, with an additional urgent task being measures for a more environmentally-friendly implementation of the energy policy.

An especially important fact for the energy policy of Slovenia is that the EU is upgrading the ambitions of its environmental policy within the scope of the Climate and Energy Package and is striving for an ambitious and comprehensive international agreement on climate change after 2012 to be reached within the scope of the United Nations Framework Convention on Climate Change (UNFCCC).

The objectives of the EU Climate and Energy Package are set as a high priority of the development strategy encompassing the period up to the year of 2020. It is expected of the measures for the efficient use of energy and renewable energy sources that they should – through the reduction of GHG emissions – assume the leading role in the Slovenian share for the permanent reduction of the impacts of climate change.

The draft NEP proposal was prepared for the 2010–2030 period and is tasked with the following objectives of Slovenian energy policy, in addition to the goals of managing the consequences of climate change:

- to increase the strategic and operating reliability of supply with energy services[1];
- to ensure competitiveness of the economy, and availability and accessibility of energy services;
- to promote environmental sustainability and combat climate change;
- to ensure social cohesiveness.

The draft NEP proposal and its Environmental Report were produced in parallel. Environmentally friendlier measures or variants of the measures of the draft NEP proposal were developed using environmentally acceptable techniques, including the observation of information on platforms and technical limitations, with the purpose of defining areas that are environmentally acceptable for siting relevant projects.

Within the scope of CEIA, environmental objectives were defined that pertain to the nine aspects of impacts on the environment, human health and protection of cultural heritage and landscape (impacts on resources, air, water, the natural and cultural heritage, climatic factors, landscape, health and material assets), whereby the consequences of each of the NEP measures were considered.

The Environmental Report assesses the proposed National Energy Programme of the Republic of Slovenia for the 2010–2030 Period – draft produced by the Jožef Stefan Institute in May 2011. The assessed measures are outlined in Appendix 5, which also defines the important environmental impacts of the measures.

The figure below shows the procedure for the assessment of environmental impacts, the steps of which have already been implemented and which will be implemented in the further steps of NEP measure implementation, whereby the Environmental Report also provides for each environmental impact of each individual measure the guidelines for subsequent procedures of siting measures or structures and equipment in the environment. The Report also defines the level of detailed treatment of mitigation or other implementation measures with the aim of avoiding the consequences of any relevant impact, mitigating the impact or reducing its consequences.

Consultations with stakeholders were carried out throughout the CEIA procedure. This included meetings and prior consultation with the competent bodies (Ministry of Health, Ministry of the Environment and Spatial Planning), governmental and non-governmental organisations working in the field of environmental protection, as well as the holders of energy development efforts for electricity generation, the transmission and distribution of electricity, and natural gas supply.

The consultations that were carried out ensure that the interests of various stakeholders have been observed in the drawing up of the draft NEP proposal and this Environmental Report.

Figure 1 shows the distinction between the strategic level of NEP assessment, the results of which are outlined in this Environmental Report, and the further comprehensive assessment of environmental impacts within the scope of spatial planning or, in certain cases, within the scope of operative planning of individual segments (sub-programmes) of NEP measures, such as the preparation of the RES AP or the overhaul of the EE AP envisaged for 2016.

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[1] Energy services are services whose key condition is the use of energy, such as lighting, heating, cooling, transport, operation of information and communication devices, mechanical work and chemical energy and electricity;

This Environmental Report defines the guidelines for the further planning of NEP measures (spatial planning and detailed planning of action plans for individual NEP measure segments) and mitigation measures that need to be observed during such planning.

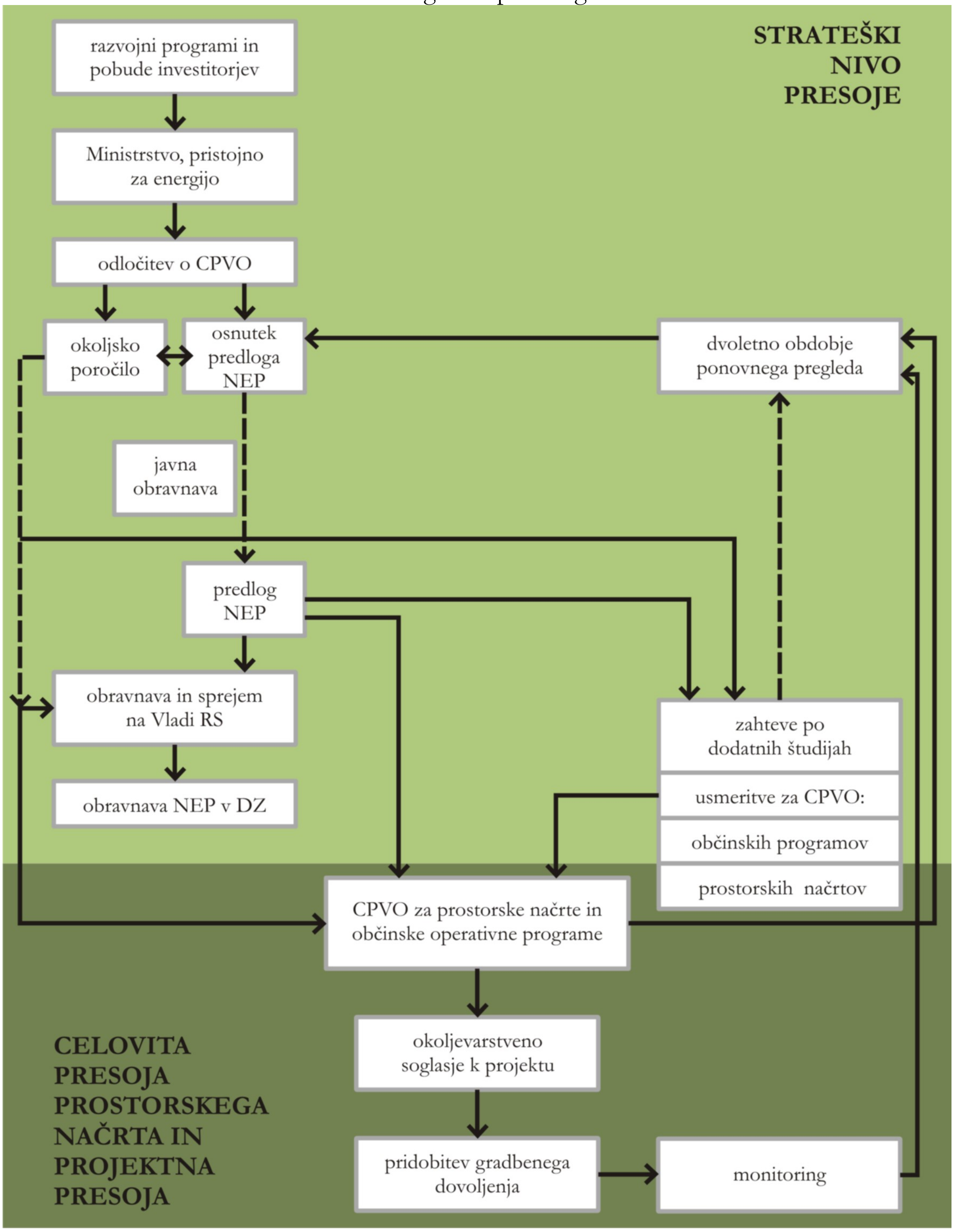

Figure 1: Environmental impact assessment procedure

2.2 Key Facts about the NEP

In accordance with the Energy Act (Official Gazette of the RS, Nos. 27/07 (UPB), 22/10), the National Energy Programme comprises:

- objectives,
- guidelines and strategy for the use and supply of energy,
- measures for attaining the objectives,
- energy balances with high potential and
- the assessment of the impacts regarding the attainment of the objectives referred to in Article 2 of the Energy Act.

Table 1: Key facts about the National Energy Programme 2010–2030

Responsibility:	**Preparation of the NEP proposal is headed by the Ministry of the Economy**
Programme name:	**National Energy Programme RS 2010 - 2030**
Decision-making procedure:	**the NEP is adopted in the National Assembly on the proposal from the government**
Purpose of the programme:	**The National Energy Programme determines long-term development objectives and guidelines for energy systems and energy supply with the observation of the environmental and technological criteria, development of public infrastructure and infrastructure of national importance, as well as incentives and mechanisms for promoting the use of renewable energy sources and implementation of measures for the efficient use of energy.**
Reason for the preparation of NEP:	**Regular preparation of the National Energy Programme prescribed by the Energy Act. In order to attain the goals of the climate and energy package, further measures are necessary in addition to the adopted measures and policies. The existing National Energy Programme (ReNEP), which was adopted in 2004, has not been implemented, which is why it is necessary to draft additional implementing mechanisms. An additional reason to revise NEP is the changed international circumstances, primarily in the energy product and energy technology markets.**
Subject:	**Efficient use of energy and energy supply.** **The NEP includes all measures of the Renewable energy sources Action Plan for the period from 2010 to 2020.**
Frequency of the revision of NEP:	**As a rule, the NEP is revised every five years.**
Planning period:	**2010 to 2030**
Area:	**Republic of Slovenia**

2.3 Objectives of NEP Sub-Programmes and Description of Measures

An individual sub-programme of the NEP defines:

- the strategy of the sub-programme: objectives of the sub-programme, key areas covered by measures in the sub-programme, guidelines, key elements of the support environment;
- the support environment or energy policy measures – mechanisms or instruments of the NEP for the implementation of the programme: tasks, implementation deadlines, assets, responsibilities of the holder;
- measures in the area of use and supply of energy – technical and other energy management measures – differ from one another relative to the sub-programme:
    - in the area of sustainable energy generation, these are measures targeting end-users of energy that are implemented in response to the planned incentives of EUE and RES in the NEP. The measures that are taken into account as NEP measures are those

measures that target end-users of energy and are not the result of autonomous trends in technology development and the market or measures and policies already in place,
  - the area of network and the development of electricity generation outline the key projects to be implemented by public or private companies based on entrepreneurial decisions;
- players;
- funding;
- indicators for monitoring the implementation of a sub-programme.

The chapters of the NEP are shown in the table below. The planning period of the NEP is from 2010 to 2030, but the implementing mechanisms focus on the period up to 2020.

Table 2: Content of the National Energy Programme 2010–2030

CONTENT OF NEP		
I. PROGRAMME IMPLEMENTATION FRAMEWORK		
	1	Situation and Challenges in Slovenia
	2	International Markets
	3	Technological Development
	4	SWOT Analysis
II. NEP STRATEGY		
	1	Strategic Framework of NEP
	2	Energy Policy Objectives
	3	Strategy for the Attainment of Objectives
	4	Priority Areas
III. NEP SUB-PROGRAMMES		
	SUSTAINABLE ENERGY	
	1	Efficient Use of Energy
	2	Use of Energy in Transport
	3	Renewable Energy Sources
	4	Co-generation of Heat and Electricity
	5	Local Energy Supply
	ELECTRICITY	
	6	Development of the Electricity Market
	7	Electricity Generation
	8	Transmission of Electricity
	9	Electricity Distribution Network
	FUEL	
	10	Natural Gas Market
	11	Natural Gas Supply
	12	Liquid Fuel
	13	Coal
	14	Nuclear Energy
	HORISONTAL MEASURES/RELATED POLICIES	
	15	Taxes and Prices
	16	Research, Technological and Entrepreneurial Development
	17	Education and Training
	18	Use of Space
IV. ASSESSMENT OF NEP IMPACTS		
	1	Long-term Energy Balances 2008–2030
	2	Financial and Investment Flows
	3	Fulfilment of International Obligations
	4	NEP Indicators
	5	Environmental Impacts
	6	Summary of NEP Impacts
V. IMPLEMENTATION AND MONITORING OF THE PROGRAMME		
	1	Institutional Measures for the Implementation of the Programme
	2	Funding
	3	Monitoring of Programme Implementation

The following is described in more detail for individual NEP sub-programmes in the appendix of this report:

- objectives of the sub-programme,

- areas of measures,
- key elements of the support environment and
- expected responses from stakeholders: measures and groups of measures.

2.4 Components of the Environmental Report

Individual chapters of the Environmental Report comprise the following content:

1. Chapter 1 "Summary" – contains a summary of the procedure for the comprehensive environmental assessment and the findings;
2. Chapter 2 "Introduction" – treats the background for the preparation of the NEP proposal, components and content of the Environmental Report, and sources of data;
3. Chapter 3 "Methodology for the Comprehensive Assessment of the Impacts of NEP" – explains the approach to the implementation of CEIA for NEP measures;
4. Chapter 4 "Legislative Framework and the Association with Other Programmes"- summarises the legislative framework for CEIA and defines the association with other programmes;
5. chapter 5 "Description and Evaluation of the Environmental Impacts of NEP" – defines the set of environmental aspects that can be associated with the implementation of NEP measures;
6. chapter 6 "Environmental Platform" – summarises the main characteristics of the existing state of the environment that is relevant for the CEIA, and defines probable developments in the absence of the implementation of planned NEP measures;
7. chapter 7 "Environmental Objectives" – presents the environmental objectives used for the assessment of NEP sub-programmes;
8. chapter 8 "Description of the Impacts of NEP Sub-Programmes" – describes the impacts of NEP sub-programmes on the environment with respect to the set environmental objectives;
9. chapter 9 »Cross-Border Impacts« - outlines the cross-border impacts and significance of each of the outlined cross-border impacts;
10. chapter 10 "Evaluation of NEP Sub-Programme Impacts and Mitigation Measures" – treats the assessment of environmental impacts of individual NEP sub-programmes and recommends approaches to the reduction or mitigation of environmental impacts;
11. chapter 11 "Evaluation of Impacts and Comparison of NEP Scenarios";
12. chapter 12 "Monitoring of the Impacts and Recommendations for Further Measure Implementation";
13. chapter 12 "Sources".

Textual and graphic appendices to the Environmental Report

2.5 Determination of the Scope of the Environmental Report

The content of the public announcement on the fact that a comprehensive environmental impact assessment is to be performed for the NEP as well as the Report On the Determination of the Scope of the Comprehensive Assessment of Environmental Impacts for the National Energy Programme for the 2010–2030 Period are provided in the appendices to the Environmental Report.

2.6 Legislative Background for the CEIA

The CEIA is a requirement for the assessment of environmental impacts pursuant to the Environmental Protection Act (Official Gazette of the Republic of Slovenia, Nos. 39/06 – official consolidated text, 49/06 – ZmetD, 66/06 decision of the Constitutional Court and 33/07 – Spatial Planning Act (ZPNačrt), 57/08 – ZFO-1A, 70/08, 108/09-ZPNačrt-A and 108/09) that transposes Directive 2001/42/EC of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment into Slovenian legislation. The purpose of the CEIA procedure is for environmental aspects to be included in the preparation of NEP measures in the early stages, and to comprehensively verify potential threats to the attainment of environmental objectives.

2.7 Further Treatment of the Environmental Report

This Environmental Report is available for consultation purposes and has been conveyed to the competent bodies, i.e. the ministry responsible for the environment, which in accordance with the law, forwards it to ministries and other competent organisations – with respect to the content of the plan – for individual environmental protection matters, protection, or the use of natural resources, the landscape, the protection of human health and cultural landscape. The ministry invites them to submit their opinions in writing within 21 days. Their opinions concern the acceptability of the environmental impacts arising from the implementation of the plan in terms of their area of competence.

2.8 Scope of the Environmental Report

In the Report Determining the Scope of the Comprehensive Assessment of Environmental Impacts that is included in this Environmental Report as Appendix 2, table 7 provides the classification of individual NEP measures into four groups with respect to the need for environmental impact assessment, namely into NEP measures the impacts of which:

- need to be assessed because they involve new measures or because the impacts of their implementation have not been assessed,
- do not need to be assessed because they have already been assessed, and for which it was found during the environmental impact assessment that their implementation is acceptable as regards the environment, human health, cultural heritage or the landscape,
- are currently being assessed, and
- do not need to be assessed within the scope of this comprehensive assessment because they are negligible in terms of how they affect an individual part of the environment, human health, cultural heritage or landscape.

The following designations are used for the classification of NEP measures with respect to the need for environmental impact assessment:

- "already" - the impact of the measure has been assessed as acceptable on the basis of a previous environmental impact assessment,
- "yes" – the impact needs to be assessed,
- "no" – the impact does not need to be assessed because it is negligible,
- "in progress" – the impact is currently being assessed.

It is evident from table 7 of the Report Determining the Scope of the Comprehensive Assessment of Environmental Impacts that each of the NEP sub-programmes, with the exception of the "Coal Mining" sub-programme, comprises one or several measures for each of which a comprehensive environmental impact assessment needs to be performed, either because it involves a new measure, or because the impacts of the measure have not been evaluated.

The comprehensive environmental impact assessment is carried out for individual NEP measures with respect to the 9 aspects of impacts on:

- natural resources, including impacts arising from the creation of waste,
- air,
- water,
- nature,
- cultural heritage,
- climatic factors,

- landscape,
- health, and
- material assets.

This Environmental Report specifically highlights for each NEP measure which environmental impacts caused by the implementation of the measure are being assessed within the scope of the CEIA procedure of state and municipal (regional) spatial plans and which are being assessed within the scope of the project assessment of an individual measure (the assessment of the environmental impacts of an intervention in the environment).

The following is provided in this Environmental Report for each assessed NEP measure:

- descriptions of important impacts,
- descriptions of relevant environmental starting-points that are observed in the evaluation of the impacts,
- definition of environmental objectives,
- descriptions of implementation alternatives,
- results of the evaluation of impacts arising from the implementation of measures,
- assessment of cumulative impacts,
- proposals for mitigation measures,
- evaluation of the impacts of measures provided mitigation measures are observed, and
- monitoring of impacts, and recommendations for the further implementation of the measure.

The structure of the description of environmental impacts of NEP measures in this Environmental Report is the same as the structure of the NEP. Descriptions of environmental impacts caused by NEP measures are provided in 12 sets, so that an individual set of the comprehensive environmental impact assessment includes measures from the following NEP sub-programmes:

- efficient use of energy,
- use of energy in transport,
- renewable energy sources,
- local energy supply,
- co-generation of heat and electricity,
- electricity generation,
- transmission of electricity,
- electricity distribution network,
- natural gas supply,
- liquid fuel,
- nuclear energy, and
- coal mining.

Environmental impacts caused by NEP measures, such as the construction of structures, are classified with respect to the following phases:

- pre-construction phase, survey to find the best location, and preparatory works at the construction site;
- construction phase: preparation of the construction site and installation of devices or equipment, and finally the construction of connecting infrastructure;
- operation phase: operation and maintenance during the period in which the measure is implemented, and
- decommissioning phase: removal of the structure (device or equipment) and connecting infrastructure.

When impacts on the environment are assessed, the potential for cumulative environmental impacts on account of the simultaneous construction, operation and decommissioning of structures are taken into account.

2.9 Sources Used

A lot of the information for the comprehensive (strategic) assessment of environmental impacts is available in environmental impact assessments already carried out for plans and programmes in other areas that also include the NEP. For the purposes of this report, it is primarily certain information from the following CEIA procedures or strategic environmental impact assessments that is of key importance:

- environmental impact assessments carried out for the purpose of the Ordinance on the Spatial Planning Strategy of Slovenia (Official Gazette of the Republic of Slovenia, No. 76/04),
- the CEIA procedure carried out for the purpose of the Operational Programme of Environmental and Transport Infrastructure development for the 2007–2013 Period (OP ETID),
- the CEIA procedure carried out for the purpose of the Rural Development Programme of the Republic of Slovenia 2007-2013 (RDP),
- the CEIA procedure carried out for the purpose of the Water Management Plan (WMP) and
- the CEIA procedure carried out for the purpose of the Operational Programme On the Elimination of Wastes with the Objective to Reduce the Quantity of Disposed Biodegradable Waste (OP BIOW).

The combination of the production of a comprehensive environmental impact assessment and the use of information from comprehensive (strategic) environmental impact assessments carried out for other plans and programmes is considered an appropriate comprehensive environmental impact assessment method for the comprehensive environmental impact assessment of individual NEP measures. Such a combined approach and the information from of environmental assessment of policies at the EU level were used for the comprehensive assessment of environmental impacts of NEP measures associated with:

1. energy efficiency, the measures for which are defined in OP ETID, and which underwent a strategic environmental assessment in terms of compliance with environmental objectives in their entirety within the scope of the adoption of OP ETID;
2. efficient energy use that pertains to the use of new energy-efficient products and was assessed in terms of environmental impacts over the entire life cycle of the product within the scope of the procedure for the recasting of Directive 92/75/EEC regarding energy labelling of products (office equipment, household equipment, lighting, etc.);
3. efficient energy use pertaining to low-energy, passive and near-zero-energy buildings in the residential sector and service activities within the scope of the procedure for the recasting of EU Directive 2002/91/EC on the energy performance of buildings;
4. energy-efficient vehicles and tyres, the environmental impacts of which were assessed within the scope of the issuance of EU acts and for which importance to the environment was defined in the impact assessments accompanying these acts, namely the Strategy to Reduce CO2 Emissions from Cars (personal, light-duty and heavy-duty commercial vehicles) and the Directive on the labelling of tyres;
5. hydroelectric power plants, for which the limitations and conditions for their siting in the aquatic environment are defined in WMP in accordance with the Water Framework Directive 2000/60/EC;
6. the production of biofuels and use of wood biomass that are included in the Rural Development Programme of the Republic of Slovenia for the 2007-2013 Period and assessed within that framework in terms of environmental impacts through the verification of compliance with environmental objectives;

7. the use of biomass for the generation of energy, the guidelines for which are provided in the EU Biomass Action Plan and which was assessed in terms of environmental impacts within the scope of the procedure for the adoption of the said action plan;
8. the use of wood biomass that is included in the Resolution on the National Forest Programme and is assessed in terms of environmental impacts within the scope of the adoption of forest-related plans;
9. waste processing for the purpose of energy generation that is included in the OP BIOW and is assessed in terms of environmental impacts within the scope of its adoption, namely by way of verification of compliance with environmental objectives;
10. the distribution and transmission networks for gas and electricity that are defined in the Ordinance on the Spatial Planning Strategy of Slovenia and were partially assessed in terms of environmental impacts within the scope of its adoption; the networks were further spatially optimised at the strategic level, with some of them also being optimised and assessed in greater detail within the scope of the drafting of implementing spatial plans;
11. the closure of coal mines, which was defined in the National Mineral Resource Management Programme (NMRMP), and mines that underwent a strategic environmental assessment in terms of compliance with environmental objectives in their entirety within the scope of the adoption of the above programme.

The figure below shows how the data from comprehensive environmental impact assessments for other programmes were used in the comprehensive environmental impact assessment of certain NEP measures.

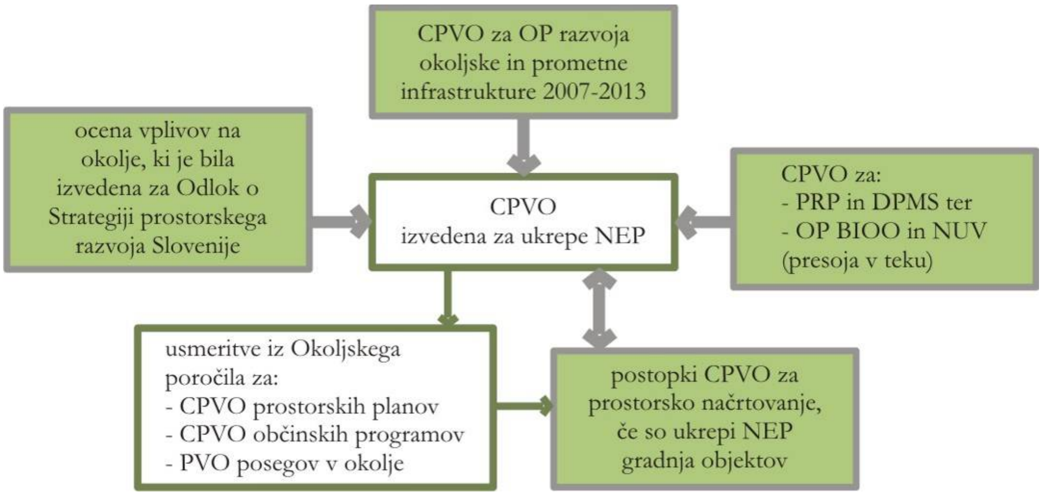

Figure 2: Use of data in comprehensive environmental impact assessments for other plans and programmes

Within the scope of production of this Environmental Report, a comparative analysis was made of the planned spatial interventions for the purpose of implementing NEP measures that encompass spatial interventions that are included for the energy sector in the Spatial Planning Strategy of Slovenia (Ordinance on the Spatial Planning Strategy of Slovenia (Official Gazette of the Republic of Slovenia, No. 76/04)).

In terms of the "renewable energy sources" and "electricity generation" sub-programmes, the assessment of this Environmental Report is closely tied to the objectives aimed at the attainment of a good status of waters that are defined in the WMP, namely because of the envisaged utilisation of energy from HPPs.

The WMP is adopted as a regulation governing:

- the extension of deadlines for the attainment of objectives relating to the attainment of a good status or a good ecological potential (hereinafter: environmental objectives) of individual water bodies for reasons associated with technical feasibility or natural conditions;
- the possibility of deviations from environmental objectives due to physical modifications of a water body caused by human activity.

The decision on the deviation from the attainment of environmental objectives on surface water bodies due to the siting of hydroelectric power plants in the aquatic environment complies with the regulations on waters, provided that:
- the NEP proves this is in the public interest,
- the NEP or this Environmental Report show that the benefits of objectives attained through modifications cannot be ensured in a different way (which would be a better environmental option) because of technical non-feasibility or disproportionate costs,
- the national spatial plan for an individual HPP and the comprehensive impact assessment of that plan ensure that all of the technically feasible and proportionate measures are implemented so as to mitigate the impact on the status of waters, and
- the NEP and the national spatial plan, or the comprehensive impact assessment of the plan, ensure that the realisation of environmental objectives on other water bodies in the same river basin district is jeopardised.

2.10 Acceptability Assessment of NEP Impacts on Protected Areas

In accordance with the regulations governing the conservation of nature (Rules on the Assessment of Acceptability of Impacts Caused by the Execution of Plans and Activities Affecting Nature in Protected Areas (Official Gazette of the Republic of Slovenia, Nos. 130/04, 53/06, 38/10)), the assessment of the impacts of the NEP on protected areas was made. An acceptability assessment of the impacts on protected areas must be made for every plan or programme that in itself or in combination with other plans or programmes exerts adverse impacts on the integrity and functionality of Natura 2000 sites or protected areas.

Natura 2000 sites encompass:

- special conservation areas in accordance with Directive 92/43/EEC on habitats,
- special conservation areas in accordance with Directive 79/409/EEC on birds,

Protected natural areas are measures taken by the state so as to conserve areas with valuable natural features and biotic diversity; these are divided into large (national, regional, landscape parks) and small (integral nature reserve, nature reserve and natural monument) protected areas in the territory of which prescribed protection regimes apply.

Within the scope of the acceptability assessment of NEP impacts on protected areas, an impact assessment was carried out for five NEP sub-programmes, the implementation of which could have adverse impacts on protected areas, namely:

- the “renewable energy sources” sub-programme: construction and operation of wind farms and the overhaul or construction of new sHPPs,
- the “electricity generation” sub-programme: HPPs in the midstream section of the Sava River and the potential use of the Mura River for energy generation purposes,
- "electricity transmission" sub-programme with 220 and 400 Kv high voltage long-distance power lines (Okroglo – Udine OPL and Cirkovce-Podlog OPL),
- the "electricity distribution network" sub-programme with 110 kV high voltage long-distance power lines,
- the "natural gas supply" sub-programme with a M9b Kidričevo – Vodice gas pipeline.

This Environmental Report assesses the programme, which is why it is drawn up in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas (Official Gazette of the Republic of Slovenia, Nos. 130/04, 53/06, 38/10) that reads as follows: "For operational programmes and other plans or parts thereof, which are not plans in the area of spatial planning and the descriptions of which do not enable, even by way of inference, the determination of all of the planned interventions because the descriptions do not provide concrete locations of interventions or do not provide details as to the type of interventions, the matrix stipulated in Appendix 6 of these Rules shall not be completed within the scope of the acceptability assessment. In this case, expert assessments shall be provided for the individual content of these Rules, which are aimed at the preservation of a favourable status of species and habitat types in accordance with the provision stipulated in the previous article. The matrix stipulated in Appendix 6 of these Rules shall in these cases be completed within the scope of the acceptability assessment at the level of a detailed plan or intervention."

3 Comprehensive Environmental Impact Assessment Methodology

3.1 Approach to the Comprehensive Environmental Impact Assessment

The CEIA procedure employed for the assessment of environmental impacts caused by NEP measures is shown in the diagram in Figure 3.

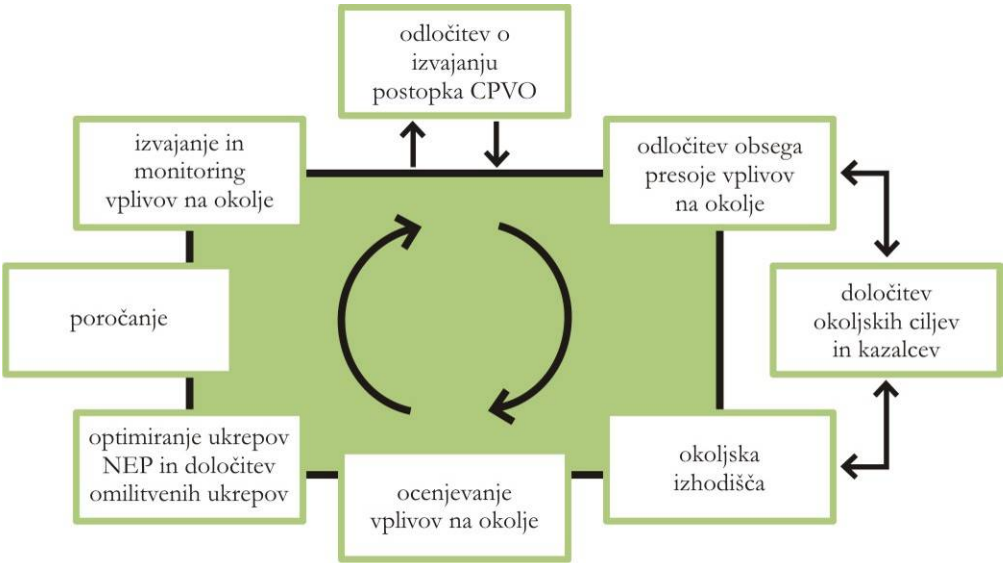

Figure 3: Schematic representation of the CEIA procedure

3.2 Public Announcement and the Determination of the Scope of the Comprehensive Assessment

The CEIA procedure for the NEP is carried out on the basis of the decision of the minister responsible for the environment that the NEP is a plan or programme for which the CEIA procedure needs to be carried out. The decision on the obligation to implement the CEIA procedure for the NEP was published at the website of the ministry responsible for the environment.
This decision was also confirmed in the Report on the Determination of the Scope of the Comprehensive Environmental Impact Assessment for the NEP for the 2010–2030 Period, which shows that the nature of the measures of NEP sub-programmes is such that their implementation significantly affects the environment.

In connection with the decision of the minister responsible for the environment on the implementation of the CEIA procedure for NEP, the Report on the Determination of the Scope of the Comprehensive Environmental Impact Assessment for the NEP for the 2010–2030 Period defined the following:
- framework and scope of the comprehensive environmental impact assessment - approach employed within the scope of the environmental impact assessment,
- content of further steps of the comprehensive environmental impact assessment.

Within the procedure for the determination of the scope of the comprehensive environmental impact assessment, the main environmental issues were identified, namely those that need to be considered in the drafting of the NEP; the procedure also determined the key sources of data for the production of an overview of potential environmental impacts and the determination of measures suitable for the environmental impact assessment.

The Report on the Determination of the Scope of the Comprehensive Environmental Impact Assessment for the NEP for the 2010–2030 Period was submitted for public discussion and also sent to the minister responsible for health for supplementation and comments.

The comments received pertained primarily to the consideration of exisitng policies, plans and programmes that should also be observed within the scope of the CEIA procedure to be carried out for the NEP.

3.3 Definition of Potential Impacts

Based on the platform established in the Report on the Determination of the Scope of the Comprehensive Environmental Impact Assessment for the NEP for the 2010–2030 Period, an overview of the potential environmental impacts was produced as the first step within the CEIA procedure.

Environmental impacts are classified with respect to the relationship between the source of an impact, the type of effect and the recipient of the consequences of the impact. In terms of duration the impacts are classified as temporary impacts and permanent, and at the local, regional (state), cross-border and global levels in terms of geographical impact.

With respect to the management of environmental impacts, the levels of environmental impact management are:

- strategic level (CEIA procedure for NEP measures),
- spatial planning or planning information level (CEIA procedure for a spatial plan for the siting of an NEP measure),
- project or technological level (assessment of the environmental impact of an intervention in the environment).

Environmental impacts are classified into positive and negative, and the finding for each impact is accompanied by a brief explanation or comment regarding the stated significance of the impact.

The approach to CEIA is based on the determination of environmental impacts, while the level of accuracy in the assessment of impacts is proportionate to the data available in the description of an individual NEP measure. The definition of environmental impacts within the CEIA procedure and the assessment of the consequences of these impacts are not carried out in such detail as the description and assessment of environmental impacts in the project environmental impacts assessment. Descriptions of all the possible environmental impacts that are outlined in the appendices to this Environmental Report are also used as guidelines in the further assessment of environmental impacts within the scope of spatial planning or the project implementation of an individual NEP measure.

The descriptions of possible environmental impacts provided in the appendices to this Environmental Report (Appendix 4) include the levels where the indicated possible environmental impacts need to be defined in more detail, and where measures need to be planned for such environmental impacts in order to avoid, mitigate or reduce adverse impacts. Environmental impacts listed in the appendices to this Environmental Report as impacts of strategic importance are also assessed in this Environmental Report.

3.4 Data on the Baseline State of the Environment

For the purpose of assessing the environmental impacts of NEP measures, an overview was drawn up of all of the available information for the definition of the state of the environment (existing and future), the detailed description of which is provided in chapter 6. Data is obtained primarily from the records of the environmental information centre and from other databases of state bodies pertaining to cultural heritage and landscape protection.

Available information for the definition of the state of the environment was reviewed with respect to the strategic significance of environmental impacts by eliminating that information on the sensitivity of the environment which needs to be taken into account in the CEIA procedure for the spatial plan or within the EIA procedure for NEP measures such as the construction of structures.

3.5 Definition of Energy Development Scenarios

Energy development scenarios (NEP alternatives) and the classification of measures within the scope of individual NEP sub-programmes in the period of their implementation are defined in the NEP. The definition of measures is taken from Table 7 of the Report on the Determination of the Scope of the Comprehensive Environmental Impact Assessment for the NEP for the 2010–2030 Period, while the measures are described in terms of the level of accuracy of the environmental impact assessment in chapter 10 of this Environmental Report.

3.6 Definition of Environmental Objectives

Environmental objectives were selected and prepared for the assessment of environmental impacts of alternative options of energy development that were defined for NEP measures (see chapter 6). These environmental objectives were defined with the observation of environmental regulations, EU directives and treaties, as well as according to the current understanding of key environmental issues. Some of the environmental objectives have special sub-objectives defined. Indicators for the verification of compliance and measurement of the efficiency of each of the NEP measures were defined in accordance with these environmental objectives.

3.7 Assessment Methodology

The planning and assessment of NEP measures was performed interactively, which included consultation with the authorities, representatives of the energy sector and other stakeholders.

The CEIA procedure has several phases, in which the measures for the attainment of the objectives of the EU Climate and Energy Package by 2020 are considered to be priority measures, while the environmental acceptability of the measures implemented after 2020 will only be assessed after the implementation of measures by 2020 is shown not to ensure the attainment of energy and climate objectives of the NEP in the 2020-2030 period. The diagram in Figure 4 schematically depicts the interactive procedure of environmental impact assessment and the planning of NEP measures.

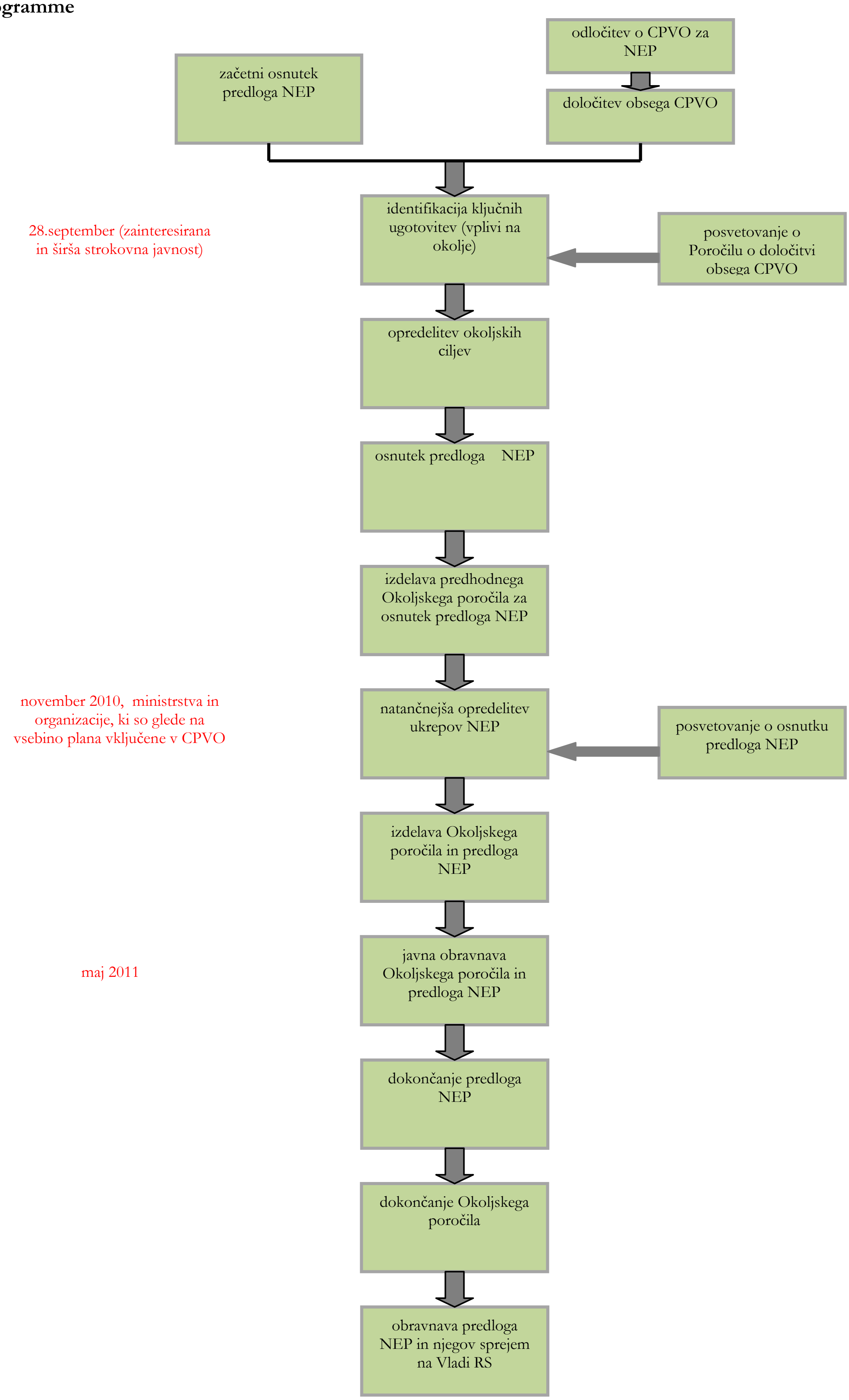

Figure 4: *The procedure for the environmental impact assessment and planning of NEP measures*

3.7.1 Assessment of NEP Measures

The proposal of measures was determined in the draft NEP proposal with respect to the technical feasibility and economic viability of the measures, with the aim of meeting the requirements for the attainment of energy objectives by 2020. Each of the measures proposed in the draft NEP proposal was assessed in terms of environmental objectives by observing available information on the state of the environment and its sensitivity in the area where measures are implemented. NEP measures and important impacts of the measures are outlined in Appendix 5.

For most of the information on the state of the environment, cartographic data are known, which enabled the assessment of adverse environmental impacts to be assessed by overlaying areas where measures are implemented over areas with sensitive environment conditions, both in terms of the scope of the impact and the probability of adverse impacts occurring.

The quality of the available information on the state of the environment was assessed in all cases, while the precautionary principle was applied in the environmental impact assessment. In addition to the environmental impact assessment, the requirements for additional research necessary for the spatial planning level of environmental impact management were defined for each measure (CEIA procedure for the spatial plan for the siting of an NEP measure).

Areas with potential for energy development in the long term (after 2030) are not defined in this Environmental Report. It is reasonable to expect that important technical changes in the energy sector will occur in the 2010–2030 period, the environmental impacts of which cannot yet be anticipated or assessed.

3.7.2 Assessment of Cumulative Environmental Impacts

Cumulative environmental impacts are defined in this Environmental Report as:

- cumulative influence on the environment, i.e. a combination of environmental impacts caused by the same or similar implementation of NEP measures in the same area, such as the cumulative environmental impact of several wind farms, and
- interactive environmental influence, i.e. a combination of environmental impacts caused by the implementation of a NEP measure and the implementation of measures of other activities, such as the cumulative impact on the aquatic environment because of the use of water in HPPs and agricultural production.

Cumulative impacts were assessed with respect to the attainment of environmental objectives. Certain cumulative environmental impacts were recognised as synergistic environmental impacts, meaning that different environmental impacts can occur as a result of a combination of individual environmental impacts.

Because the NEP proposal provides no information on the development of other activities in the area where a cumulative environmental impact could occur, options for the concurrent implementation of activities and measures of the NEP were taken into account in the assessment of cumulative environmental impacts based on the precautionary principle. In this sense, guidelines for the further environmental impact assessment were provided for individual NEP measures.

European guidelines (guidance documents) were observed in the assessment. When the cumulative nature of impacts was being established, programmes adopted at the state level were taken into account, while the cumulative nature of plans and interventions will be assessed at hierarchically lower levels of planning.

3.7.3 Assessment of NEP Scenarios (Alternatives)

3.7.3.1 Definition of NEP Scenarios (Alternatives)

The preliminary analysis of the long-term energy balance in the 2006-2026 period has shown that the energy policy measures adopted so far and the measures which were being prepared at the time will not suffice for the attainment of the target of a 25% share of renewable sources in the final consumption of energy which Slovenia has undertaken to achieve as part of the Climate and Energy Package (Directive 2009/28/EC). The NEP proposal fills this gap and plans additional implementing mechanisms to promote efficient energy use and renewable sources of energy in order to enable the attainment of the objectives.

Energy development scenarios are based on the following starting points:

- development challenges facing the Slovenian energy sector, including an analysis of external circumstances: international markets (energy prices, reliability of supply, prices of emission coupons); economic activities in Slovenia (added value and physical product, development of energy intensive industries) and global technological development and transport policy;
- alternative strategic guidelines for the energy sector which are part of a wider development policy of the state; Slovenia's international obligations; and the energy policy in the EU – which have already been adopted or and under preparation;
- the state of affairs in the energy sector; projects being implemented and alternatives that are in preparation based on projects, as well as analyses of the possibilities for projects in the areas of energy use and supply; in so doing, we are relying on analyses of technical, economic, environmentally acceptable and attainable options and increasing the attainable potential with energy policy instruments proposed in the NEP;
- analyses of the response of stakeholders in the energy sector to external factors and energy policy measures in different scenarios;
- quantitative assessment of the impacts of the mentioned factors relative to the set objectives.

The NEP will fully integrate the adopted measures stipulated by previous and new documents:

- National Energy Efficiency Action Plan for the 2008–2016 Period (EE AP)[2];
- Operational Programme for Limiting Greenhouse Gas Emissions by 2012 (OP GHG)[3];
- Operational Programme of Environmental and Transport Infrastructure Development 2007-2013 (OP ETID)[4];
- Action Plan for Green Public Procurement for the 2009-2012 Period;
- Renewable Energy Sources Action Plan 2010-2020;
- and other adopted measures in the area of energy as defined in the Energy Act, the Environment Protection Act, the Construction Act and related implementing regulations.

The NEP also assumes a series of measures for which comprehensive environmental impact assessments have been carried out or are underway, and plans a support environment for their implementation.

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2 http://www.mop.gov.si/fileadmin/mop.gov.si/pageuploads/dokumenti/akcijski_nacrt_energetska_ucinkovitost.pdf

3 http://www.mop.gov.si/fileadmin/mop.gov.si/pageuploads/zakonodaja/okolje/varstvo_okolja/operativni_programi/op_toplogredni_plini2012_1.pdf

4 http://www.svlr.gov.si/fileadmin/svlsrp.gov.si/pageuploads/KOHEZIJA/OP_ROPI_SLO_05.12.2006.pdf

As part of the expert groundwork for the NEP, a series of possibilities for the energy development strategy in Slovenia by 2030 has been analysed and assessed. With respect to the set objectives, six scenarios have been prepared and included in the detailed analysis (or six alternatives; hereinafter: scenario) for the NEP strategy, all of which were prepared for the purpose of the comprehensive environmental impact assessment.

Two scenarios (for strategy/measures) of energy policy in the area of so-called sustainable energy policy have been analysed: in the promotion of efficient energy use in all sectors, including increasing efficiency with new sources of energy in transport, the use of renewable energy sources, the co-generation of heat and electricity, and local energy supply. The two scenarios for the energy policy strategy in the EUE and RES areas are termed:

- "reference strategy" – urgent measures necessary for the fulfilment of obligations;
- "intensive strategy" – support environment for the implementation of all profitable projects of efficient use of energy ensuring greater economic effects and advantages in the technological race in the area of green energy technologies;

For comparison, a scenario without additional EUE and RES measures has also been assessed, which is, however, is not fit for further discussion, because it does not meet the obligations undertaken under the Climate and Energy Package.

The reference strategy assumes the continuation of existing measures and the strengthening of their implementation, with the aim of meeting the requirements stipulated by the EU, while the intensive strategy assumes a more active policy in Slovenia on the efficient use of energy and renewable sources of energy to accelerate the transition to a low-carbon society, which means that, in the intensive scenario, Slovenia exceeds the requirements which it has undertaken within the scope of the EU. The strategies differ primarily in terms of the impacts from 2020 to 2030. The analysis has pointed to the advantages of the intensive promotion of the efficient use of energy and renewable sources of energy, both from the energy and environmental and the economic points of view. An even bigger contribution to improving the competitiveness of the economy with the promotion of the implementation of measures for the efficient use of energy and renewable sources of energy will be made if the areas of promoting the efficient use of energy and renewable sources of energy are included as priority areas of the development strategy of the state.

External circumstances – added value and physical product are provided as a mean value (biggest probability) and a possible range, while transport policy is provided in the form of two scenarios, namely sustainable transport policy and unsustainable transport policy. Slovenia's transport policy will affect the scope of work in the transport sector and the selection of transport methods, while Slovenian and European policies (transport policy etc., further enlargement of the EU, European commodities market, taxation of energy sources) will affect the volume of transit through Slovenia, the purchasing of motor fuel in Slovenia and the associated final consumption of energy. The transport policy will considerably affect the attainment of the objectives of the state undertaken under the Climate and Energy Package by 2020: the objectives of the state regarding the reduction of greenhouse gas emissions (Decision No. 406/2009/EC), the share of renewable sources of energy (Directive 2009/28/EC) and the efficient use of energy (COM (2010)2020)). Other external factors are presented with only one scenario, and the projections of international prices are based on international analyses (IEA, World Energy Outlook 2009, etc.).

The impacts of energy scenarios were verified with an analysis of sensitivity to traffic trends, especially the fulfilment of international obligations with regard to GHG and NO_X[5].

[5] Only some of the impacts affecting the use of energy in traffic are the subject of the energy policy (these are mainly measures for the promotion of the efficiency of vehicles and driving, and the replacement of an the energy source), while

Three scenarios for electricity supply for the NEP have been considered and assessed:

- the basic scenario – investments in thermal energy generation facilities that are underway in accordance with planning on the basis of lowest production costs, an extension of the service life of the Krško Nuclear Power Plant (NEK), the facilitation of the construction of planned hydroelectric power plants, the modernisation of co-generation of heat and electricity;
- the NPPK2 scenario for a second reactor at the KRŠKO NPP (upgrade of the basic scenario) – to ensure the long-term utilisation of nuclear energy in Slovenia, to extend the service life of the NPP and to build a new NPP adjacent to the location of the existing NPP; to ensure the simultaneous operation of both NPPs over the long-term, as well as the construction and start of operations between 2022 and 2030;
- scenario with natural gas (upgrade of the basic scenario) – to ensure with a fourth energy source greater diversification of sources than is currently the case in the supply of electricity, the construction of two combined-cycle gas and steam power plants by 2030.

The originally assessed scenarios for the NEP did not verify the strategic aspects of the investments that were underway. Because of dilemmas that raise concerns in public circles and associated with investments in the project for the construction of Unit 6 of the Šoštanj Thermoelectric Power Plant that was underway, two additional scenarios for electricity supply were analysed. These scenarios enable an assessment of the strategic aspects of energy development should the investment be discontinued[6]. Other investments underway and measures already adopted were not verified in the analysis. Additional scenarios assume the closing of the VCM in 2027 and the overhaul and environmental rehabilitation of Units 4 and 5 at the Šoštanj HPP. The platform for the scenarios remains the preservation of a comparable level of electricity generation in the country - just as in the basic scenario - the preservation of all the functions of electricity generation and distribution system in the country, including system services, and the preservation of the level of diversification of sources for the supply of electricity. The platform also sheds light on the consequences of reducing electricity generation from domestic coal. Additional scenarios are assessed with consideration of the intensive development of the use of electricity and its scattered generation. The version with the reference strategy of promoting efficient use and local supply was not analysed. Additional scenarios are:

- **the additional nuclear scenario (ADD_NPP)** without Unit 6 at the Šoštanj HPP takes into account the construction of a combined gas-steam electric power plant with 400 MW and a NPP with 1000 MW of power;
- **the additional gas scenario (ADD_GAS)** without Unit 6 at the Šoštanj HPP takes into account the construction of two CCGSPPs with the combined power of 800 MW.

The 1600 MW NPPK2 option is treated as a sub-version of both nuclear scenarios (NPP_INT and ADD_NPP).

For other energy areas,: namely the transmission of electricity and natural gas, the uniform development scenario was assessed for the NEP; however, priority measures were defined within the scope of sub-sectors. Within the scope of horizontal NEP measures, energy development is linked

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other measures that significantly affect the scope of traffic work and/or the selection of a transport method and thereby the consumption of energy are the subject of traffic, tax, spatial planning and other policies, i.e. the comprehensive sustainable traffic policy· Because the measures of these policies will play a key role in the fulfilment of energy objectives set by Slovenia under the Climate and Energy Package, the sensitivity analysis verified the fulfilment of objectives in the event that certain measures of the comprehensive sustainable traffic policy that do not fall within the scope of the energy policy were not adopted (only energy policy objectives for the efficient use of energy and the introduction of new energy products would be implemented, while traffic policy measures would not be implemented).

[6] The analysis is limited to the assessment of the strategic aspects of energy development without Unit 6 of the Šoštanj HPP and is not detailed enough for the assessment of the consequences of the termination of the investment from the point of view of the company or the projects.

primarily to the following policies: tax, housing, spatial planning, education and training, R&D, and the general development policies of the state. These are on a scale that supports measures aimed at sustainable use and the local supply of energy, as well as energy supply for all sectors, which significantly affects the impacts of the NEP.

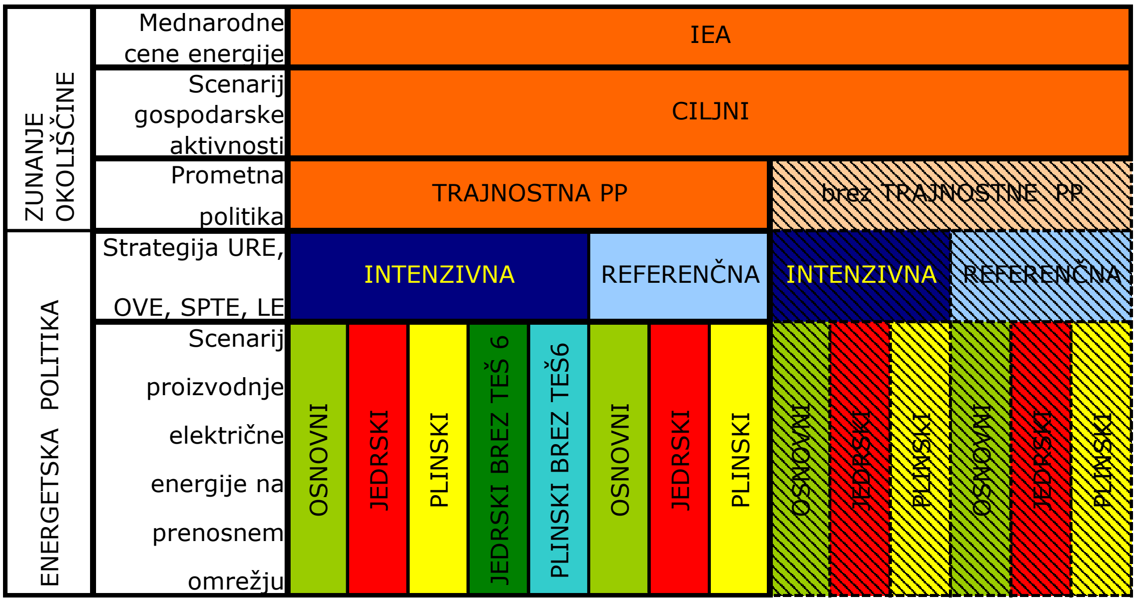

Figure 5: Combination of NEP scenarios

Figure 5 shows a frame with upright rectangles representing individual scenarios within which NEP sub-programmes are combined into three groups: the group of NEP sub-programmes, or measures within the scope of the former that pertain to:

- traffic policy,
- EUE and RES measures,
- electricity generation in large electric power plants.

Scenarios that meet the objectives of the EU Climate and Energy Package in terms of EUE and RES measures as well as those for the use of energy in traffic, are designated hereinafter with the suffix »_REF«, while scenarios with more intensive EUE and RES measures and sustainable traffic policy are designated »_INT«.

The scenario envisaging the overhaul of large electric power plants is designated »BAS_«, while that which envisages the construction of a new NPP is designated »NPP_«; finally, the scenario that envisages the construction of a new combined cycle gas-steam turbine electric power plant is designated »GAS_«.

The meaning of the designations for NEP scenarios used in the comparative analysis of environmental impacts is presented in the table below.

Name of the NEP scenario	Designation
Basic scenario / **Reference** strategy	**BAS_REF (OSN_REF)**
Nuclear scenario / **Reference** strategy	**NPP_REF (JE_REF)**
Gas scenario / **Reference** strategy	**GAS_REF**

Basic scenario / **Intensive** strategy	**BAS_INT (OSN_INT)**
Nuclear scenario / **Intensive** strategy	**NPP_INT (JE_INT)**
Gas scenario / **Intensive** strategy	**GAS_INT (PLIN_INT)**
Additional nuclear scenario / **Intensive** strategy	**ADD_NPP (DOD_JE)**
Additional gas scenario / **Intensive** strategy	**ADD_GAS (DOD_PLIN)**

3.7.3.2 Method for the Evaluation of Environmental Impacts of Individual Scenarios

An individual NEP scenario is comprised of sub-programmes that are in turn comprised of measures. The assessment of environmental impacts caused by NEP sub-programmes or their measures, which is described in detail in chapter 5 of this Environmental Report, is based on the assessment of the importance of an environmental impact in terms of the individual aspects of environmental impacts: natural resources, air, waters, natural and cultural heritage, climatic factors, landscape, health, and material assets.

The method for assessing environmental impacts of NEP sub-programmes and their measures described in chapter 5 is not suitable for an international comparison of environmental acceptability assessments of NEP scenarios in terms of the total impact on the environment. An individual NEP scenario is made up of sub-programmes or their measures, for which environmental impact assessments are produced according to this assessment method for each aspect separately; the assessment of the total impact of a NEP scenario is not possible, because this assessment method does not include a mutual evaluation of these aspects.

This is why the evaluation of environmental impacts of individual NEP scenarios employs a multi-parameter method of evaluation of environmental impacts caused by an individual NEP scenario, whereby it is used:

- for seven parameters used to describe the impacts on natural resources (forest and soil), waters, natural and cultural heritage, health, landscape and material assets in order to evaluate the classification of the impact into one of the 16 classes in terms of its importance,
- while a monetary evaluation of these impacts is used for the three parameters used to describe the environmental impacts caused by the creation of waste, emissions of pollutants into ambient air and GHG emissions. This evaluation is assessed based on the marginal external environmental costs caused by the creation of waste (natural resources), emissions of pollutants into the air and GHG emissions.

The selected evaluation of the environmental impacts of individual NEP scenarios represents an upgrading of the environmental impact assessment used for the assessment of the environmental acceptability of individual sub-programmes and their measures. The evaluation method is described in chapter 5 of this Environmental Report.

3.7.3.2.1 Description of the Classification of Environmental Impacts into Classes

The classification of environmental impacts in terms of their importance into 16 classes from the point of view of impacts on natural resources (forest and soil), waters, natural and cultural heritage, health, landscape, and material assets represents the environmental impact assessment for the purpose of mutual comparison of NEP scenarios and is considered an additional assessment of the acceptability of environmental impacts with respect to the assessment of NEP sub-programmes and their measures as described in chapter 5 of this Environmental Report.

The additional assessment of environmental impacts evaluates the impacts of sub-programmes and their measures that make up an individual NEP scenario in terms of the change of quality in the environment (character and level of change) and in terms of the scope of changes in the environment that result from these impacts. The method of additional environmental impact assessment is shown in the table below.

Table 3: Additional assessment of environmental impacts

Impact on the environment (the greater the product of grades, the greater the negative (positive) impact)			**Scope of the negative (positive) change**		
			small, spatially limited, point source and local impact	moderate, reflected in the wider environment, in the corridor, at the regional level	extensive, reflected in the entire environment, at the national level
			1	2	3
Character and level of change in the state of the environment	Distinctly positive change	+2	**2**	**4**	**6**
	Positive change	+1	**1**	**2**	**3**
	No change in the environment or the change is negligible	0	**0**	**0**	**0**
	Negative change – small	-1	**-1**	**-2**	**-3**
	Negative change – moderate	-2	**-2**	**-4**	**-6**
	Negative change – grave	-3	**-3**	**-6**	**-9**

An environmental impact of an individual sub-programme or measure is classified into classes from »-9« to »+6« with respect to the product of the grade according to the »character and level of change in the state of the environment« and the grade according to the »scope of negative (positive) change«.

The NEP scenarios are compared with one another in terms of individual aspects of environmental impacts with respect to the sum of grades from the classification of environmental impacts into classes, both by all of the assessed sub-programmes and by measures based on the following equation:

$$C_{scenarij} = \sum_{i=1}^{i=I} c_{zn,i,j} * c_{ob,i,j}$$ [7]

where:

$C_{scenario}$ is the grade for the environmental impacts of an individual scenario,
$c_{zn,i,j}$ is the grade according to the character and level of change in the state of the environment,
$c_{ob,i,j}$ is the grade according to the scope of negative (positive) change,
i, I is the number of assessed sub-programmes or measures within an individual scenario,
j is the consecutive number of an aspect of environmental impacts, to which the impact assessment applies.

3.7.3.2.2 Description of the Financial Evaluation of Environmental Impacts

[7] Translator's note: *scenarij* means scenario.

Within the scope of the financial evaluation of environmental impacts on waste creation, air and climatic factors:
- the values used for the financial evaluation of environmental impacts on air and climatic factors as a unit of environmental damage are those of the external environmental costs already established in the EU and assessed based on the methods for determining marginal social costs resulting from the impacts of GHG emissions on climatic factors stipulated in the report entitled »The Impacts and Costs of Climate Change«[8] , while the values used for the emission of pollutants are those of external environmental costs defined by the Commission in 2005 for individual countries of EU25[9],
- the values used for the financial evaluation of environmental impacts on waste creation as a unit of environmental damage are those of the environmental costs caused by waste disposal that have already been established in the EU,
- the period during which environmental damage occurs is used as an important factor of the unit of damage within a certain range for the assessment of environmental impacts on waste creation, air and climatic factors for an individual pollutant. The temporal dependence of external environmental costs caused by waste creation, the emission of pollutants and GHG emissions is used similarly to the discounted values of financial costs.

The discounted value of environmental costs as a result of environmental impacts on natural resources (waste creation), air and climatic factors is calculated as follows:

$$C_{ext,j} = \frac{c_{ext,odpadki}}{(1+r)^j} M_{j,odpadki} + \sum_{i=1}^{i=N} \frac{c_{ext,i}}{(1+r)^j} M_{i,j}$$ [10]

where:

$\boldsymbol{C_{ext,j}}$ is the discounted value of environmental costs in year ***j***, expressed in euros,
r is the discount rate (usually, the value used is 3.5%),
$\boldsymbol{C_{ext,waste}}$ are the marginal environmental costs caused as the result of impacts of waste creation (fly ash and slag) on the environment, which is expressed in euro/t of waste created,
$M_{j,waste}$ is the quantity of waste created in year ***j***,
$\boldsymbol{c_{ext,i}}$ are the marginal environmental costs caused as the result of environmental impacts of the emission of substance 1 t ***i*** into the air, which is expressed in euro/t of emissions of the substance,
i substance ***i***: CO_2, NH_3, SO_2, NO_x, $PM_{2,5}$, NMVOC and radio-active substances,
$M_{i,j}$ is the quantity of emissions of substance ***i*** in year ***j***, and
j is the year for which the discounted value of environmental costs is calculated.

The total environmental costs as the result of the environmental impacts on air and climatic factors is calculated for an individual NEP scenario based on the following equation:

$$C_{ext} = \sum_{2010}^{2030} c_{ext,j}$$

where:
$\boldsymbol{C_{ext}}$ is the net current value of total external environmental costs as the result of environmental impacts on air and climatic factors because of the implementation of an NEP scenario in the 2010–2030 period.

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[8] The Impacts and Costs of Climate Change; Final Report September 2005, AEA Technology Environment in Stockholm Environment Institute, Oxford; Commissioned by European Commission DG Environment Prepared as task 1 of the project 'Modelling Support for Future Actions – Benefits and Cost of Climate Change Policies and Measures';
[9] Clean Air for Europe (CAFE) Programme: Damages per tonne emission of PM2.5, NH3, SO2, NOx and VOCs from each EU25 Member State (excluding Cyprus) and surrounding seas.
[10] Translator's note: *odpadki* means waste.

The application of the discount rate in the calculation of total external environmental costs has a certain significance, provided that the implementation of sub-programmes in individual NEP scenarios is distributed variably over time within the period of 2010–2030 of measure implementation. Because the temporal distribution of measures in the case of the considered NEP scenarios is not of key importance for the evaluation of scenarios, current values of external environmental costs are used for the mutual comparison of NEP scenarios, rather than discounted values..

The environmental benefits of implementing an individual NEP scenario need to be used in the evaluation of the economic efficiencies of NEP scenarios. When ascertaining the economic efficiencies of investments in the implementation of an individual NEP scenario, the net current value of environmental benefits of the scenario must be added to the net current value of the economic benefits of the NEP scenario in question; however – in so doing – it should be taken into account that certain environmental costs have already been internalised (the costs of impacts on climatic factors due to direct emissions of GHG and costs generated by waste creation).

Marginal environmental costs caused by pollution of ambient air

Marginal environmental costs $\boldsymbol{C_{ext,i}}$ are indicated for individual substances in the table below. The marginal environmental costs of CO_2 emissions are the same for all EU Member States (19 euro/t of CO_2 – lower grade and 80 euro/t of CO_2 – higher grade), while the marginal environmental costs for the emissions of pollutants are country-specific for each EU Member State.

Marginal environmental costs caused by GHG emission include all forms of anticipated social costs that arise or could arise because of the impacts of these emissions on climatic factors, including adverse impacts on nature. The evaluation of impacts on climatic factors is otherwise global; however, the social costs resulting from these impacts depends on the social wealth of the area for which the costs are evaluated. For EU Member States, the entire territory of the EU27 is considered as a uniform territory for the purposes of evaluating the marginal environmental costs caused by GHG emissions.

Marginal environmental costs for pollutants are calculated separately for each EU Member State and comprise the external environmental costs caused by impacts on human health due to the creation of $PM_{2.5}$ and ground-level ozone, as well as the costs caused by impacts affecting plant life that caused by the creation of ground-level ozone. The calculation of marginal environmental costs is assessed separately for each EU Member State because the method for calculating marginal environmental costs takes into account both the route and type of influence and the impact on the recipient. The method is therefore based on an analysis of:

- pollutant emissions,
- dispersion of pollutants,
- exposure of the population, ecosystems and material assets,
- quantitative status of impacts, and
- the evaluation of the consequences of impacts.

Table 4: Marginal environmental costs for GHG and pollutant emissions for Slovenia in 2010

Substance type	**Low price (€/t)**	**High price (€/t)**
CO_2 equiv.	19	80
NH_3	13,000	37,000
SO_2	5,600	16,000
NO_x	6,700	18,000
$PM_{2,5}$	22,000	64,000
NMVOC	1,400	4,400

The marginal environmental costs are expressed in euros-2005, while for the marginal environmental costs of pollutants, the creation of secondary $PM_{2.5}$ particles due to chemical processes in the air, to which SO_2, NH_3 and NO_x are exposed, is taken into account.

The marginal environmental costs caused by GHG emissions are also taken into account in the evaluation of environmental impacts on climatic factors for the operation of the NPP, HPPs and wind farms. These marginal environmental costs are assessed based on data on GHG emissions occurring over the entire life cycle of the NPP, HPPs and wind farms (LCA), while in the case of the NPP, they also include GHG emissions created in the production of fuel. The marginal environmental costs of GHG emissions created in the generation of electricity at the NPP and renewable energy source-powered electric power plants are estimated at 25 to 100g CO_2 equiv/kWh$_e$ of electricity generated, or from 0.06 to 0.25 cent €/kWh$_e$[11].

It is estimated that, in 2007 in Slovenia, the marginal environmental costs of electricity generation from coal, which causes emissions of substances into the air, were from 4.6 to 16.2 cent €/kWh$_e$, while external environmental costs of generation from liquid fuels (heating oil, residual fuel oil, LPG) were from 3.9 to 13.4 cent €/kWh$_e$. In the generation of electricity from natural gas, external environmental costs are estimated to be from 2.9 to 10.4 cent €/kWh$_e$[12]. GHG emissions from other stages of the life cycle of a fossil fuel-powered electric power plant - such as GHG flu emissions -are estimated at 100g CO_2 equiv/kWh$_e$, so that the associated marginal environmental costs are estimated at 0.25 cent €/kWh$_e$.

For the purposes of comparing NEP measures, the marginal environmental costs of electricity generation calculated for Slovenia are not the most suitable. Because the NEP scenario comparisons compare the various techniques for electricity generation (use of different fuels), those environmental costs of electricity generation have been selected for the comparison of scenarios that are indicated for the various techniques and uses of fuel by the European Environment Agency[13], namely from 8 to 26 for electricity produced from coal, from 7 to 22 for electricity produced from liquid fuels, and from 2 to 5 cent €/kWh$_e$ for electricity produced from natural gas. These environmental costs also comprise the damage caused by GHG emissions. If the environmental costs of the average emission of GHG in the generation of electricity (0.6 kg CO_2 equiv/kWh$_e$) - amounting to around 1.5 cent €/kWh$_e$ at the price of 25 EUR/t CO_2 equiv - are subtracted from these values, the costs of electricity generation due to the emission of SO_2, NO_x and VOC from the use of coal are from 7 to 25 cent €/kWh$_e$, while they are from 6 to 21 for generation from liquid fossil fuels, and from 1 to 4 cent €/kWh$_e$ for generation from natural gas.

If GHG emissions from the entire life cycle are taken into account, the marginal environmental costs for nuclear energy are 0.1 cent €/kWh$_e$ (40g CO_2 equiv/kWh$_e$), and from 0.06 (wind farms) to 0.25 cent €/kWh$_e$ (solar power plant) for renewable energy sources. The external environmental costs of electricity generated are estimated at 0.19 cent €/kWh$_e$ (75g CO_2 equiv/kWh$_e$) for HPPs and 0.25 cent €/kWh$_e$ (100g CO_2 equiv/kWh$_e$) for sHPPs.

Marginal environmental costs caused by the risk of exposure of the population to radiation

The marginal environmental costs caused by the generation of electricity from nuclear energy are based on the assessment of GHG emissions over the entire life cycle of the NPP (0.1 cent €/kWh$_e$),

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[11] COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.

[12] External costs of electricity generation in Slovenia EN23, Environmental Agency of the Republic of Slovenia (ARSO), Environmental Indicators in Slovenia.

[13] EN35 External costs of electricity generation, European Environment Agency,

and on external environmental costs, because of the exposure of the population to radiation (0.19 cent €/kWh$_e$). External environmental costs caused by the exposure of the population to radiation are based on the assessment of years of life lost because of harmful ionising radiation (DALY – Disability Adjusted Life Years) and the estimated amount of external environmental costs of 50,000 €/DALY[14]. The estimate of years of life lost because of harmful radiation is based on the value of DALY/(1000 MW/year)=240, which is calculated for a 1000 MW NPP in its 50-year life cycle (this includes raw materials extraction, nuclear fuel production, construction, operation and decommissioning of the NPP).[15]

Marginal environmental costs caused by waste creation

The marginal environmental costs caused by waste creation (filter ash, gypsum and slag) are defined for the generation of electricity from solid fossil fuels and equals the average environmental costs of the disposal of ash and slag in landfills (from 80 to 100 €/m^3 of waste). The marginal environmental costs for the use of coal from the Velenje and Zasavje coalmines for energy generation purposes (from 15 to 20% of ash by mass in the coal, ash density of 2.6 g/cm^3, energy value of coal 11 MJ/kg and a 35% energy efficiency of electricity generation in HPPs) due to the environmental impacts of ash creation are 0.7 cent €/kWh$_e$. The marginal environmental costs caused by the creation of waste also comprise the costs of maintaining landfills after their closure and the costs of the permanent degradation of space at the landfill location.

Marginal environmental costs of imported electricity

For imported electricity, only the marginal environmental costs of GHG emissions are taken into account, namely in the amount of 750g CO_2 equiv/kWh$_e$ (average GHG emissions for 1 kWh$_e$ from electric power plants in the EU).

3.7.3.2.3 Presentation of the Assessment of Environmental Impacts of NEP Scenarios

The multi-parameter assessment of environmental impacts caused by the implementation of individual NEP scenarios is shown in the figure below, where the value of an individual impact is expressed in percentages of the highest assessed value of the impact of all scenarios that are compared with one another. The NEP scenario, to which the largest surface area is attributed in the multi-parameter assessment, has the greatest environmental impact.

[14] External costs of electricity generation in Slovenia EN23, Environmental Agency of the Republic of Slovenia (ARSO), Environmental Indicators in Slovenia.

[15] Estimation of the Years Of Lost Life (YOLL) as a consequence of the nuclear fuel cycle; Ove Edlund; Studsvik Eco & Safety AB; Sweden, 2001.

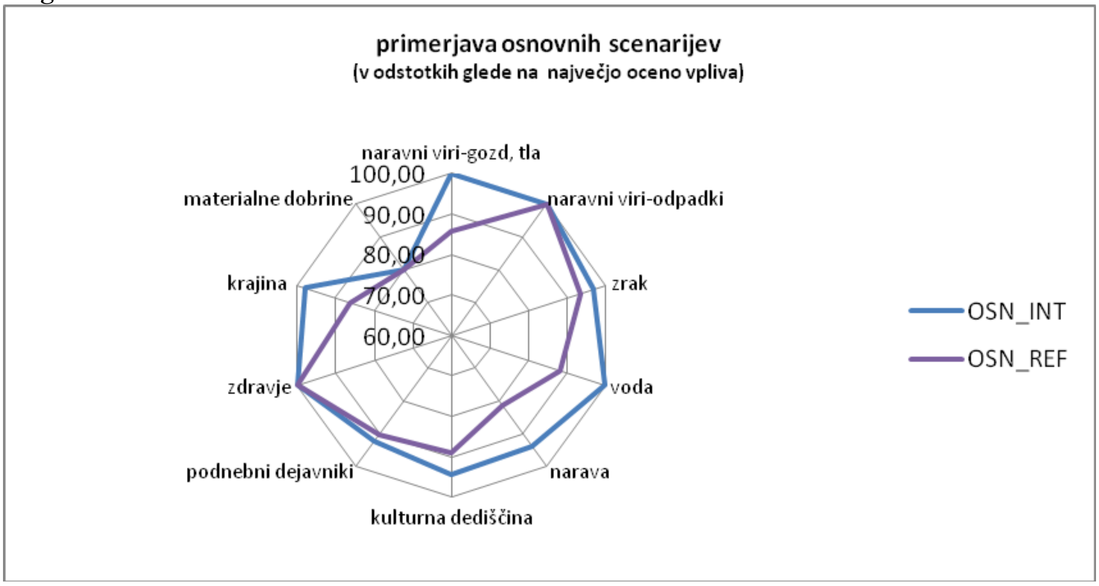


Figure 6: Presentation of the assessment of environmental impacts of NEP scenarios

3.7.3.2.4 Findings in the Event of Variant Solutions for Locations

During the preparation of the National Energy Programme, an expert groundwork report was produced entitled 'Comprehensive Overview of Potentially Suitable Areas for Wind Energy Utilisation' (Aquarius, 2011). In addition to the potential locations for wind farms included in the NEP, the report also examines other areas from the register of energy permits or other records. It was found that 14 areas encroach on important nature protection areas and would significantly affect individual species and habitat types or the integrity and functional connectedness of these areas. These areas are assessed as unacceptable, which is why they were excluded during the drafting of the NEP and are not treated in this Environmental Report. The areas with wind farms that affect protected areas and were excluded from the NEP during the harmonisation period (Aquarius, 2011) are:

WF locations from records	Definition of activities affecting important nature protection areas
WF Dolge njive	- the wider area of the location coincides with the *wider area of Natura 2000 SPA: Kamnik – Savinja Alps and eastern Karavanke (ID No. SI5000024) and the wider area of Natura 2000 SCI: Kamnik – Savinja Alps (ID No. SI3000264)*
WF Zvoh	- partial overlap with the *wider area of Natura 2000 SPA: Kamnik – Savinja Alps and estern Karavanke (ID No. SI5000024) and the wider area of Natura 2000 SCI: Kamnik – Savinja Alps (ID No. SI3000264)*
WF Krvavec	
WF Križišče	- inside a part of the area of *Natura 2000 SCI: Kamnik – Savinja Alps (ID No. SI3000264)*
WF Velika planina	- the wider area of the location coincides with the *wider area of Natura 2000 SPA: Kamnik – Savinja Alps and estern Karavanke (ID No. SI5000024), an area regarded as a geomorphologically valuable natural feature: Velika Planina (reg. No. 1092)*
WF Menina planina	- the location is situated in the central part of the *area of Natura 2000 SCI: Menina (ID No. SI3000261)* and an *area regarded as a geomorphologically valuable natural feature: Menina planina (reg. No. 413)*
WF Rogla	- the location is situated in the centre *of Natura 2000 SPA and SPA - annexes: Pohorje (ID No. SI50000006)*
WF Tabor	- the location is situated in the *area of Natura 2000 SPA – annexes: Snežnik – Pivka (ID No. SI50000002)*
WF Golič	- the location is situated in the *area of Natura 2000 SPA – annexes: Kras (ID No. SI5000267), area of Natura 2000 SPA - annexes: Kras (ID No. SI5000023) and in an area with valuable botanical and zoological natural features: Golič – Lipnik – Kavčič – grasslands (reg. No. 4815)*

WF Slavnik	- the location is situated in the *area of Natura 2000 SCI: Kras (ID No. SI5000267), area of Natura 2000 SPA - annexes: Kras (ID No. SI5000023)*; *part of it lies in the Slavnik area of valuable botanical features and ecosystems (reg. No. 286)* and *the area of the Slavnik natural monument – peak and slopes*
WF Kokoš	- the location is situated in the *area of Natura 2000 SCI: Kras (ID No. SI5000267), area of Natura 2000 SPA - annexes: Kras (ID No. SI50000023)*
WF Nanos	- complex protection area of great symbolic significance – *area of Natura 2000 SPA: Trnovski gozd – southern edge and Nanos (ID No. SI5000021), area of Natura 2000 SCI: Trnovski gozd – Nanos (ID No. SI5000255)* and *an area of valuable geographic and geological features: Nanos (reg. No. 198);* part of the *area lies inside the landscape park: southern and western hillsides of Nanos*
WF Bate	- the location is situated in the *area of Natura 2000 SPA: Banjščice (ID No. SI5000007) and the area of Natura 2000 SCI: Banjščice – grasslands (ID No. SI3000034)*
WF Sleme on the Banjška planota plateau	- the location is situated in the *area of Natura 2000 SPA: Banjščice (ID No. SI5000007) and the area of Natura 2000 SCI: Banjščice – grasslands (ID No. SI3000034)*

The Vodnogospodarski biro Maribor produced a study in August of 2010 entitled *Verification of Locations from the Point of View of Nature Protection – Expert Groundwork for the Consideration of the HPP on the Mura River*. They found that the construction of a chain of HPPs on the Mura River is unacceptable in terms of nature protection and biotic diversity Locations for HPPs in the NEP and OP are not considered.

3.7.4 Optimisation of NEP Measures, and the Determination and Implementation of Mitigation Measures

The Environmental Report and NEP proposal were produced simultaneously. The condition for the preparation of this Environmental Report is the sufficiently early inclusion (environment) of protection mechanism in the drafting of the NEP for the purpose of planning NEP measures in a way that these measures devalue the environment to the least extent possible and, perhaps, even improve it. The assessment of impacts is therefore not envisaged as a verification procedure - a confirmation of environmental acceptability - but as an optimisation procedure. Work within the scope of the preparation of this Environmental Report was directed at: the provision of an environmental platform; the optimisation of NEP measures; the optimisation of spatial arrangements at the general level that arise from individual measures; and the definition of mitigation measures. Mitigation measures must be included primarily in the spatial plans when these are being drafted

The holder of spatial planning or energy planning authorisation and the investor are responsible for observing the guidelines and implementation of mitigation measures, while these measures are examined by the entity that produced the Environmental Report during the procedure of the comprehensive assessment of environmental impacts caused by spatial plans intended for the siting of individual structures for the implementation of NEP measures, and the Division for the Comprehensive Environmental Impact Assessment and individual holders of spatial planning authorisations when issuing an opinion. The success of the implementation of mitigation measures will be monitored with the indicators outlined in chapter 6.1, namely within the scope of state monitoring procedures.

3.8 Reporting

This Environmental Report outlines the results of the CEIA procedure in the form of a description and evaluation of the probable occurrence of important environmental impacts that may arise because of the implementation of NEP measures. So as to avoid repetition in reporting the results of the

CEIA procedure, this Environmental Report outlines only those sensitive features of the environment in the area of NEP measure implementation that are important for the strategic level of environmental impact management.

Where appropriate, mitigation measures are defined to reduce the negative environmental impacts caused by the implementation of NEP measures.

3.9 NEP Implementation and the Monitoring of Its Environmental Impacts

The key principles for implementing NEP measures and monitoring their environmental impacts ensure that the mitigation measures will be implemented so as to be useful and effective.

The purpose of monitoring NEP measure environmental impacts is to prove the appropriacy of the environmental impact forecasts and the success of mitigation measures. The results of NEP environmental impact monitoring will be used in future amendments to the NEP and within the scope of the CEIA procedure for such amendments.

Every four years, the NEP and the Environmental Report will be examined and supplemented or amended as appropriate.

3.10 Consultation

Consultations with stakeholders were of central importance for the development of the CEIA for the NEP. The engagement of stakeholders and the inclusion of the public play a significant role in collecting data, identifying key issues, defining environmental objectives and selecting priority measures in the draft NEP proposal.

Consultation activities comprised the following:
- sending requests for data and comments,
- circulation of draft documents to obtain comments, and
- meeting stakeholders and organising workshops that were open to the general public.

The dialogue with stakeholders ensured that all of aspects were taken into account in assessing the environmental impacts of individual NEP measures.

Consultations were held with:
- bodies responsible for protecting the environment, water, nature, mining, health, cultural heritage, landscape, agriculture and forestry,
- NGOs,
- entities involved in energy development, and
- bodies responsible for spatial planning.

Table 5: Overview of the main stages of consultations with stakeholders

Consultation stage	Purpose of the inclusion of stakeholders in the CEIA procedure	Stakeholders	Method for stakeholder inclusion	Key subject of the consultation
Determination of the scope of the environmental impact assessment	Determination of the requirements and scope of the CEIA for the NEP as a whole.	Representatives of competent bodies, entities responsible for energy development and NGOs.	Stakeholders' written comments on the proposed Report On the Determination of the Scope of the Comprehensive Environmental Impact Assessment for NEP.	Confirmation of requirements and scope of the CEIA, supplementation of the set of programmes and objectives associated with them that are relevant to the NEP.
Definition of key findings from the consideration of the proposal on the requirements and scope of the CEIA and the definition of important environmental impacts	Presentation of the key findings from the consideration aimed at the determination of the scope of the CEIA for NEP and the presentation of important environmental impacts caused by the implementation of NEP.	Representatives of competent bodies, entities responsible for energy development and NGOs that took part in deliberations on determining the scope of the CEIA.	Stakeholders' written comments on the proposal of the description of important environmental impacts caused by the implementation of NEP.	Confirmation of the description of important environmental impacts.
Preliminary environmental report: **Final definition of environmental objectives and assessment of the environmental impacts of individual sub-programmes and NEP alternatives**	Presentation of the environmental objectives and assessments of environmental impacts of NEP sub-programmes and alternatives stipulated in the preliminary Environmental Report that are relevant to the CEIA.	Representatives of competent bodies	Stakeholders' written comments on the draft Environmental Report proposal for the NEP.	Confirmation of the relevant environmental objectives and key findings from the draft Environmental Report proposal for the NEP.
Public discussion on the NEP proposal and the Environmental Report	Acquisition of comments on and proposals for amendments or supplementation of the Environmental Report for the NEP.	The public and all stakeholders (competent bodies, entities responsible for energy development and NGOs).	Environmental Report available at the website of the Ministry of the Economy. Opinions regarding the Environmental Report are obtained via e-mail.	Acquisition of opinions regarding the Environmental Report. Consultations and presentations of the Environmental Report. Wider public awareness-building on the need to implement NEP measures.
Production of the final version of the NEP proposal and Environmental Report	Review of opinions from the public discussion and the preparation of replies and position statements with regard to the opinions stated in the public discussion.	The public and all stakeholders (competent bodies, entities responsible for energy development and NGOs).	Additional consultations with bodies and groups that took an active part in the public discussion.	Acquisition of additional opinions for the formulation of the final version of the Environmental Report.
Publication of the final version of the NEP proposal and	Provision of information to stakeholders on the	The public and all stakeholders (competent bodies,	Publication of the final version of the NEP proposal and	Acquisition of additional opinions regarding the final

Environmental Report	final version of the NEP proposals and Environmental Report	entities responsible for energy development and NGOs).	Environmental Report at the website of the Ministry of the Economy.	version of the NEP and Environmental Report.

3.11 Assumptions for the Comprehensive Environmental Impact Assessment

The National Energy Programme assessed in this Environmental Report is the key strategic document for energy development in Slovenia, with four objectives set for the period up to 2030. The findings of the Environmental Report primarily influence the achievement of the third objective - promoting environmental sustainability and countering climate change. Within this scope, it is assumed that the measures for achieving other objectives proposed in the draft NEP are urgent and that only those that are environmentally unacceptable will be excluded from the final document.

The Environmental Report does not treat those concrete interventions that have already been or that are currently in the process of adoption of a spatial planning act. It is assumed that the methodology for the environmental impact assessment used in these cases was or is comparable to the one used in this report.

The Environmental Report provides a detailed treatment of the measures or interventions for which spatial information is provided in the NEP and which are not yet in a procedure for the adoption of spatial planning acts or the comprehensive environmental impact assessment. Such measures are: potential areas for the siting of wind farms in the entire territory of Slovenia; the chain of HPPs in the midstream section of the Sava River; the possibility of exploiting the water potential of the Mura River; the Okroglo – Udine long-distance power line; the Cirkovce - Podlog long-distance power line; and the M9b gas pipeline.

The report proposes guidelines and mitigation measures for individual NEP measures or groups of measures that are to be taken into account later on within the scope of spatial planning.

Because a more detailed assessment of impacts on archaeological heritage at the level of the strategic assessment of the impacts of NEP measures is not possible, this Environmental Report provides only a warning with regard to known archaeological areas to which special attention must be given at the level of the detailed siting of spatial interventions and the assessment to be performed at that time.

4 Legislative Framework and Association with Other Programmes

4.1 Introduction

The wider legislative framework associated with the implementation of NEP measures the environmental impacts of which are evaluated in this Environmental Repor was reviewed within the scope of the CEIA procedure for NEP. This wider review of the legislative framework comprised primarily the impacts of NEP measures on the attainment of environmental objectives that are defined in other (non-energy-related) policies, plans or programmes.

The NEP proposal was produced in accordance with the objectives and norms derived from prescribed environmental starting points, including international legislation, and guidelines arising from EU legislation on the environment.

The NEP proposal is the national strategic framework for energy and the medium-term vision for its development. Just as other plans and programmes affect the implementation of NEP measures, the latter will also affect the implementation of other plans and programmes. This mutual influence of plans and programmes includes:

- the legislative framework pertaining to interventions in the environment or siting during the implementation of NEP measures in all phases of their implementation,
- the framework of development strategies of Slovenia, and
- environmental plans and programmes for especially sensitive (protected) areas.

The review of (non-energy-related) policies, plans or programmes that could affect the implementation of NEP measures has contributed to the definition of:

- environmental objectives that are important for the assessment of the impacts of individual NEP measures,
- other factors, including environmental aspects that were taken into account in the planning of NEP measures, and
- mutual benefits and cumulative environmental impacts that could arise because of the mutual influence of individual alternative NEP measures and the implementation of other plans and programmes.

Important aspects of other (non-energy-related) policies, plans and programmes are described in chapter 7 of this Environmental Report.

4.2 Relationship between the CEIA and the Spatial Siting of Energy Measures

Information obtained during the CEIA procedure for the NEP will be used in further environmental impact assessments, i.e. CEIA procedures for spatial plans, and in EIA procedures if the implementation of NEP measures involves the construction of structures or the use of environmental goods.

The environmental impact assessment within the scope of CEIA, as a rule, includes the larger plants for electricity and heat generation, structures for the transmission and distribution of such energy, and all interventions in the environment that impact areas that are safeguarded and protected in accordance with regulations governing nature protection.

Plants for electricity and heat generation and structures for the transmission and distribution of such energy are ranked in accordance with the regulations governing spatial planning among structures of the energy infrastructure of national or municipal importance. In order to determine sites for these locations, it is necessary to ensure the comprehensive assessment of environmental impacts of the spatial plan, namely in areas that have previously been envisaged for the generation of electricity in strategic state programmes, such as the Spatial Planning Strategy of Slovenia or the NEP.

Definition of the structures of the energy infrastructure with respect to their siting is shown in the table below.

Table 6: Spatial planning procedures for siting structures of energy infrastructure

Type of plant or infrastructure	National Energy Programme/Strategic Spatial Plan	National spatial plan	Municipal spatial plan	Comprehensive environmental impact assessment
HPPs	>10 MW_e	>10 MW_e	≤10 MW_e	*≥1 MW_e*
Wind farms	field >10 MW_e	field >10 MW_e	field ≤10 MW_e	*≥10 MW_e in protected areas ≥0.5 MW_e*
Geothermal power plant	>16 MW_e	>16 MW_e	≤16 MW_e	>30kW_t
Thermal power plants and CHP power plants	>16 MW_e	>16 MW_e	≤16 MW_e	*≥50 MW_t*
Thermal power plants and CHP power plants fuelled by solid fuels from non-hazardous waste or non-hazardous waste incineration plants		> 1000 tonnes of waste per year	≤ 1000 tonnes of waste per year	> 100 tonnes of waste per day
Plants for the production of biofuels from biomass	-	-	✓	✓
Electricity transmission lines	≥110kV	≥110kV	<110kV	≥110kV and the length of 5 km in a settlement area or in protected areas
Gas pipelines and the heating or cooling distribution network	-	-	✓	for a pipeline diameter of 800 mm and length of 40 km or for a pipeline diameter of 500 mm and length of 5 km in protected areas
Plants for decentralised electricity generation, for heating or cooling – less demanding construction structures	-	-	✓	-
Plants for decentralised electricity generation, for heating or cooling – investment maintenance work	-	-	-	-

It is evident from the table above that the areas with electric power plants and district heating plants must be indicated in the NEP if their nominal production output exceeds the values defined in the second column as the threshold for the structure of infrastructure of national importance. In the "renewable energy sources" sub-programme, only those wind farms are included in the NEP that rank in terms of their electricity generation output among structures of the infrastructure of national importance.

The environmental impact assessment for plants and equipment for the generation of electricity and heat includes all of the phases of such a project, including the preparatory construction works, construction, operation and decommissioning.

The actual effect of the environmental impact of plants and devices for the generation of electricity and heat depends on the location of such a plant or equipment, the duration of an individual phase (preparatory works, construction, operation and decommissioning), the sensitivity of the recipient of adverse impacts, as well as the pressures on the existing state of the environment caused by other forms of activities.

4.3 Observation of Other Policies, Plans, Programmes and Environmental Objectives

In accordance with the Environment Protection Act, a position has to be taken on the wider framework of environmental policies, plans, programmes and environmental objectives in the procedure of the comprehensive assessment of the environmental impacts of NEP measures.

The table provided in Appendix 3 of this Environmental Report summarises the descriptions of the key environmental objectives that are defined in other (non-energy related) policies, plans or programmes and that significantly affect the planning and implementation of NEP measures. The explanations of the consequences provided in column three of the table in Appendix 3 describe the prohibitions, limitations or mitigation requirements for the planning and implementation of individual NEP measures that are the result of non-energy related plans or programmes aimed at the attainment of an environmental objective.

Within the scope of production of this Environmental Report, the compliance of the NEP with the Spatial Planning Strategy of Slovenia (SPRS, Official Gazette of the Republic of Slovenia, No. 76/04) - as the basic strategic spatial planning act and comprehensive spatial planning document that realises the concept of sustainable spatial development - was examined. The documents are not entirely compliant. The electricity generation sub-programme is non-compliant:

- electricity generation in HPPs: Hrastje Mota HPP and the Vržej HPP are located outside the graphically defined potential area for an HPP (notwithstanding the schematic representation in the SPSS);
- electricity generation from nuclear energy: the new NPP is not defined.

Table 1: Compliance of NEP with the SPSS

NEP sub-programme/measures	Compliance with SPSS/comment with respect to the provisions of the SPSS
1. EFFICIENT USE OF ENERGY	Yes/it needs to be achieved through interministerial cooperation and energy efficient urban planning and architectural design
2. USE OF ENERGY IN TRANSPORT	not the subject of SPSS
3. RENEWABLE SOURCES OF ENERGY	Yes/all RES types or NEP systems are defined, as is

3.1 Micro, small and medium-sized power plants	the energy released from the incineration of waste; the use of RES is promoted and included in the energy designs of regions, cities and local communities.
3.1.1 Wind farms	
3.1.2 Small HPPs	
3.1.3 Solar power plants	
3.1.4 Geothermal power plants	
3.1.5 Wood biomass fuelled CHPs	
3.1.6 Landfill gas, other bio gases and water treatment plants	
3.2 Heating systems using RES	
3.2.1 Geothermal heating systems	
3.2.2 Solar hot water panels	
3.2.3 Heating systems fuelled by wood biomass (WB)	
3.2.4 Heat pumps	
4. LOCAL ENERGY SUPPLY	Yes/it is realised within the scope of the energy design of regions, cities and local communities
5. CHP FUELLED BY NATURAL GAS	Yes/the promotion of construction of units for combined generation of heat and electricity is defined, whereby the use of natural gas as a resource is not defined.
6. GENERATION OF ELECTRICITY	Yes/the priority is the overhaul of existing generation units and RES
6.1 Generation of electricity from fossil fuels	Yes/the priority is the replacement of existing generators with cleaner technology or fuels; new thermal power plants are planned in locations alongside the existing thermal power plants; potential areas for thermal power plants are defined graphically; the construction of new thermal power plants fuelled by coal is not envisaged (note: the spatial planning act for the purpose of the construction of Unit 6 of the Šoštanj HPP has been adopted).
6.2 Generation of electricity in HPPs	Yes (with reservations)/HPPs are to be preserved on the rivers Drava, Sava and Soča, while new ones are to be built on the Sava River; utilisation of the Mura River is defined as potential – needs to be confirmed within the scope of the comprehensive solution for rehabilitation by dredging; the solution must be adapted to other uses and the preservation of biotic diversity; the potential area of use is defined from the border with Austria to the motorway bridge at Vučja vas on the inner Mura River; to determine peak energy, the pumped storage HPP is examined on the rivers Drava, Sava and Soča.
6.3 WB in large high-efficiency CHP units	Yes/the promotion of construction of units for the combined generation of heat and electricity is defined, whereby the use of WB as a resource is not defined.
6.4 Generation of electricity from nuclear energy	**No/**The Krško NPP is to remain operational, as is the extension of its service life, **while a new NPP has not been defined.**
7. TRANSMISSION OF ELECTRICITY	Yes/the assessed link with Italy is also defined.
8. DISTRIBUTION OF ELECTRICITY	Yes/in built or residential areas and areas of cultural heritage, priority is given to the cable version.
9. NATURAL GAS SUPPLY	Yes/long-term, secure and reliable supply from various sources is ensured, and international gas pipeline links are defined.
10. LIQUID FUELS	Yes/sufficient capacities for storage are to be ensured in existing locations and other locations that are accessible in terms of traffic connections, and acceptable from the point of view of the environment

	and spatial planning.

4.4 Legislative Framework that Was Observed

In accordance with the Environment Protection Act, environmental starting points must be taken into account in the procedure of comprehensive assessment of environmental impact, namely the state of the environment and its components, operational programmes, and:

- obligations arising from ratified and published treaties relating to the prevention and reduction of environmental burdens,
- protection, safeguarded, protected, degraded and other areas, in which a special regime is prescribed for the purpose of environmental protection, nature conservation, water regulation, protection of natural resources or cultural heritage,
- areas or parts of the environment that are grouped into classes and levels in accordance with regulations, and
- the legal regime in force in specific areas or parts of the environment.

This chapter summarises the descriptions of the key environmental objectives that are defined in other legal acts at the international, European and national levels significantly affect the planning and implementation of NEP measures.

Data on interventions are not known at the programme level, which is why the observation of individual acts on protection could not be verified. Precise locations are determined in the NEP only for certain interventions (wind farms, HPPs, long-distance power lines, NPP, gas pipeline). When the impacts of these interventions are described, the associated legislation and warnings are provided, namely that the said legislation must be observed in the subsequent phases of siting the interventions.

Natural resources, air, water and climatic factors

- Environment Protection Act (ZVO-1), Official Gazette of the Republic of Slovenia, Nos. 41/04, 17/06, 20/06, 49/06-ZmetD, 33/07-ZPNačrt, 57/08-ZFO-1A, 70/08, 108/09-ZPNačrt-A, 108/09; the Environment Protection Act regulates protection against environmental burdens as the fundamental condition for sustainable development, and within this framework; determines the fundamental principles of environmental protection; measures for environmental protection; monitoring of the state of the environment; and information on the environment, economic and financial instruments of environmental protection, public services for environmental protection and other issues related to environmental protection;
- Water Act (ZV-1), Official Gazette of the Republic of Slovenia, Nos. 67/02, 110/02-ZGO-1, 2/04-ZZdrI-A, 41/04-ZVO-1, 57/08; the water Act regulates the management of the sea, inland waters and groundwater (hereinafter: waters) and the aquatic and coastal land, whereby the management of waters, and aquatic and coastal land comprises the protection of waters, regulation of waters, and decision-making with regard to the use of waters;
- Energy Act (EZ-UPB1), Official Gazette of the Republic of Slovenia, Nos., 27/07 – official consolidated text, 70/08 and 22/10; the Energy Act defines the principles of energy policy; the rules for the operation of the energy market, methods and forms of operation of public utility services regarding energy; the principles of reliable supply and efficient use of energy, and the conditions for the operation of energy plants; the conditions for the performance of activities related to energy; the issue of licences and energy permit; and it also determines the bodies that perform administrative tasks under this act.
- Mining Act (ZRud), Official Gazette of the Republic of Slovenia, Nos. 56/99, 46/04-ZRud-A, 68/08-ZRud-B; the Mining Act regulates the exploration, utilisation and management of mineral

resources as a natural resource, irrespective of whether they are in the ground, on the surface in running or standing waters or in the coastal sea. This act lays down the method for conferring mining rights; the competences and method of issuing individual licences; and the organisation and method of implementation of the mining inspection service.

- Agriculture Act (Official Gazette of the Republic of Slovenia, No. 45/08 - ZKme-1); the Agriculture Act lays down the goals of agriculture policy; agriculture and countryside development planning; agriculture policy measures; the safety of foodstuffs of plant origin in primary production; the quality of foodstuffs in all phases of production, processing and trade; the protection of consumers' interests; the labelling of agricultural products or foodstuffs; trade in agricultural products and foodstuffs; the preservation of biotic diversity in agriculture; supplementary farm activities; public services, databases and the provision of information regarding agriculture; procedures and bodies for the implementation of this act; research, education, development and expert tasks, and inspection.
- Agricultural Land Act (Official Gazette of the Republic of Slovenia, No.), 55/03 - ZKZ-UPB1); this act regulates the use of agricultural land, its protection, trade and leasing, agrarian operations and common pastures. The provisions of this act are applied *mutatis mutandis* to forests, unless otherwise provided for by law.
- Act on Forests (Official Gazette of the Republic of Slovenia, Nos. 30/93, 13/98 - Constitutional Court decision , 56/99-ZON, 67/02 and 110/02-ZGO-1, 115/06, 110/07, 106/10); this act regulates the protection, cultivation, exploitation and use of forests and disposal of forests as a natural resource with the goal of ensuring sustainable and multi-purpose management.
- Decree on protective forests and forests with a special purpose (Official Gazette of the RS, Nos. 88/05, 56/07, 29/09, 91/10).

Nature

- Environment Protection Act /ZVO1-UBP1/ (Official Gazette of the Republic of Slovenia, No. 39/06): The purpose of environmental protection is to promote and direct social development which provides for long-term conditions for human health, well-being and the qualify of life, and also preserves biodiversity.
- Act on the Ratification of the Convention on the Conservation of European Wildlife and Natural Habitats – the Bern Convention (Official Gazette of the Republic of Slovenia, No. 55/99): The Convention defines the protection of wild flora and fauna and their habitats.
- Act Ratifying the Convention on Biological Diversity (Official Gazette of the Republic of Slovenia, No. 30/96): The goals of this convention are the preservation of biological diversity, sustainable use of its components, and the fair and just distribution of benefits from the use of genetic resources, together with adequate access to them and the appropriate transfer of adequate technologies, while taking into account all rights to these resources and technologies, and with adequate financing.
- Nature Conservation Act /ZON-UBP2/ (Official Gazette of the Republic of Slovenia, Nos. 96/04, 70/08, 108/09): The act lays down measures for the preservation of biodiversity and the system of protection of valuable natural features, with the aim of contributing to the conservation of nature.
- Triglav National Park Act (ZTNP - 1), Official Gazette of the Republic of Slovenia, No. 52/10).
- Act Determining the Conservation Area for the Soča River with Tributaries (Official Gazette of the Socialist Republic of Slovenia, Nos. 7/76, 8/76, 29/86, 83/89, 5/90, 10/91, 17/91, 55/92, 13/93, 66/93, 31/00, 110/02).
- Act on the Škocjan Caves Regional Park (Official Gazette of the Republic of Slovenia, No. 57/96).
- Decree on the categories of valuable natural features (Official Gazette of the Republic of Slovenia, Nos. 52/02, 67/03): Determines the categories of valuable natural features and protection guidelines for their protection.
- Decree on protected wild animal species (Official Gazette of the Republic of Slovenia, Nos. 46/04, 109/04, 84/05, 115/07, Constitutional Court decision 13. 03. 2008, 96/08, 36/09): This decree serves to protect endangered wild animal species, prescribe rules of conduct, a special protection regime, protection measures and guidelines for the preservation of habitats of animal species, with the aim of preserving the favourable status of these species.
- Decree on protected wild plant species (Official Gazette of the Republic of Slovenia, Nos. 46/04, 110/04, 115/07, 36/09): This decree serves to protect endangered plant species, prescribe rules of conduct, a special protection regime, protection measures and guidelines for the preservation of habitats of these species, with the aim of preserving the favourable status of these species.
- Decree on special protection areas (Natura 2000 sites) (Official Gazette of the Republic of Slovenia, Nos. 49/04, 110/04, 59/07, 43/08): This decree determines special protection areas (Natura 2000 sites) and protection objectives in these areas, as well as protection guidelines for the preservation or attainment of a favourable status of wild plant and animal species (hereinafter: plant and animal species), their habitats and habitat types, the conservation of which is in the interests of the European Union, and other rules of conduct aimed at the conservation of these areas.
- Decree on habitat types (Official Gazette of the Republic of Slovenia, Nos. 112/03, 36/09): This decree determines habitat types the favourable state of which is to be preserved as a priority with respect to other habitat types present in the territory of the Republic of Slovenia, and also regulates the guidelines for their conservation.
- Decree on ecologically important areas (Official Gazette of the Republic of Slovenia, No. 48/04): This decree determines ecologically important areas and protection guidelines for the conservation or attainment of a favourable status of habitat types and wild plant and animal species and their habitats in these areas.

- Decree on the quality required of surface waters supporting fresh-water fish life (Official Gazette of the Republic of Slovenia, Nos. 46/02, 41/04-ZVO1): This decree lays down the physical and chemical quality parameters for surface waters required to support fresh-water fish, determines and classifies the limit and recommended values for the parameters for salmonid and cyprinid fish species, and the obligation to perform monitoring.
- Rules on the designation of surface water sections important for fresh-water fish species (Official Gazette of the Republic of Slovenia, No. 28/05). These rules designate the surface waters and sections of surface waters (hereinafter: sections) that are important for the life of fresh-water fish, namely in accordance with the provision of Article 4 of Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life.
- Rules on the inclusion of endangered plant and animal species in the Red List (Official Gazette of the Republic of Slovenia, Nos. 82/02, 42/10). These rules designate plant and animal species that are endangered and are ranked with respect to the level of their endangerment in the Red List; the rules further lay down certain measures for the improvement of the status of endangered plant and animal species.
- Rules on the assessment of the acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas (Official Gazette of the Republic of Slovenia, Nos. 130/04, 53/06, 38/10). These rules lay down the content and detailed methodology for the acceptability assessment of impacts caused by the implementation of plans and activities affecting nature in protected areas, special protection areas and potential special conservation areas, as well as activities affecting the environment that can significantly affect these areas.
- Rules on the designation and protection of valuable natural features (Official Gazette of the Republic of Slovenia, Nos. 111/04, 70/06, 58/09, 93/10). These rules determine those parts of the natural environment that are categorised with respect to those of their properties that are recognised as valuable natural features into valuable natural features of national importance and valuable natural features of local importance, and govern the detailed protection and development guidelines and other compulsory rules of conduct aimed at their protection.

Cultural heritage

- Cultural Heritage Protection Act (Official Gazette of the Republic of Slovenia, No. 16/08).
- European Landscape Convention, European Treaty series No. 176, Council of Europe, 2000; Act Ratifying the European Landscape Convention (MEKK), Official Gazette of the Republic of Slovenia, No. 74/03).
- European Convention on the Protection of the Archaeological Heritage (revised), the Malta Convention, European Treaty Series No. 143, Council of Europe, 1992; Act Ratifying the European Convention on the Protection of the Archaeological Heritage (revised) (MEKVAD), Official Gazette of the Republic of Slovenia, No. 24/1999).
- Convention for the Protection of the Architectural Heritage of Europe – the Granada Convention (European Treaty Series No. 121, Council of Europe, 1985; Official Gazette of the SFRJ – International treaties, No. 4-11/1991; Act Notifying Succession to Conventions of the Council of Europe, Geneva Conventions and Additional Protocols on the Protection of War Victims and International Treaties from the Area of Armament Control Whose Depositories Are the Three Major Nuclear Powers, Official Gazette of the Republic of Slovenia, No. 14/1992).

Landscape

- Ordinance on the Spatial Planning Strategy of Slovenia (Official Gazette of the Republic of Slovenia, No. 76/04).
- Decree on the spatial order of Slovenia (Official Gazette of the Republic of Slovenia, No. 122/04).

- European Landscape Convention, European Treaty series No. 176, Council of Europe, 2000; Act Ratifying the European Landscape Convention (MEKK), Official Gazette of the Republic of Slovenia, No. 74/03).

5 Description and Evaluation of Environmental Impacts

5.1 Introduction

The implementation of NEP measures can cause numerous environmental impacts over the entire life cycle of measure implementation. This Environmental Report treats all phases of NEP measure implementation – from research activities prior to the implementation of a measure to the construction, operation and decommissioning of structures, the purpose of which is intervention in the environment for the implementation of an individual type of measure.

The actual environmental impact depends on the geographical and geomorphological characteristics of the area in which measures are implemented, as well as the time and approach to the implementation of the measure, and the sensitivity of the environmental conditions in that area. The CEIA procedure for NEP measures observes all of the potential important environmental impacts, which is evident for individual measures from the appendices to this Environmental Report.

Information on potential environmental impacts was obtained from literature and the review of studies and expert opinions that relate to the typical energy techniques envisaged for the planned NEP measures.

The environmental impacts of individual NEP measures are classified in the appendices to the Environmental Report with respect to the level of impact of environmental impact management on strategic impacts and the impacts that are important for the CEIA of the spatial planning act, based on which the measure is sited in space (regional level).

The appendices to the Environmental Report provide requirements for certain NEP measures both for the strategic level of assessment and the regional level, namely for additional studies or research to be performed specifically for individual areas if the sensitivity of environmental conditions in that area is unknown or if the occurrence of additional environmental impacts is anticipated.

5.2 Tables with Descriptions of Environmental Impacts

In the appendices to this Environmental Report, potential environmental impacts caused by the implementation of NEP measures are classified with respect to the phase of implementation of an individual measure, namely the pre-construction phase (survey for the best location and preparatory work at the construction site); construction phase (preparation of the construction site and installation of devices and equipment, and the construction of connecting infrastructure); operational phase (operation and maintenance in the period of operation); and the decommissioning phase (removal of devices and equipment that were used for the implementation of the measure and removal of the connecting infrastructure).

When assessing environmental impacts, the possibility is taken into account of the occurrence of cumulative environmental impacts caused by the implementation of NEP measures in the same area, as well as cumulative environmental impacts arising from the simultaneous implementation of NEP measures and measures based on plans or programmes of other activities in the same area or on the same valuable natural feature.

Environmental impacts are classified with respect to the relationship between the sources of an impact, the type of influence and the recipient of the impact. The impacts are further classified in terms of duration into short-term impacts and permanent impacts, and to the local, regional (state), cross-border and global levels in terms of geographical impact.

In terms of the management of environmental impacts, impacts are classified with respect to their importance into the strategic level (which is assessed within the scope of the comprehensive environmental impact assessment of NEP measures); the spatial planning level (which is assessed within the scope of the comprehensive environmental impact assessment of the spatial plan for the siting of a NEP measure); or the level of the impact assessment for interventions (which is assessed within the scope of the project assessment of environmental impacts caused by an intervention in the environment).
Environmental impacts are classified into positive and negative, and the finding for each impact is accompanied by a brief explanation or comment regarding the significance of the environmental impact.

The approach to CEIA is based on the determination of environmental impacts, while the level of accuracy in the impact assessment is proportionate to the data available in the description of an individual NEP measure. The definition of environmental impacts within the CEIA procedure and the assessment of the consequences of these impacts are not carried out in such detail as the description and assessment of environmental impacts in the project assessment of environmental impacts. Descriptions of all the possible environmental impacts that are outlined in appendices to this Environmental Report are also used as guidelines in the further assessment of environmental impacts within the scope of spatial planning or the project implementation of an individual NEP measure.

The descriptions of possible environmental impacts provided in the tables also list the levels where the indicated possible environmental impacts need to be defined in more detail and where measures need to be planned for such environmental impacts in order to avoid, mitigate or reduce adverse impacts. Environmental impacts marked in these tables as impacts of strategic importance are also assessed in this Environmental Report.

5.3 Evaluation of Environmental Impacts

This Environmental Report defines the important environmental impacts, which can be: direct, long-distance, cumulative and synergistic, short-, medium- and long-term, permanent and temporary. We evaluated the impacts caused by the implementation of the programme based on the consequences affecting environmental objectives by using evaluation criteria prescribed in the Decree laying down the content of environmental report and on the detailed procedure for the assessment of the effects of certain plans and programmes on the environment (Official Gazette of the Republic of Slovenia, No. 73/05) in size grades shown in the table below.

Table 8: Assessments of the importance of an environmental impact

Grade designation	Importance of the impact	Description of the importance of an impact
A	**No impact or positive impact**	The sub-programme or measure could significantly benefit the achievement of the environmental objective for the resolution of existing environmental issues and/or could offer an opportunity to improve the state of the environment.
B	**Insignificant impact**	The sub-programme or measure would partially benefit the achievement of the environmental objective by contributing to the resolution of existing environmental issues and/or offer an opportunity for certain environmental improvements.
C	**The impact is insignificant due to the implementation**	The sub-programme or measure will not significantly affect the achievement of environmental objectives. Implementation is

	of mitigation measures	acceptable provided mitigation measures and the guidelines from the Environmental Report are observed.
D	**Significant impact**	The sub-programme or measure would partially threaten the achievement of the environmental objective, because it additionally contributes to environmental problems and/or would partially threaten the possibility of improving the state of the environment.
E	**Destructive impact**	The sub-programme or measure would seriously threaten the achievement of the environmental objective, because it causes an environmental problem and/or threatens the possibility of improving the state of the environment.
X	**Determination of the impact is impossible**	The details associated with the sub-programme or measure are insufficient to enable the assessment of how important the impact is for the achievement of the environmental objective. In the case of such uncertainty, it is impossible to assess the impacts without more precise data on the programme and/or further research.

The following procedure is followed within the scope of CEIA for assessing and evaluating the environmental impacts of the planned NEP measures:

- areas where individual NEP sub-programmes or their parts are implemented are overlaid with cartographically arranged data on environmental starting points,
- environmental recipients affected by the impact of the sub-programme are defined, and
- the nature of the potential environmental impact is established and assessed (positive, negative or neutral) for each NEP sub-programme and the significance of the environmental impact is determined based on the assessment of the importance of the impact.

The importance of the environmental impact is expressed as the product of sensitivity of the environmental recipient and receptors and the size and nature of the change that is the consequence of the environmental impact. When determining the importance of the environmental impact, the precautionary principle was applied.

Grades awarded to the consequences of plan implementation of the size orders A, B and C imply that the impacts of plan implementation on the realisation of environmental objectives are acceptable, whereby impacts that do not require special mitigation measures (with the exception of the observation of legislative regulations) are graded B; grade C is attributed to impacts that are acceptable, provided additional (specific or special) mitigation measures are implemented are graded. The grades for the consequences of plan implementation in the size grades of D and E imply that the impacts of plan implementation for the realisation of environmental objectives are unacceptable.

The direct impacts of plan implementation have direct effects on the selected evaluation criteria. Long-distance impacts are determined if the plan foresees an intervention in the environment the impacts of which are the result of the plan and occur a long distance from the location of the intervention in the environment. With respect to duration, we distinguish short-term impacts (mostly during construction) and long-term ones (mostly during operation).

Cumulative impacts reflect the negligible impact of plan implementation on selected evaluation criteria, whereas plan implementation together with existing interventions in the environment and those that are planned and built based on other plans has an extensive impact on the selected evaluation criteria; or several interventions in the environment that are part of the same plan have a combined impact, the impacts of which on selected evaluation criteria are not negligible. The combined synergistic impacts of plan implementation are greater than the sum of the individual impacts.

A synergistic impact is determined if the plan foresees an activity affecting the environment the combined impacts of which are greater than the sum of individual impacts.

5.3.1 Methodology for Assessing Impacts on Natural Resources

A – no impact/positive impact: implementation of an NEP sub-programme or a measure within the scope of a sub-programme will improve the existing state in terms of burdens on environmental resources, or will not affect it.

B – insignificant impact: implementation of an NEP sub-programme or a measure within the scope of a sub-programme will have a negligible impact on the existing state in terms of burdens on environmental resources.

C – the impact is insignificant due to the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have an acceptable impact on the existing state in terms of burdens on environmental resources, provided certain mitigation measures aimed at the burdens on environmental resources are implemented for individual sub-programmes or measures.

D – significant impact: implementation of an NEP sub-programme or a measure within the scope of a sub-programme will not improve the existing state in terms of burdens on environmental resources, despite the implementation of reasonable mitigation measures aimed at the burdens on environmental resources. Reasonable mitigation measures include measures that do not reduce the possibility of achieving the objectives of an NEP sub-programme or measure and that are socially and economically acceptable.

E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of the sub-programme will worsen the existing state in terms of burdens on environmental resources, despite the implementation of reasonable mitigation measures aimed at the burdens on environmental resources.

5.3.2 Methodology for Assessing Impacts on Air

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will prevent the upper national emissions limit for pollutants in ambient air from being exceeded, or will not affect them.
B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have a negligible impact on reaching the upper national limit for emissions of pollutants into ambient air.
C – the impact is insignificant due to the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have an acceptable impact on reaching the upper national limit for emissions of pollutants into ambient air, provided certain mitigation measures aimed at the upper national limit are implemented for individual NEP sub-programmes or measures.
D – significant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not enable the reaching of the upper national limit for pollutants in ambient air, despite the implementation of reasonable mitigation measures because of the reaching of the upper national limit. Reasonable mitigation measures include measures that do not reduce the possibility of achieving the objectives of an NEP sub-programme or measure and that are socially and economically acceptable.
E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will prevent the reaching of the upper national limit for pollutants in ambient air, despite the implementation of reasonable mitigation measures because of the reaching of the upper national limit.

5.3.3 Methodology for Assessing Impacts on Water

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will enable the attainment of a good status of waters, which implies a good status of groundwater water bodies and surface water bodies, or will not affect the attainment of a good status of waters.
B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have a negligible impact on the attainment of a good status of waters.
C – the impact is insignificant due to the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have an acceptable impact on the attainment of a good status of waters, provided certain mitigation measures aimed at the attainment of a good status of waters are implemented for individual NEP sub-programmes or measures.
D – significant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not enable the attainment of a good status of waters, despite the implementation of reasonable mitigation measures aimed at the attainment of a good status of waters. Reasonable mitigation measures include measures that do not reduce the possibility of achieving the objectives of a NEP sub-programme or measure and that are socially and economically acceptable.
E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will prevent the attainment of a good status of waters, despite the implementation of reasonable mitigation measures aimed at the attainment of a good status of waters.

5.3.4 Methodology for Assessing Impacts on Nature

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not affect biodiversity and important nature protection areas, or the impact will be positive.

B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not significantly affect biodiversity and important nature protection areas.

C – the impact is insignificant due to the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not significantly affect biodiversity and important nature protection areas, provided mitigation measures are implemented.

D – significant impact: implementation of an NEP sub-programme or a measure within the scope of a sub-programme will significantly affect biodiversity and important nature protection areas. Mitigation measures are not possible.

E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have a devastating impact on biodiversity and important nature protection areas, despite the implementation of mitigation measures. Mitigation measures are not possible.

5.3.5 Methodology for Assessing Impacts on Cultural Heritage

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not affect cultural heritage or contribute to the reduction of risks posed to cultural heritage.

B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have an impact on areas, structures or areas of influence of cultural heritage and the wider heritage areas; however, the characteristics of the sub-programme measures will not cause the scope of the heritage to be diminished or the protected features of the heritage to be affected, or the impact will be minute.

C – the impact is insignificant because of the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will impact areas, structures or areas of influence of cultural heritage and will put at risk protected heritage features; however, effective mitigation measures are possible and feasible, and will make the impact acceptable.

D – significant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will significantly affect areas, structures or areas of influence of cultural heritage, and there will be significant risk to the protected heritage features and/or the decrease of the scope of heritage.

E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will affect areas, structures or areas of influence of cultural heritage in such a way that would cause the destruction of the protected heritage features and/or an extensive reduction in the scope of heritage.

5.3.6 Methodology for Assessing Impacts on Climatic Factors

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will either cause a reduction in GHG emissions or will not affect them.

B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have a negligible impact on the attainment of environmental targets for reducing GHG emissions.

C – the impact is insignificant because of the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will have an acceptable impact on the attainment of environmental targets for reducing GHG emissions, provided certain mitigation measures aimed at the attainment of these environmental targets are implemented for individual NEP sub-programmes or measures.

D – significant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not enable the attainment of environmental targets for reducing GHG emissions, despite the implementation of reasonable mitigation measures aimed at the attainment of these environmental targets. Reasonable mitigation measures include measures that do not reduce the possibility of achieving the objectives of a NEP sub-programme or measure and that are socially and economically acceptable.

E – devastating impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will prevent the attainment of environmental targets for reducing GHG emissions, despite the implementation of reasonable mitigation measures aimed at attaining these environmental targets.

5.3.7 Methodology for Assessing Impacts on Landscape

A – no impact/positive impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will not affect the landscape or will entail interventions in areas with no distinctive landscape features and in degraded areas, or will contribute to the enhanced identifiability of landscape.
B – insignificant impact: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will entail interventions that are either small-scale or of such a nature that there will be no significant encroachment on distinctive landscape features or changes to the landscape image, and the implementation of the sub-programme will not entail an encroachment on areas of outstanding landscape and/or a landscape area with distinctive features on the national level.
C – the impact is insignificant due to the implementation of mitigation measures: implementation of a NEP sub-programme or a measure within the scope of a sub-programme will cause an acceptably wide scope of changes to distinctive landscape features, moderate impacts on the quality of the landscape image, and/or encroachments on the landscape areas with distinctive features on the national level; however, effective mitigation measures are possible and feasible, and will make the impacts acceptable.
D – significant impact: implementation of an NEP sub-programme or a measure within the scope of a sub-programme will cause significant and long-term changes to the distinctive landscape features and the devaluation of the landscape image, and/or encroachments on areas of outstanding landscape, and/or encroachments on landscape areas with distinctive features on the national level in such a way that the quality of the landscape in these areas would be significantly reduced.
E – **devastating impact**: implementation of a NEP sub-programme or a measure within the scope of a sub-programme would cause extensive destruction of the distinctive landscape features, significant devaluation of the landscape image, and/or encroachments on areas of outstanding landscape or landscape areas with distinctive features on the national level in such a way that the quality of the landscape in these areas would be destroyed.

6 Environmental Objectives

The most important environmental objectives were defined for the purpose of this Environmental Report based on an analysis of the important environmental impacts that would be caused with respect to the environmental sensitivity of an individual area by the implementation of NEP sub-programmes or measures within the scope of programmes (hereinafter: NEP measures) and based on the findings of previous CEIA procedures for energy measures (primarily the siting of energy structures).

Upon completion of the definition of environmental impacts caused by individual NEP measures, the selection of environmental objectives was improved with the aim of defining environmental objectives that are important for the strategic level of environmental impact management, and so as not to use the environmental objectives and associated indicators used for the regional level of the comprehensive environmental impact assessment (CEIA for spatial plans produced for the purpose of siting NEP measures).

Each of the environmental objectives defined for the CEIA procedure was broken down into several environmental sub-objectives if this proved necessary because of the special characteristics of measures or the sensitivity of the area in which the NEP measures would be implemented. For each environmental objective and the environmental sub-objective associated with it, an indicator was defined that enables the use of these environmental objectives as a criterion for the evaluation of environmental objectives caused by the implementation of NEP measures. The figure below shows the relationship between environmental objectives and indicators.

During the CEIA procedure, the success of each of the alternative NEP measures was measured, namely for each environmental objective or sub-objective with respect to the existing state of the environment (the description of which was also reflected in the units of the indicator).

Environmental objectives will also be used as a criterion for determining environmental impacts during the implementation of individual NEP measures.

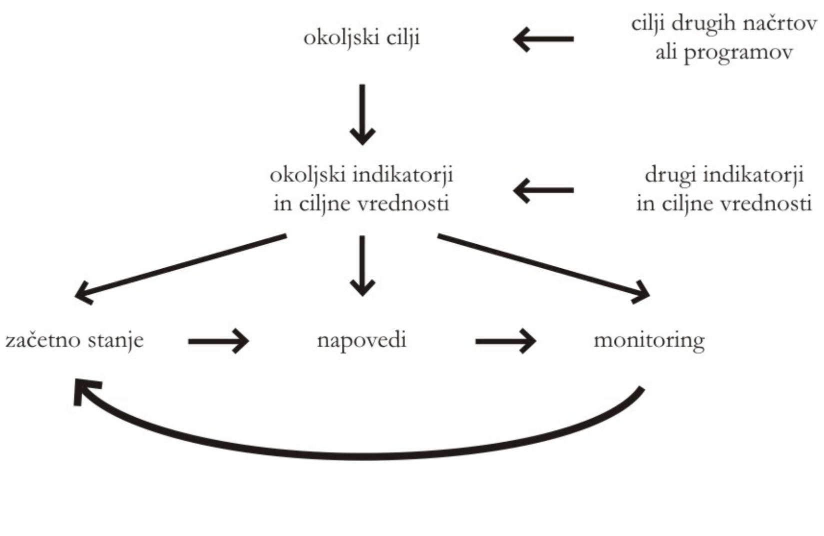


Figure 7: Relationship between environmental objectives and indicators

6.1 Definition of Environmental Objectives

The ten environmental objectives, their sub-objectives and indicators are outlined in Table 9.

Environmental objectives pertain to all aspects of environmental impacts that are required for the purpose of the comprehensive assessment of plans or programmes by Directive 2001/42/EC, with the exception of those aspects found during the analysis of environmental impacts of an individual NEP sub-programme which are insignificant for the environment.

Table 9: Environmental objectives, environmental sub-objectives and indicators

CEIA recipient (aspect of the impact)	Environmental objective	Environmental sub-objective	Indicator
Natural resources	Sustainable use of natural resources	Gradual decrease in environmental impacts caused by the use of mineral resources for energy generation.	Annual consumption of coal in the energy sector
		Sustainable use of forest biomass for energy generation.	Annual use of forest biomass for the generation of energy/annual use of wood in the wood processing industry
		Increase in the production of biofuels from own renewable energy sources.	Annual production of biofuels by processing of lignocellulose fibres.
		Efficient use of energy	Energy intensity of final energy use
Air	Ensure the attainment of upper national limits for pollutant emissions into ambient air	Ensure the attainment of the upper national limit for SO_2 emissions.	Annual SO_2 emissions
		Ensure the attainment of the upper national limit for NO_x emissions.	Annual NO_x emissions
		Ensure the attainment of the upper national limit for VOC emissions.	Annual VOC emissions
		Ensure the attainment of the upper national limit for NH_3 emissions.	Annual NH_3 emissions
		Ensure the attainment of the upper national limit for dust particles (PM TSP, PM_{10}, $PM_{2.5}$).	Annual emissions (PM TSP, PM_{10}, $PM_{2.5}$)
Waters	Protect the quality of surface and groundwater	Attainment of a good status of waters of water bodies for which environmental objectives will not be achieved by 2015 without suitable supplementary measures.	The parameters of the good status of waters, namely those for the good status of groundwater water bodies and surface water bodies: - parameters of the good status of groundwater water bodies are the parameters of the good chemical status of groundwater water bodies and the parameters of the good quantitative status of groundwater water bodies, - the parameters of the good status of surface water bodies are the parameters of the good chemical status of surface water bodies and the parameters of the good ecological status of surface water bodies,
		Prevention of the deterioration of the status of waters for all water bodies, whereby it is necessary to ensure the protection and preservation of the good status of these water bodies in the future.	
		Gradual decrease in pollution from priority substances and the halting or gradual elimination of emissions, discharge and leakage of priority hazardous substances.	

Nature	Prevention of a reduction in biotic diversity at the level of ecosystems (and habitat types), the number of species (and habitats) and genomes (and genes)	Preservation of the high level of biotic diversity of flora, fauna and habitat types.	A change in the status of conservation of species and habitat types listed in the Report prepared in accordance with Article 17 of the Habitats Directive (92/43/EEC).
		Preservation of the high level of biotic diversity of wild birds.	A change in the conservation status of species in SPA areas and in the entire territory of Slovenia listed in the Report prepared in accordance with Article 12 of the Conservation of Wild Birds Directive (79/409/EEC).
	Prevention of the negative impact on important nature protection areas.	Preservation of the scope and characteristics of important nature protection areas (on the international and national scale).	The scope and nature of interventions into important nature protection areas: − Natura 2000 sites (SCI, SPA and SPA annexes), − ecologically important areas, − protected areas, − valuable natural features, − Ramsar wetlands, − biosphere reserves, − UNESCO's natural heritage, − IBA areas.
Cultural heritage	Protect cultural heritage	Preservation of the scope and characteristics of cultural heritage structures and areas.	The scope and character of interventions in cultural heritage structures and areas
Climatic factors	Include measures for the mitigation of and adaptation to climate change	Ensure efficient generation of clean and green energy that ensures the fulfilment of energy objectives.	The share of final consumption of energy from renewable energy sources Positive contribution to a reduction in GHG emissions To what extent do the forecasts of climate change increase the threat to infrastructure in the long term?
Landscape	Protect landscape qualities	Preservation of landscape features	Scope and character of changes to landscape features
		Conservation of landscape areas with distinctive features at the national level and conservation of exceptional landscapes.	The scope and character of interventions in landscape areas with distinctive features at the national level and in exceptional landscapes.
Health	Include measures for the avoidance of negative impacts on human health and the population, and	Reduce exposure of the population to electromagnetic radiation from the long-distance power lines of the electricity transmission network and the electricity distribution network power lines.	The number of buildings with protected spaces exposed to excessive EMR. The percentage of the electricity distribution network power lines that are located underground in settlement

	seek possibilities for improvements		areas.
Material assets	Protect and decrease the impacts on the existing rights or the existing settlement that are caused by the siting of large energy structures.	The siting of energy structures in existing industrial and energy locations, with the aim of utilising the existing infrastructure to the greatest extent possible.	The number of new, large-scale energy locations.

7 State of the Environment

Within the scope of the CEIA procedure, it is necessary to ensure that the descriptions of important aspects of the existing state of the environment and the probable development of this state without the implementation of NEP measures are included in the Environmental Report.

Descriptions of important characteristics of the existing state of the environment and its probable development are focused on those characteristics of the environment that are important for the strategic level, which encompasses the general characteristics of the treated area of environmental interventions and the characteristics of the environment that are important on the international and national levels. This chapter also includes information on the probable future change of state of the environment if measures are not implemented, as well as information on existing excessive burdens in an area where NEP measures are implemented.

The following aspects are considered for the purpose describing the relevant characteristics of the state of the environment in an area where NEP sub-programmes are implemented:

- natural resources (soil, forest, management of residues from the combustion of solid fossil fuels),
- air,
- waters,
- nature (flora, fauna, habitat types, safeguarded areas, EPO, valuable natural features),
- cultural heritage,
- climatic factors,
- landscape,
- human health, and
- material assets.

The description of the existing state of the environment is summarised from the report of the Environment Agency of the Republic of Slovenia; the reports of the Statistical Office of the Republic of Slovenia; the analysis of the state of the environment in the National Environment Protection Action Programme 2005–2012 (ReNPVO); and the analysis of the status of operational programmes for various areas.

The existing state of the environment is first treated descriptively, which at the same time represents the justification of the selection of indicators relevant to the monitoring of the environmental impacts caused by the implementation of measures from individual NEP sub-programmes. The description of the development of the state of the environment without the implementation of NEP measures shows the existing state of the environment with individual indicators for the state of the environment.

The existing state of nature is treated in greater detail in the Annex for the Assessment of the Acceptability of the Impacts Caused by the Implementation of the NEP on Protected Areas, which is a separate appendix to the Environmental Report.

7.1 Presentation of the Existing State of the Environment

7.1.1 Natural Resources

7.1.1.1 Soil

The soil in Slovenia is highly diverse. Because the factors affecting the creation and development of soil are very diverse, the soil itself reflects substantial ecological variety. This diversity is simultaneously reflected in the use of soil (the actual use of soil is presented in the chart in Appendix 1). Slovenia is characterised by the varied intertwinement of forest and agricultural land. The land category designated as 'building land' covers 22.7% or almost one-third of all Slovenian territory. With 58% (including brushwood), forests are the prevailing category of ground cover in Slovenia. There is not enough available data on brownfield areas resulting from industrial activities (deserted quarries, disposal sites for industrial waste, deserted industrial areas).

Since the seventies of the previous century, reforestation has been recognised as the main reason for the change of ground cover in Slovenia. In recent times, changes have been observed in the territory of Slovenia caused by the enlargement of non-continuous urban areas and areas intended for industry and road networks. In this period, the most important cause of extensive change from forested and agricultural surfaces to built surfaces was the construction of the road network (source: Environmental Indicators in Slovenia, Environmental Agency of the Republic of Slovenia -EIONET).

The soil in Slovenia is generally rich in organic matter due to the relatively carbonaceous basic soil composition and the minor impact of ambient air pollution in recent periods; no consequences of acidification due to gas emissions which cause acidification or eutrophication are observed on land which has not been built on. The relatively good state of the soil is the consequence of the fact that intensive industrial activity which would cause an extensive degradation of soil because of waste production was not implemented on so-called building land. However, as a rule, it can be observed that there are areas in the surroundings of larger fossil fuel-fired thermal power plants that are degraded, either due to the processing of the used mineral resources for energy generation or the disposal of residues from their use for energy generation.

Intensive industrialisation and partially agricultural production have caused damage to fertile soil and forests in recent decades. This primarily involves a change of the category of land use of agricultural land and various forms of impacts of anthropogenic origin that expose the soil to various changes that cause degradation.

An assessment of the degradation of soil due to the use coal for energy generation, which is the only fossil fuel available in Slovenia, can be produced on the basis of data on the utilisation of brown coal and lignite, which represented 15.3% of the primary energy balance in the country in 2008. Recoverable brown coal reserves in the Trbovlje-Hrastnik (RTH) mine are estimated at 26 million tonnes of lignite and 168 million tonnes in Velenje. For the purpose of environmental protection, the use of coal is limited to thermal energy generation facilities only, most of which have devices for purififying flue gas. The Act amending the Act Regulating the Gradual Closure of the Trbovlje-Hrastnik Mine and Developmental Restructuring of the Region Act has extended the extraction of coal for sale from the mine until 2010, after which coal will probably be extracted in Slovenia only from the Velenje coalmine for the supply of lignite exclusively for the Šoštanj Thermal Power Plant for the generation of electricity and heat.

7.1.1.2 Forest

More than half of the land territory of the country is forest (56%, and 58% together with scrub forest), while other natural vegetation (natural pastures, wetlands, aquatic areas and areas with little or no vegetation) accounts for 4%, 35% of the surface being intended for farming, and slightly more than 3% being man-made areas (according to the interpretation of satellite images captured in 2006 using the CORINE Land Cover - CLC2006 methodology). The surface area of forests is increasing, however, only in those places where forests are already plentiful from the point of view of landscape variety and landscape appearance. Up until 2008, most instances of forest clearance were the result of the construction of infrastructural structures such as motorways and long-distance power lines, buildings, and structures intended for other purposes (quarries, landfills, dumps). A special problem are instances of forest clearance for quarries and sand pits that do not stand out in terms of extent but exert a major impact on the surroundings and their number is increasing. In 2008, there was a significant increase in forest clearance for agricultural purposes and they account for almost half the cleared areas. According to the CLC methodology, which takes into account changes larger than 5 ha only, surfaces intended for road infrastructure in the 1996–2006 period increased by a total of 603 ha, with an additional 507 ha for larger construction sites. Surfaces intended for industry and trade have increased by at least 86 ha.

Forest biomass used for the classic burning of wood in individual heating systems, industrial boilers for energy purposes or modern individual or group devices for heating and process heat is one of the greatest potentials for the use of RES in Slovenia. Biomass used as an RES currently comprises 8% of the consumption of energy by end-users, primarily for heating households and as supplementary industrial fuel. In 2008, the utilisation of this energy source rose significantly in the generation of electricity and heat, due to the commencement of wood biomass co-incineration. The potential sources of wood biomass are fuel wood from forests (around 1.500.000 m^3/year), wood biomass from agricultural land overgrown with forests (around 276.000 m^3/year), and wood residues from the wood processing industry (around 500.000 m^3/year).

Despite the great variety of climatic, geological and relief conditions in Slovenia, forest habitats prevail, and the principal tree species is supposed to be the beech. These habitats occupy three quarters of the forested surface area. The species composition of forests has not changed significantly through several hundreds of years of forest management; however, forests in Slovenia can in general be considered to be in a very good state of species preservation.
The protective role of forests in the given geological, climatic and hydrological conditions in Slovenia is exhibited in the protection of settlements, technical infrastructure and agricultural land from the forces of nature. The current conditions that enable the use of land for relatively stable agricultural production can be preserved in Slovenia only with the help of the relatively high level of forest cover. Forests are also very important for Slovenia economically.

71 tree species are found in Slovenia, ten (10) species of which are coniferous and sixty-one (61) deciduous. The mountainous character of Slovenia, the difficult accessibility of the karstic environment and the consequently high share of forests that are difficult to access are the main reasons that people have affected the forest in the past less detrimentally in the territory of Slovenia than in other central European countries. This is why forests are relatively well preserved, especially as regards variety in the natural composition of tree species and the structure (vertical and horizontal) of stands. There are only approximately 15% of heavily modified forests (overgrown with spruce). Despite this, actual tree composition deviates significantly from the potential vegetation.

Wood reserves in forests have increased twofold in the last 50 years, whereby we must also consider the increase in the surface area that is overgrown with forest. Another important fact to consider is that the increment of wood reserves in Slovenian forests absorbs more than 7 million tonnes of CO_2, thus removing it from the air each year.

Wood biomass is one of the rare natural materials that binds CO_2 from the atmosphere, because of the specificity of its creation in the photosynthesis process. The release of CO_2 is a significant threat in the ecology of today's globalised world and changes in climatic conditions. This threat comes fromy the uncontrolled release of CO_2 into the atmosphere from global industry that is wasteful in terms of energy and materials. Wood and wood products do not release this gas during their entire life cycle. On the contrary, they store CO_2 (CO_2 sequestration). Because of this property of wood, it is necessary to formulate and achieve as rational and efficient a system for the use of wood in the entire forest and wood processing chain. When establishing the system of wood utilisation, it has to be ensured that the generation of all forms of energy, even biofuels, utilises primarily by-products from wood processing (from all stages of wood production and processing) and wood obtained from products at the end of their life cycle. This form of the wood utilisation system is the only sensible one from the point of view of the entire national economy. It improves the efficiency of the wood processing industry and thereby directly enhances the competitiveness of this industry, which is the result of the decrease in CO_2 emissions and the positive economic and environmental benefits associated with such a decrease and which in turn increase the economic efficiency of the whole Slovenian economy.

7.1.2 Air

Pollution from PM_{10} particles and ozone is decreasing. Measurements of M_{10} show that the limit values are occasionally exceeded throughout Slovenia, especially in the interior, where long-lasting temperature inversions occur. The analysis of the sources of PM_{10} shows that the cause for pollution with PM_{10} particles is primarily road traffic, especially in urban centres with heavy traffic, valleys with little wind, and heating devices and industrial sources. Remote transport from the Po valley in Italy contributes significantly to ozone pollution in the Primorska region. In the brownfield area of the Mežica Valley, elevated lead values occasionally occur in ambient air.

Despite the increased use of final energy, especially in the traffic sector, emission of compounds that cause acidification or eutrophication as well as ozone precursors is decreasing and does not exceed limit values. Projections up to the year 2020 indicate a further decrease in pollutant emissions into the air to below the prescribed target values. It needs to be mentioned that the projections for nitrogen oxide (NO_x) concentrations remain quite uncertain, primarily due to the influence of transit traffic, which has seen a major increase since Slovenia's accession to the EU.

In addition to the negative impact of polluted air on human health, we also find damage to ecosystems, mostly in the surroundings of industrial and thermal energy generation facilities.

Data show that children (0-15 years of age) are on average exposed to annual concentrations of 30-40 $\mu g\ PM_{10}/m^3$, which is above the value recommended by the WHO (20 $\mu g\ PM_{10}/m^3$).

The ground cover with epiphytic lichen shows improved preservation of forests at higher elevations, while the biomonitoring of mosses shows slightly elevated values for metals and nitrogen in the surroundings of larger towns and industrial and thermal energy generation facilities. Increased values in western Slovenia are attributed to remote transport, while they are caused primarily by traffic and agriculture in north-eastern Slovenia. The consequences of elevated ozone concentrations (AOT40) are to a large extent reflected in the reduced quantity of crops, diminished growth of perennials and formation of seeds in annual plants, as well as in weaker growth of forest trees.

In the future, Slovenia will have to find more efficient solutions in all environmentally relevant sectors, with the emphasis on intersectoral cooperation in the fields of transport and energy. The objectives which ensure the quality of ambient air will have to be included in the system of spatial planning at municipality level, and the field of economic instruments strengthened in terms of the 'polluter pays' principle. It will be necessary to promote care for human health, and place greater emphasis on education, notification and awareness-building, the result of which will be the expression of concern for environmental protection in the actual behaviour of individuals.

Slovenia must attain the objectives defined in Directive 2008/50/EC and Directive 2001/81/EC (NEC Directive). The national emissions ceilings stipulated in the NEC Directive for the following pollutants are important for the assessment of the environmental impacts of individual NEP sub-programmes: SO_2, NO_x, NMVOC, NH_3 and, as may be envisaged, also PM_{10} or $PM_{2.5}$.

In addition to elevated PM_{10} concentrations, elevated ozone concentrations occur throughout Slovenia. These exceed both the target and long-term regulated values at all measuring points, except those that are exposed to emissions of nitrogen oxides caused by traffic. The most frequent instances of the action value for the protection of human health (180 µg ozone/m^3) being exceeded occur in the summer in the Primorska region and at higher elevations, to which airborne transport from the Po Valley in Italy contributes significantly.

The effects of pollutants on forest ecosystems through acidification (SO_2 and NO_x) and eutrophication (NOx, NH_4) are monitored in Slovenia. The results show that, compared to other areas in Europe, Slovenia records very few instances where the critical loads of acidic pollutants have been exceeded, whereas the country is potentially more prone to eutrophication. When it comes to the acidification of soil, the connection between the bedrock and the calculated critical loads is noticeable, as the values in carbonates are so high as to be irrelevant, because such deposition first causes direct damage to plant life. As regards acidification, it would be reasonable to evaluate only non-carbonaceous areas (primarily in the eastern part of the country). Critical loadings for nitrogen as a factor of eutrophication are lowest in the area of gravelly terraces of larger rivers. Instances of the values being exceeded are scattered throughout Slovenia, but their extent in terms of surface area is very small. Calculations show that these instances occur in less than 1% of the forest areas in Slovenia.

Air pollution is to a large extent affected by the slow restructuring of the Slovenian economy, unsustainable consumer patterns, and emissions, primarily from traffic and the energy sector. Despite the increased use of final energy, especially in the traffic sector, the emission of compounds that cause acidification or eutrophication as well as ozone precursors is decreasing and does not exceed limit values.

The high growth of final energy in traffic is the result of the increasing number of people who own motorised vehicles,
and the increasing number of kilometres travelled per personal vehicle, while the main source of increased consumption of liquid fuels following accession to the EU is the highly expressed increase in transit traffic. In 2007, traffic accounted for 37% of the use of final energy and became the biggest consumer of energy, while it further strengthened this position in 2008, as it accounted for well over 40%.

Despite the increased use of energy, emissions into the air from the energy and traffic sectors are decreasing. In 2007, emissions of NO_x and NMVOC decreased to below the target values; emissions of SO_2 and NH_3 remained lower than the target values for 2010. This had an effect on the decrease in emissions of substances that cause acidification, ozone precursors and particles. NO_x is the only pollutant present in all three groups, in which it has an important share. The main source of NO_x emissions is traffic, followed by electricity and heat generation.

Emissions of gases that cause acidification and eutrophication decreased by almost 50% in the period between 2002 and 2007 (with respect to 2002), or by 73% in the entire 1990–2007 period (with respect to 1990) mainly because of the reduction in $S0_2$ emissions. By 2007 in Slovenia, SO_2 emissions had been reduced by 80% (with respect to 2002) or by 94% (with respect to 1980). The reduction was primarily the result of lower emissions from thermal power plants, the introduction of liquid fuels with lower sulphur content (1995), the use of higher quality fuels, and the implementation of the Decree on emission limit values discharged into the atmosphere from large combustion plants and Directive 96/61/EC concerning integrated pollution prevention and control (IPPC Directive) (2004).

SO2 emissions in 2007 were 47% lower than the target value.

Annual NO_x emissions decreased by almost 10% by the year 2007 (as compared to 2002), or by 20% (as compared to 1987). NOx emissions in 2007 were 1% lower than the target value.

Annual NH_3 emissions decreased by 7% by the year 2007 (as compared to 2002), while they decreased by 23% in the entire 1990–2007 period (with respect to 1990). The decrease was the result of the reduction in the livestock population. NH3 emissions in 2007 were 1 % lower than the envisaged target value.

Annual NMVOC emissions decreased by 18% by the year 2007 (as compared to 2002), or by 39% (as compared to 1990). The decrease can be attributed to the decrease in emissions from motorised vehicle traffic, an increase in the number of vehicles fitted with catalytic converters, and the implementation of two decrees governing emissions of VOC into the air. NMVOC emissions in 2007 were 1.7% lower than the target value.

7.1.3 Waters

When compared to other countries around the world, Slovenia has above-average water discharges; however, the uneven local distribution of precipitation and diversity of runoff conditions result in varying water availability (Appendix 2). The objectives of the environmental policy in the area of waters are hence directed particularly to the assurance of a reliable and secure water supply for the population, the promotion of its sustainable use, the preservation of a good quantitative, chemical and ecological status, the reduction in harmful water activities and the mitigation of the effects of drought on the availability of water resources. The reduction in water discharges of rivers can affect the generation of electricity from renewable sources and make it more difficult to achieve the environmental objective of the EU Climate and Energy Package.

The diversity of climatic and hydrological conditions in Slovenia result in frequent flooding and drought that occasionally cause extensive material damage and even claim human life.

The extensive scatter of burdens and ever greater pressures on very vulnerable areas cause the pollution of water and worsen its status. Access to drinking water that is compliant with health regulations is one of the most important environmental objectives. Limit values for pesticides and nitrates in drinking water are exceeded in a large number of places.

The water balance of Slovenia, with almost 1580 mm of annual precipitation and a runoff coefficient of 54.5%, is generally favourable. The last thirty-year water balance period of 1971–2000 indicates an increase in evaporation of 11% and a reduction in the surface runoff of around 6% with respect to the previous balance period of 1961–1990. The decrease is also shown in the **river discharge balance**. The study of the available data set for the 1961–2007 period shows a decrease in the net river runoff from Slovenia. In the event of further changes to the use of space, primarily the expansion of the surface area of forests and rising of air temperature, we can expect a further a decrease in the net runoff.

The trend of the number of **occurrences of high waters** on Slovenia rivers has not been prominent in the last decade. During this decade, there were between 24 (in 2003) and 86 (in 2005) high water events when discharges of Slovenian rivers exceeded the action value for the issue of a flood warning. The prominence of the high water events is increasingly greater and the discharges of Slovenian rivers are increasingly more frequently coming closer to or exceeding the record values from long-term observations. In this regard, it is the smaller streams with a torrential character that lie predominantly in high mountains and the headwaters of larger rivers that stand out.

Even though the annual quantity of precipitation in Slovenia is not yet decreasing regionally, and is actually on the increase in certain areas, we are recording increasingly more frequent **hydrological droughts**.

The use of water in recent years, i.e. from 2002 to 2008, has fluctuated by around 12%. The largest consumer of water is the energy sector, with 600 to 800 million m^3 (for cooling alone, excluding the use of water for the generation of electricity in hydroelectric power plants), which is followed by households, industry, mining, and agriculture with less than one million m^3 of water consumed by irrigation systems on 7,255 ha of land.

Some 20.2% more water was consumed for different purposes in agriculture, construction and the processing activity in Slovenia in 2008 as compared to 2007. The consumption of drinking water in households is increasing only slightly; in 2008, it was 0.3% higher than in 2002. According to the indicator of the utilisation of water resources, Slovenia ranks among the European countries with the lowest utilisation of water resources.

An increase in water use is expected in the future in both river basin districts. The construction of new hydroelectric power plants is expected by the end of 2015 in the river basin district of the Danube River, and in 2013, the beginning of construction of several dry retarding basins for protection from flooding, the development of fish farming and fisheries, increased use of water for irrigation, etc. An increase in demand is also expected in the river basin district of the Mediterranean Sea, particularly for drinking water for supplying the increasing number of permanent and temporary population. An increase in maritime traffic and nautical tourism is also expected, and consequently, a deterioration in the status of all parts of the environment in the coastal area.

We have found for the period from 2006 to 2008 that the chemical status is good for 147 (95.5%) of **surface** water bodies, while a poor chemical status was found for seven water bodies (4.5%). The assessment of the chemical status of surface waters presents the loading of surface waters with 33 priority and priority hazardous substances, for which uniform environmental quality standards have been set and maximum allowable concentrations of these substances in water determined for the territory of EU countries. Even the chemical status of the sea is poor, due to an excessively high content of tributyltin compounds.

In terms of the ecological status of surface water bodies, 48 of them (31%) do not achieve a good status, with two water bodies (1%) being classified into the very poor status category, seven (5%) into the poor and 39 (25%) the moderate ecological status category. Environmental targets are achieved by 78 water bodies (50%), 11 (7%) of which are classified in the very good status category and 67 (43%) into the good status category. The candidates for the heavily modified water bodies category (19 heavily modified water bodies) have been assessed for rivers, but not for retarding basins.

Because of special pollutants which form an integral part of the assessment of the ecological status of surface waters, 19 water bodies have been classified into the moderate status category. The reasons are the instances of the limit values for metals, halogenated organic compounds (AOX), mineral oils, anion-active detergents, metolachlor, sulphate and polychlorinated biphenyls being exceeded.

As regards the **quality of bathing water** in the 2004–2008 period, we find, based on the results of analyses of two microbiological (total coliform bacteria and coliform bacteria of faecal origin) and three physical-chemical parameters (phenols, mineral oils, detergents), that there is a minor non-compliance in water at sea and greater non-compliance in inland waters. A large portion of bathing waters at sea also meet the recommended values of the directive, whereas the quality of inland waters is poorer.

The joint assessment of the **chemical status of groundwater** shows that intensive human activity is loading water bodies the most in those aquifers with intergranular porosity in north-eastern Slovenia.

7.1.4 Natural and Biotic Diversity

In spite of its modest size, Slovenia has abundant diversity of species, with a large number of species in a small territory. On a global scale, it has one of the most biotically diversified underground systems, and with more than 58% of forest cover (with well-preserved species), it is one of the most forested countries in Europe. Safeguarded natural areas that include the protected natural sites of Natura 2000 comprised 39.7% of the territory of Slovenia in 2009, which is almost six times as much as in 1992. The monitoring of biotic diversity status is being organised.

In Slovenia, one of the most important mechanisms for the preservation of plant and animal species and their habitats is the establishment of **protected areas,** while we also established **ecologically important areas** upon accession to the European Union, as well as special protection areas that are termed **Natura 2000 sites**. We thus have 12.57% of protected areas in our territory today; 52.16% of ecologically important areas; 35.5% of safeguarded areas within the scope of Natura 2000; and from 2008, 1.7% within the scope of areas that meet the conditions for special protection areas according to the opinion of the European Commission, but which were not designated Natura 2000 sites by way of a decree (Ministry of the Environment and Spatial Planning, 2010).

Habitat types

The basis for the definition and naming of habitat types is the manual entitled *Habitat Types of Slovenia – Typology*. The typology of habitat types in this document is harmonised with the European typology (*A Classification of Palearctic Habitats*) and, where professionally justified, it is adapted to conditions in Slovenia. Habitat types with a larger number of endangered species are primarily dry and wet grasslands, coastal and marine habitat types, and standing and flowing waters. The Decree on habitat types (Official Gazette of the Republic of Slovenia, Nos. 112/03, 36/09) outlines the habitat types, the favourable condition of which is preserved as a priority in the entire territory of the Republic of Slovenia, and habitat types that are at risk of dissappearing in the territory of the European Union and are therefore defined in the regulations of the EU that govern the protection of wild plant and animal species as priority habitats.

Flora

There are 3,266 various indigenous taxa of tracheophytes and phanerogams described for Slovenia; their basic character is defined with Alpine and Central European floristic elements and Pannonian, Dinaric and Mediterranean species. The abundance of species is associated with the diversity of habitat types, which is in turn dependent on various factors ranging from the natural-geographic (range of heights above sea level, solar irradiation, geological makeup) to the florogenetic and, finally, purely anthropological (intensity of impacts on nature, urbanisation, extensive farming, etc.). Parts in western Slovenia (a major part of the Alps and the Slovenian sub-Mediterranean with the Karst and parts of Istria) show significantly greater diversity than the central and eastern parts. The western parts namely have approximately 140 km^2 of surface area in four quadrants that together form the basic field and are home to 800 or more taxa (Ministry of the Environment and Spatial Planning, 2010).

There are many endemic plants (66 taxa, 22 are unique to the territory of Slovenia) that grow in a very small area and nowhere else in the world. For over 25 plant species, we can no longer confirm that they still grow in Slovenia and are therefore considered to have gone extinct here. Rare and endangered plant species in the territory of Slovenia are protected by law, namely the Decree on protected wild plant species (Official Gazette of the Republic of Slovenia, Nos. 46/04, 110/04, 115/07, 36/09) and the Rules on the inclusion of endangered plant and animal species in the Red List (Official Gazette of the Republic of Slovenia, Nos. 82/02, 42/10). Appendix 1 of the Decree stipulates protection for 59 species of tracheophytes and phanerogams and all species of the following genera: Narcissus, Clove/Dianthus (except for Sweet William), Jovibarba, Sempervivum tectorum, Droseraceae, Gladiolus, Lilium, Paeonia, Stipa, Helleborus, Pulsatilla, Pinguicula, Iris, and all species in the Lycopodiaceae and Orchidaceae families. The Rules on the inclusion of endangered plant and animal species on the Red List stipulate protection for 779 species of tracheophytes and phanerogams.

The trend of extinction of endangered species is observed in the Slovenian Istria, in the easternmost part of Slovenia in the flood plain of the Mura River, the westernmost part of the Slovenia river basin of the Sava River (Prilipe, Jovsi, Dobrava), as well as in the western Karavanke and the northern branches of the Dinaric region. A slight concentration of extinctions of endangered flora can be observed in the area of Pohorje and Slovenske gorice. On the other hand, quadrants with a seemingly improved status are scattered throughout Slovenia, with some unpronounced density of these quadrants in the upper Posočje, eastern Kamnik Alps and Bela krajina (Jogan, 2007).

Fauna

Between 13,000 and 15,000 species are registered in Slovenia; 4000 of these are endemic animal species (primarily underground animals) (Hland and Skoberne, 2001). This is home to species with highly diverse areas of geographical distribution (eastern European, Eurasian, western European, Mediterranean and numerous endemic species of the western Dinarides). The abundance of species is particularly found in invertebrate groups; and among vertebrate groups, an important (vital) portion of the population of some European or the world's most endangered charismatic species is present in this area.

Rare and endangered animal species in the territory of Slovenia are protected by law, namely the Decree on protected wild animal species (Official Gazette of the Republic of Slovenia, Nos. 46/04, 109/04, 84/05, 115/07, Constitutional Court decision 13.03.2008, 96/08, 36/09)) and the Rules on the inclusion of endangered plant and animal species on the Red List (Official Gazette of the Republic of Slovenia, Nos. 82/02, 42/10).

Appendix 1 of the Decree on protected wild animal species stipulates protection for the following: 54 species of mammal; all autochthonous species of bird in the territory of Slovenia from the orders of Gaviiformes, Podicipediformes, Procellariiformes, Pelecaniformes, Ciconiiformes, Phoenicopteriformes, Anseriformes (except Anas platyrhynchos L.), Falconiformes, Galliformes (except for pheasant and partridge - bred), Gruiformes, Charadriiformes, Columbidae (except for C. livia), Cuculiformes, Strigiformes, Caprimulgiformes, Apodiformes, Coraciiformes, Piciformes and Passeriformes (except for Corvus cornix, Garullus glandarius and Pica pica), 16 species of reptile, 19 species of amphibian, 34 species of fish and lamprey, 119 species of beetle and all species from 15 genera, 102 species of butterflie, 24 species of dragonfly and 8 species of crustacean.

59 mammal species, 162 bird species and all species of Passeriformes with the exception of 3 species, 24 reptile species, 19 amphibious species, 74 fish and lamprey species, 192 coleoptera species, 223 butterfly species, all dragonfly species and 141 crustacean species, and all species from the 5 crustacean species are included in the Rules on the inclusion of endangered plant and animal species in the Red List.

Safeguarded areas

Natura 2000 sites

In April 2004, the Slovenian Government adopted the Decree on Special Protection Areas (Natura 2000 sites) (Official Gazette of the Republic of Slovenia, No. 49/04, amended 110/04, 59/07 and 43/08) whereby it determined the Natura 2000 sites and protection guidelines for the conservation or achievement of a favourable status of wild plant and animal species, their habitats and habitat types, whose conservation is in the interests of the European Union, as well as other rules of conduct for the conservation of these sites.

A special protection area or Natura 2000 site is an area that lies in the territory of the EU and is important for the conservation and achievement of a favourable status of bird species and other animal and plant species, their habitats and habitat types, the preservation of which is in the interests of the EU. The determination and conservation of Natura 2000 sites is defined in the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and on wild fauna and flora). When Natura sites were being designated, all habitat types outlined in Appendix 1 were taken into account, as were all plant and animal species outlined in Appendix II of the Directive. In addition to the above, the birds outlined in Appendix I to the Birds Directive (Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds) for which special areas of protection are designated in the country (SPA – Special Protection Areas) were also taken into account.

71% of the Slovenian Natura 2000 network is covered by forests, which is approximately 15% more than the European average and, in general, indicates they are well preserved. Despite this, certain forest types, especially the bottomland type, were cleared extensively in the past and do not exhibit a favourable conservation status. Of the non-forest surfaces in the Natura 2000 network, 20% is agricultural land in use, the most important of which are extensive meadows. These still exhibit a favourable conservation status in many areas, while the pressures that aggravate this good state are great both naturally due to overgrowth brought on by the abandonment of farming and the intensified use of these areas. Agricultural areas with high natural value are among the most important opportunities for the achievement of greater biological diversity and protection of endangered habitats in individual rural areas. In general, we can characterise them as characteristic areas of extensive agriculture, with great diversity of biological species and habitats.

Caves play an exceptionally important role in the Natura 2000 network and are the subject of conservation efforts in over 70 areas (out of a total of 260). Inland waters represent only somewhat more than a percentage of the network in terms of surface area, but their importance for the conservation of the network is very great. Many of the waters do not exhibit the most favourable conservation status. Human dwellings are important for the reproduction, rest and wintering of certain species, which is why some built areas are essential Natura 2000 sites. These are especially birds (e.g. white stork, scops owl) and mammals (e.g. bats).

Proposals for areas which Slovenia designated based on the Habitats Directive were accepted by the European Commission in accordance with a special procedure that took several years to complete. Based on the Alpine Biogeographical Seminar in May of 2005 and the Continental Biogeographical Seminar held in April of 2006, the European Commission confirmed the Slovenian proposal in the continental region in November of 2007 (the decision was published in January 2008), and afterwards, the proposal in the Alpine region in January of 2008 (the decision was published in March 2008). This meant the confirmation of all potential Natura 2000 sites (pSCI) by the European Commission (SCI). Based on the conclusion of both seminars, Slovenia will have to designate some other sites in line with the Habitats Directive as habitat types or species which the European Commission finds not to have been sufficiently defined. These are, for example: the section of the Mura River along the border, the lower Vipava valley (Italian agile frog, *Rana latastei*), part of Slovenske gorice, part of Goriška brda, Komarnik fish pond, the downstream section of the Sava River, etc. The Institute of the Republic of Slovenia for Nature Conservation (IRSNC) has already prepared a supplemented proposal for Natura 2000 sites.

Interventions and activities need to be planned for Natura sites (SPA and SCI areas) in accordance with Article 7 of the Decree on special protection areas, so that the following is achieved to the greatest extent possible:

- preservation of the extent of habitat types and habitats of plant and animal species,
- preservation of suitable characteristics of abiotic and biotic composition of habitat types, their specific structure, natural processes and suitable utilisation,
- conservation and improvement of the quality of the habitats of plant and animal species, especially those parts of the habitat that are essential for the most important phases, such as especially the areas for breeding, roosting in groups, wintering, migration and feeding.
- preservation of the connectedness of habitats of plant and animal species populations and the facilitation of the process of reconnecting habitats if the connection is severed.

In these areas, an acceptability assessment should be performed for interventions in accordance with Article 28 of the Nature Conservation Act. If an actvity affecting nature is performed, it is necessary to foresee and implement all possible technical and other measures, so that the adverse impact on habitat types, plants and animals and their habitats is minimised. Natura sites are provided in the chart in Appendix 3.

Protected areas
Protected areas of nature represent the state's measure aimed at the conservation of areas with valuable natural features and biotic diversity. We distinguish large (national, regional, landscape parks) and small (integral nature reserve, nature reserve and natural monument) protected areas, in the territory of which prescribed protection regimes apply. These are protected by national and municipal acts. Since 2002, protected areas have expanded by 5.8%, mostly because of the protection of the Goričko Landscape Park in 2003 and the Ljubljansko barje Landscape Park in 2008. *Protected areas are provided in the chart in Appendix 4.*

Large:
National park
A national park (NP) is a large area with numerous valuable natural features and great biotic diversity. The major part of a national park consists of indigenous nature with preserved ecosystems and natural processes, while a smaller part of the national park can have areas of more extensive human influence, which is, however, harmoniously linked to nature.
Regional park
A regional park (RP) is an extensive area of regionally characteristic ecosystems and landscape with large parts of indigenous nature and areas with valuable natural features that intertwine with parts of nature that are significantly influenced by people, but nevertheless in equilibrium with nature.
Landscape park
A landscape park (LP) is an area with an accentuated quality and long-term intertwinement of people and nature having a high ecological, biotic and landscape value.

Small:
Integral nature reserve
An integral nature reserve (INR) is an area of naturally preserved geotopes, habitats of endangered, rare or characteristic plant and animal species or an area that is important for the preservation of biotic diversity where natural processes take place without human influence.
Nature reserve
A nature reserve (NR) is an area of geotopes, habitats of endangered, rare or characteristic plant and animal species or an area that is important for the preservation of biotic diversity that is maintained through balanced human activities.
Natural monument
A natural monument (NM) is an area that contains one or several valuable natural features that boast an outstanding form, size, content or location, or are rare examples of a valuable natural feature.

In Slovenia, we currently have: 1 national park, 3 regional parks, 43 landscape parks, 1 integral nature reserve, 54 nature reserves, and 1,277 natural monuments. 254,847 ha are protected, which is as much as 12.57% of the surface area of Slovenia (state recorded in July 2010, source: Environmental Agency of the Republic of Slovenia, 2010). An increase is also envisaged in the share of protected areas of various categories, by 10% of the surface area of Slovenia by 2014 (Resolution on National Environmental Action Plan 2005-2012, Official Gazette of the Republic of Slovenia, No. 2/06).

<u>EPO and valuable natural features</u>
Valuable natural features that comprise all natural heritage were defined by the Rules on the designation and protection of valuable natural features. Valuable natural features are protected as soon as they are granted that status, as interventions and activities can only be performed there if no other spatial or technical options are available, and even then, they need to be performed so that the valuable natural feature is not destroyed and the properties, because of which a part of nature was

recognised as a valuable natural feature are not changed. The existing use is, as a rule, maintained in such valuable natural features, but other uses are also possible if they are such that do not put the existence of a valuable natural feature at risk or do not hinder its protection. A valuable natural feature and its immediate vicinity are arranged in accordance with the prescribed procedure for visits by the public by building paths, lookout spots, rest areas, fences, information boards, warnings and the like. The valuable natural feature protection system is based on the protection of primarily those parts of nature that are recognised by society in a particular period and space as valuable. The Rules on the designation and protection of valuable natural features has designated 6,519 valuable natural features and 8,382 caves. There are 2,092 (32.09%) valuable natural features of national importance in Slovenia and 4,427 (67.91%) of local importance. Of these valuable natural features, 4,085 are structures (64.2%) that are shown in space as points; 2,830 (35.8%) have a polygon demarcating the area of the valuable natural feature in addition to the point that serves as an identity marker. The total surface area of all polygons is 2,334.69 $km^{2,}$ 11.52% of the surface area of the country (Valuable Natural Features Register, Environmental Agency of the Republic of Slovenia, 2008). In terms of surface area, the largest geomorphological valuable natural features are the Pokljuka and the Jelovica plateaus, followed by the Nanos thrust-fold mountain and the Karst Rim.

The share of occurrence of individual categories of valuable natural features in the territory of the country is shown in the chart below. The density of valuable natural features for all of Slovenia is 0.32 per km^2, or one valuable natural features per 3.11 km^2 (Appendix 5).

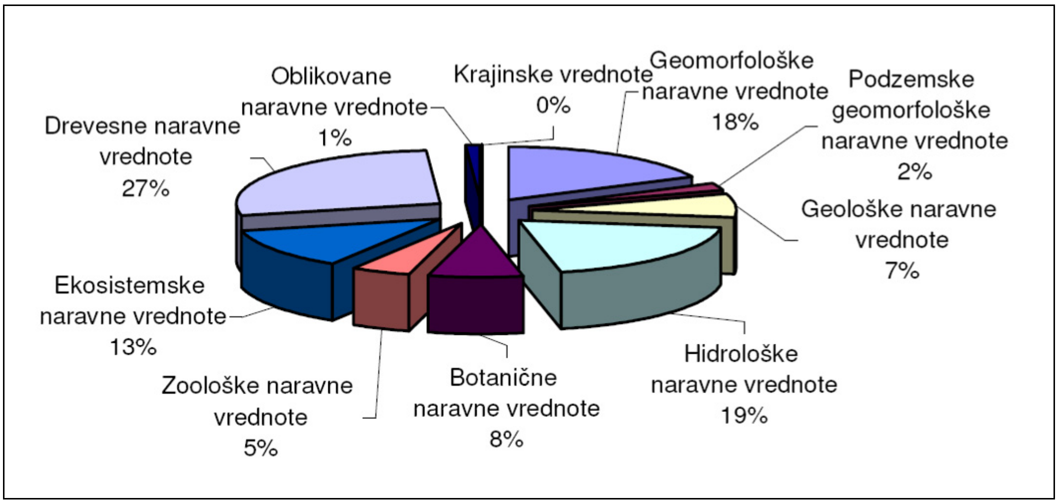


Figure 8: The share of occurrence of individual valuable natural feature categories (Ministry of the Environment and Spatial Planning, 2010)

Expected valuable natural features are shown in the map in Appendix 9.

Ecologically important areas are defined by the Decree on ecologically important areas from 2004 and are areas of a habitat type, part of a habitat type or larger ecosystem units that contribute importantly to the preservation of biotic diversity (Appendix 5). Certain protection guidelines and rules of conduct apply to these areas that must be observed in the arrangement of space and use of environmental goods. One of the ecologically important areas is the central area of the habitat of large predators, as well as the sea and seashore. A component part of ecologically important areas are also the Natura 2000 sites.

In accordance with Article 5 of the Decree on ecologically important areas, various interventions and activities are possible in EPO areas that are at the same time Natura 2000 sites. They are planned so that the natural extent of habitat types and plant and animal species habitats are preserved to the greatest extent possible, as are their quality and connectedness of the habitat populations, as well as the possibility of reconnecting them if the link was to be severed by a planned intervention. No nature protection conditions need to be met or nature protection consents acquired for the implementation of interventions in an EPO area.

According to Article 32 of the Nature Conservation Act, ecologically important areas are:
1. Areas of habitat types that are biotically extremely diverse and well-preserved; areas of habitats of endangered or endemic plant and animal species; and habitats of species that are internationally important according to the criteria stipulated in ratified treaties or that otherwise contribute to the preservation of biotic diversity.
2. Areas of a habitat type or a larger ecosystem unit that importantly contribute to the preservation of the natural balance by being biogeographically distributed in a balanced way with respect to other ecologically important areas and make up an ecological network.
3. Habitats of internationally protected species.
4. Migratory routes of animals.
5. Areas that contribute significantly to the genetic connectedness of plant and animal species populations.

Other internationally recognised nature protection areas

Wetlands

The inventory of wetlands (2000) includes more than 3,500 locations. Only somewhat more than a third of all the inventoried locations are larger than 0.15 ha, and they cover 1.74% of the country's territory. As much as 83% of all locations and 61% of the surface area of all wetlands are ecosystems that were created by or depend on anthropogenic influences. When we take into account all floodplains, wetlands account for less than 5% of the territory of Slovenia (Vodnogospodarski inštitut (Water Management Institute), 2000)). Flood meadows and wet meadows and are the most extensive of these wetlands. Most are found in the Ljubljansko barje (Ljubljana Marshes), Cerkniško polje, Planinsko polje and Radensko polje, as well as the Bloke Plateau and the Jovsi plain. Smaller lakes (including high mountain lakes) and swamps prevail among natural wetlands in terms of number; in terms of surface area, these are intermittent lakes (the largest of which is the Cerkniško jezero lake) and swamps. The most extensive inland wetlands are found in the plains or downstream sections of rivers (along the rivers Mura, Drava, Sava and Krka) or in karst poljes[16] (the Karst Ljubljanica River with Cerkniško polje and Planinsko polje), while they are smaller, but more frequent on plateaus (high marshes on Pokljuka and Pohorje, low marshes on the Bloke Plateau). Most inventoried Slovenian wetlands are smaller than 0.15 ha (man-made ponds, clay pits, smaller retarding basins, channels). The Sečovlje and Strunjan salt pans with the Štjuža lagoon and the Škocjanski zatok nature reserve are the only larger and well-preserved wetland areas on the Slovenian coast (Beltram G., 2003).

The Ramsar Conventions is an agreement on wetlands of international importance, which especially includes habitats of aquatic birds, signed in February 1971 in the Iranian town of Ramsar. It is an intergovernmental agreement ensuring international cooperation on the preservation of wetlands, their functions and biotic diversity. The signatories to the convention have undertaken to:

- place wetlands on the List of Wetlands of International Importance and preserve and maintain their ecological balance,
- include the conservation of wetlands in national development programmes and plan the comprehensive management of wetlands by observing the principle of sustainable use,

[16] Translator's note: *polje* is defined as "great closed karst basin with flat bottom, karstic drainage and steep peripheral slopes"

- support development policies for the conservation of wetlands in their respective territories by designating protected areas and supporting the professional training of wetland researchers and operators,
- cooperate with other signatories in the area of wetlands located along borders and in the area of hydrological systems, as well as in joint development projects directed at wetlands.

The areas in Slovenia that are designated as Ramsar wetlands are: Cerkniško jezero lake and the surroundings, the Sečoveljske soline salt pans and the Škocjanske jame caves.

Slovenia acceded to **UNESCO** on 27 May 1992. The Škocjanske jame caves were registered in the UNESCO World Heritage List because of their exceptional importance for cultural and natural world heritage in 1986. They are a unique natural monument in the area of classical Karst, where the Reka River has formed an extraordinary mix of caves, collapsed dolines, sinks and one of the largest subterranean canyons in Europe at the contact point where flysch and limestones meet.

Biosphere reserves are areas of inland and coastal ecosystems that are internationally recognised within the scope of the UNESCO MAB programme, which is aimed at the promotion and presentation of a balanced relationship between humans and nature. **The Man and Biosphere Programme** is a UNESCO intergovernmental research programme that confirms biosphere reserves as a concept and means for the realisation of a sustainable balance between the frequently opposing objectives of the preservation of biological diversity, the promotion of the development of human resources and the maintenance of cultural values. Biosphere reserves are locations where these objectives are tested, presented and implemented. This interdisciplinary programme was established in 1971. One of the central objectives of the programme is the establishment of a network of biosphere reserves. These are areas of inland or coastal/marine ecosystems where the conservation of ecosystems and their biotic diversity are harmonised with the sustainable use of natural resources through the suitable designation of areas with a different protection regime and management.

Biosphere reserves in Slovenia:
- In July 2003, UNESCO designated the Julian Alps as a biosphere reserve of global importance – the *Julian Alps Biosphere Reserve*.
- On 29 October 2004, the Škocjan Caves Park joined the global network of biosphere reserves as the Karst Biosphere Reserve.

Important Bird Areas (IBAs) are internationally important areas (habitats) intended for the preservation of bird populations. IBAs are designated in accordance with the methodology of BirdLife International. IBAs were designated around the world on the basis of uniform scientific criteria. These areas are small enough to enable successful conservation, or are frequently also a part of already protected areas (see Appendix 3).

For an area to become an IBA, they must meet at least one of the following requirements:
- Supports a significant number of one or more globally endangered species.
- Is one of the areas that jointly support a limited number of species or habitats.
- Is a key stop-over site on a migratory route.

7.1.5 Cultural heritage

Heritage consists of property inherited from the past that Slovenians, members of the Italian and Hungarian national communities and the Roma community, and other citizens of the Republic of Slovenia determine as a reflection and expression of their values, identities, religious and other beliefs, knowledge and traditions. Heritage includes the environmental aspects arising from the interaction between people and space through time (Article 1 of CHPA-1).

Slovenia and its regions are not characterised by exceptional or other kinds of monuments, but the diversity and distribution of heritage and the emergence of certain features 'in series', such as religious buildings, wooden folklore architectural heritage, cultural landscapes, heritage elements linked to major historical events such as World War I in the valley of the Soča River. Heritage dates back to the Palaeolithic period and subsequent metallic ages; relics from the Iron Age are particularly important. As a result of the Roman occupation, there are many remains of ancient urban civilisation. A period that left no significant remnants followed until the Romanesque period, which was characterised by the systematic construction of churches whose features have largely been destroyed by later reconstructions. Medieval castles comprise an important item in the heritage inventory; some are even of Roman origin. Many magnificent religious buildings survive from the Gothic period (for example, the Cistercian monastery in the village Kostanjevica ob Krki). The impact of the Renaissance is reflected in some urban environments (for example, in the towns of Škofja Loka and Kranj) and in castle architecture (for example, the castles at Fužine and Brdo pri Lukovici). The economic boom in the 18th century enabled (in relation to other parts of Europe), a late development of the Baroque both in religious art and urban renewal (for example, in Ljubljana). Classicist forms are reflected in urban architecture. The 19th century is characterised by a conscious acceptance of stylistic forms from the past. The heritage of this period consists of visible representative urban public facilities, as well as rural villas. In the period after WW I, the major expansion of architecture (Plečnik Vurnik, Fabiani) is important. After WW II, the heritage is a result of different stylistic trends; in space, particular importance is accorded to the legacy of modern architecture (Mihevc, Ravnikar, Sever). We should also mention the extensive rural architectural heritage and heritage landscapes (Sources: Guidelines for the design of the SDSS: The development of activities for cultural heritage protection and the safeguarding of cultural heritage, Ministry of Culture, 2003; Art in Slovenia, MK, 1998, Slovenia: Tourist guide, MK, 1996).

The Register of Cultural Heritage at the Ministry of Culture (RKD, August 2010) records 31,259 units of heritage (definitions of heritage types taken from: Guidelines for the design of the SDSS: The development of activities for cultural heritage protection and the safeguarding of cultural heritage, Ministry of Culture, 2003):

- - 22,014 units of architectural heritage which can be secular (14,039 units), religious (7,774 units) and religious/secular (201 units). These are individual buildings, other facilities and devices, groups of interconnected buildings, facilities and devices, including installations and equipment, where the physical substance is the bearer of the values mentioned in the definition.
- - 1,361 units of urban heritage; these are areas of settlements which constitute their historical core, historical quarters and other historical areas. It is comprised of individual facilities and groups of buildings with associated open spaces that are functionally and visually related to them.

- - 225 units of cultural landscapes; these are special (topographically) delimited parts of the landscape which are created through the interaction of human and natural factors, and illustrate the development of human society in time and space. They obtained socially and culturally recognised values due to the material remains, which are reflected in past land use, activities, skills and traditions, or because of their depiction in literary or artistic works.
- - 238 units of garden-architecture heritage; these are parts of the human environment or cultivated nature, including natural and built elements according to landscape architecture principles. As a rule, they are spatially and substantively related to the architectural heritage.
- - 4,164 units of memorial heritage; these are facilities and regulated land, such as public monuments and public sculpture, monuments, tombs, cemeteries with graves, tombstones and garden-architecture arrangements, and individual graves and tombstones that have been built or arranged so that they celebrate a historic event, a historical happening and a memory of a historic person, or which have served or still serve a commemorative or pious purpose, with the exception of buildings that have directly served or still serve the purpose of religious rituals.
- - 3,088 units of archaeological heritage; these are professionally identified and registered archaeological sites, together with all the relics, artefacts and human traces that are a testimony of the history of mankind and the human relationship with the natural environment, irrespective of whether they are on land or under water, and for which the main scientific source are the excavations or discoveries and other scientific methods of research.
- - 40 units of historical landscape; these are areas that gained socially and culturally recognised values due to obtained and proved links with important historical events, such as battles and other military operations whose material remains are preserved at the site.
- - 129 units of other heritage (for example, technical heritage, areas of abandoned villages, locations of castles).

The heritage sites occupy a total area of 2,456 km2, or approximately 12% of Slovenia's surface (they are shown on the map in Appendix 6).

Value of cultural heritage space is quickly declining, and the activity of protection alone cannot prevent this with the mechanisms that are available in the legislative framework. Protected areas are threatened, especially those pertaining to the urban heritage, because of the absence of mechanisms and development of spatial hearing. Castles are threatened due to total neglect; architectural heritage – especially if a monument is not involved – is threatened due to the encouragement of new constructions and the neglect of the urban arrangement of the existing parts of settlements, due to poor maintenance and control over operations, and in areas threatened by natural disasters. The architectural and technical heritage of the 20th century and the cultural landscape are not yet sufficiently recognised as cultural heritage. In the natural parks, the objectives of protecting cultural heritage are neglected (Source: Guidelines for the design of the SDSS: The development of activities for cultural heritage protection and the safeguarding of cultural heritage, Ministry of Culture, 2003).

7.1.6 Climatic factors

In the base year, GHG emissions in Slovenia amounted to 20.35 million tonnes of CO2 eq, while an 8% reduction means that Slovenian releases in the period 2008-2012 on average will not be allowed to exceed 18.73 million tonnes of CO_2 per year. In 2007, GHG emissions in Slovenia were 20,722 Gg of CO_2 eq, which is 1.8% more than in the base year.

Almost a third of Slovenian emissions of GHG results from the generation of electricity and heat. In traffic, which in 2007 with 26% was our second largest source of GHG emissions, the proportion is still increasing and, according to some indicators, also due to transit traffic, is currently uncontrollable. In comparison with the base year 1986, emissions increased by 174%, mainly due to the increase in passenger and freight (especially transit) traffic. Due to road traffic, total GHG emissions over the past two years increased by more than one per cent per year, which nullifies the efforts to reduce GHG emissions in all other sectors.

The most alarming increase is in emissions in transit through Slovenia, which increased significantly after the accession of Slovenia to the EU. In 2004, following an assessment of the fuel sold to foreigners, CO_2 emissions in transit already amounted to 490,000 tonnes, 12% of the total emissions from transport.

Emissions from the use of fuels in households and emissions from waste also contributed to the increase. In agriculture, emissions in 2006 were lower than in the base year, mainly due to a reduction in livestock numbers.

Emissions arising from fuel consumption and emissions in the process industry were reduced.

The presence of F-gases in the atmosphere is almost exclusively a consequence of human activities. These gasses include HFCs, PFCs and SF_6. In the overall greenhouse effect caused by human emissions of GHG, F-gases represent a relatively small part, but due to their high greenhouse potential, with increasing use their contribution to global warming may increase greatly. Therefore, efforts have recently been made to limit their use, to prevent their discharge, to recover them from spent plants, and to replace them with substances with a lower greenhouse potential.

In Slovenia, agriculture contributes about 10% of GHG emissions. This proportion is comparable to the average level in the EU, where agriculture contributes 9.5% of GHG emissions. The most important gasses that come from farming are methane (CH_4), which represents approximately 55% of emissions from agriculture, and nitrous oxide (N_2O), which contributes 45% of emissions.

Slovenian agriculture is characterised by great fragmentation. The average holding has only 6.3ha of agricultural land in use and rears less than 7 livestock units, which is well below the average of EU countries.

The Operational Programme for reducing greenhouse gasses emissions (GHG OP-1) identifies the key instruments and obligations of individual sectors, which, if fully implemented, will enable Slovenia to attain an 8% reduction in emissions by 2012.

With the adoption of European legislation in the context of the climate-energy legislative package of EU, the importance of measures adopted by the operational programme is further increased, as the full implementation of planned measures to meet the Kyoto Protocol is a necessary condition to fulfil the obligations of the climate and energy legislative package. GHG OP-1 includes a set of measures by the year 2012, but these measures will have effects on the reduction of GHG emissions also in the period 2013-2020.

GHG OP-1 is consistent with the development goals of the country. Reducing GHG emissions is among the priorities of the National Environmental Action Programme. In addition, it will be necessary to prepare a long-term vision for the transition to a low-carbon society. A long-term strategy will define in particular the objectives of reducing GHG emissions and policies and measures to optimise the management of the transition to a society with low GHG emissions. For this, the integration of sectoral policies, particularly those of transport, energy, housing, environment, space and agriculture is a key feature, as well as the appropriate situating of climate policies in a broader development policy.

As an EU member, Slovenia is also included in the mandatory EU trading scheme. The trading of rights to emit greenhouse gases is an important cornerstone of the European Union strategy to reduce GHG emissions.

The environmental tax is paid because of the use of fuels and burning of combustible organic matter (for the purpose of heat generation or power), while it is understood that fuel is represented as an organic compound containing carbon, hydrogen, oxygen and other substances in solid, liquid or gaseous state used to provide heat and to power engines and turbines. It was introduced with the aim of integrating the external costs of air pollution with CO2 emissions, and it should have an impact on reducing air pollution with CO2 emissions and therefore on reducing environmental pollution. The implementation of this measure in the period 2008-2012 will on average contribute to reducing emissions by 27 kt CO2eq per year.

7.1.7 Landscape

Slovenian landscapes are characterised by very diverse morphological features as a result of natural conditions, diverse morphology, different climate zones and human impacts, particularly those of land use, historical development and the diversity of cultural backgrounds. A fundamental feature of the Slovenian landscape, therefore, is a great diversity and variety of landscape patterns.

In Slovenia, we distinguish five basic landscape areas (Regional Distribution of Landscape Types in Slovenia, MESP, BF, Department of Landscape Architecture, 1998), which are determined primarily by their climate and geological basis:

- - Alpine landscapes include areas in the south-west and northern Slovenia. The area defines the high mountains, the rocky areas above the tree line and below it, mountain meadows and plateaus and some humble farming areas in mountain pastures. Typical are: remnants of glacial moraines, rare and dispersed settlements in alpine valleys, wooded slopes, bigger flattened and settled areas of spread materials of rivers and distant mountain plateaus.
- - Sub-Alpine landscapes stretch from the extreme west to east and central Slovenia and constitute the largest landscape macro-unit. They are determined by hilly, wavy or undulating plateaus, river valleys and extensive flood plains, changing slowly into a flat region. The landscape is characterised by a marked contrast between compact forests, which are similar to a framework, and open agricultural areas.

- - Subpannonian landscapes cover north-east and eastern Slovenia. Typical are: vast plains without sharp edges, diverse landscape, hills of vineyards with small relative differences in altitude, valleys running through the hills, rivers with extensive riparian vegetation and flooded plain forests.
- - Karst landscapes of central Slovenia comprise a large area south of the Ljubljana basin, karst areas in the south-east, and the Karst highland plateau to the west. The most diversified karst features dominate the area, and they define the surface configuration and diversity at the micro- and macro-levels.
- - Littoral landscapes are characterised by flysch hills, edges of karst plateaus, fragmentation of space, a large proportion of forests, karst fields and plateaus, and the sea along with the coastline. The cultural landscape of the coastal zone is characterised by vineyards and orchards, terrace-like modified slopes, coastal plains, remnants of salt pans. The hinterland is hilly, with creeks along the valley bottoms. In the northern parts of the coastal region, there is a dry karst landscape with plateaus, with a distinctive architecture.

The Spatial Development Strategy of Slovenia (Official Gazette of RS, No. 76/2004) identifies 71 landscape areas with distinguishing features on the national level. These are areas that include distinctive and representative parts of the Slovenian landscape, with well-preserved landscape elements; in particular, these are areas of outstanding landscape, with rare or unique patterns of landscape structure and a spatially underlined cultural heritage of high testimonial and memorial value, in combination with exceptional forms of natural elements, and with natural values. The total surface area is 3,410 km2. Some municipal spatial planning documents also define landscape areas with recognisable features at the local level.

Exceptional landscapes in Slovenia (MESP, Acer Novo mesto d.o.o., 1996, mod. 1999) comprise a selection of rare, unique Slovenian landscapes that are notable for having one or more especially valuable features, such as: a unique pattern of land use, characteristic landscape structure, consistent spatial relationships, an appropriate share of natural elements, a specific settlement pattern, characteristic emphasis reflecting the unique spatial structure. There are 93 identified exceptional landscapes, with a total area of 233 km2 (areas are shown on the map in annex 7).

Slovenian landscapes have not undergone modern large-scale rearrangements that would decisively change their image. Slovenian landscapes are characterised by relatively high diversity, a high degree of natural conservation and the preservation of cultural elements of the landscape. In the last decade, Slovenian landscapes were most affected by large infrastructure operations, such as the construction of highways, pipelines, and power lines. In particular, large infrastructural interventions strongly influence the structural features of the landscape and its experiential quality. There are visible also some cases of minor degradation, such as unregulated or poorly regulated quarries and gravel pits, clay pits, over-regulated rivers, inadequate infrastructure construction operations (large cuts or big dams), land reclamation carried out improperly, and dispersed settlements. Landscapes are very loaded in the valley regions of Slovenia, where all human intervention is intensively concentrated (Source: The European Landscape Convention - the implementation in Slovenia, MESP, 2008).

7.1.8 Health

The effects on health caused by the emission of pollutants into the air from energy facilities are fully incorporated in the chapters of this Environmental Report relating to the description and evaluation in terms of impact of NEP on the air, including impacts caused by population exposure to ionising radiation from the use of nuclear energy.

An assessment of the effects on health caused by noise emitted from energy facilities and an assessment of the impacts of potential emissions of substances by the discharge of waste water from energy facilities which could adversely affect water bodies intended for the drinking water supply will not be considered a strategic level of assessment of NEP impact on the environment. Assessments of these impacts must be carried out for each NEP measure in the context of CEIA in spatial planning and in the framework of the project environmental impact assessment of each intervention affecting the environment.

Exposure of the population to electromagnetic radiation

In Slovenia, the control of electromagnetic fields of low frequency sources of EMR in the frequency range between 0 and 10 kHz, rated voltage above 1 kV, is governed by regulations. EMR source managers must provide the first measurement after starting a new or reconstructed radiation source, and periodic measurements in every fifth calendar year for a low-frequency radiation source.

Measurements carried out by authorised institutions in Slovenia in the surroundings of low- and high-frequency electromagnetic radiation sources show that the loading of the natural and living environment with electromagnetic radiation does not exceed the limits imposed by the regulation on electromagnetic radiation in the natural and living environment (Official Gazette of the RS, Nos. 70/1996 and 41/2004-ZVO-1). The results of background measurements of environmental pollution in 2006 and measurement campaigns in Slovenian municipalities in the period 2005-2008 show that the typical load of the natural and living environment with EMR in Slovenia is low, as the largest measured values reach up to 3% of the limit value.

There has been established a data register of radiation load sources based on the initial measurements and operational monitoring of electromagnetic radiation in the natural and living environment carried out by authorised institutions for persons liable, or owners or operators of radiation sources in accordance with the regulations. Measurements carried out in the surrounding low- and high-frequency electromagnetic radiation sources indicate that the loading of the natural and living environment with electromagnetic radiation does not exceed the limit values.

In 2006, background measurements of environment loading with high frequency EMR in the range of 80-3,000 MHz (broadcasting, mobile telephony, etc.) were carried out in the cities of Ljubljana, Maribor, part of Koper, and at five other locations in Slovenia. Measurements were carried out in selective frequency ranges across the bandwidths of the main sources in the environment (radio frequencies and television frequencies GSM2, DCS3 and UMTS4). The results show that the loading of the natural and living environment with EMR in almost all cases is small, as the maximum measured values reach only about 3% of the limit values. The measurement campaign now includes over 60 municipalities from different regions of Slovenia, on the basis of received applications at the Community and the Association of Municipalities of Slovenia. The measurement results of measurement campaigns in the period 2005-2008 show that the loading of the natural and living environment with electromagnetic radiation does not exceed the very strict limits. Average radiation loads have only rarely exceeded 1% of permitted limit values.

The low values of radiation loading measured so far do not mean that they are low everywhere, as the intensity of the EMR in an environment is a highly dynamic phenomenon, affected by several factors, which changes according to both time and space. To determine the radiation loading in a given area, there is practically no other option than to carry out EMR measurements.

7.2 Presentation of environment status with indicators of the environment status

7.2.1 Description of indicators

Status indicators for natural resources

1. Land cover and land use

In 2006, more than half of Slovenia's land area was covered with forests (56%, with scrub forest 58%); other, predominantly natural, vegetation occupied 4%; 35% of the surface was mainly devoted to agriculture; almost 3% were artificial surfaces. During the periods between 1996 and 2000 and 2000 and 2006, changes in land cover and land use were relatively minor (they occurred on 0.12% and 0.13% of the surface), and related specifically to the management of forests and building of road infrastructure.

2. Wastes from coal combustion in energy generation

The indicator shows the amount of waste from coal combustion by type (gypsum, fly ash, slag) and source (facilities TE-TOL, TET, TEŠ) of waste, as well as their further use.

The amount of waste from coal combustion has declined in the period 2002-2008, which is largely due to the better quality of lignite. The largest source is Thermal Power Plant Šoštanj, which contributes more than 80% of the waste. Only 7% of waste is discharged, the rest is being mainly used as filler in mines, as well as in cement and concrete production.

3. Growing stock with growth and fellings

Growing stock has been historically one of the main indicators of the status of forests. Along with the growth, fellings, forest area and possible felling, it constitutes a basic group of indicators used in monitoring the development of forests. Moreover, these indicators today are the basis for the assessment of biomass and carbon contained or chained by a specific forest. At the same time, of extreme importance, of course, is information on how these indicators change over time.

4. Renewable energy sources
The share of renewable energy sources in overall energy consumption in 2008 increased, but we are still far from the outlined objectives. The most important renewable source is wood biomass, followed by hydropower.

5. Available stocks of mineral resources
Information on the status of availability of mineral resources for energy use are not regulated in a way that they would serve as a basis to form an indicator of mineral resources stocks. Based on estimates

of stocks of mineral resources elaborated for the National Programme of mineral resources management (DPMS) for the period 2010-2030, the only significant stocks of mineral resources for energy use are in the Velenje Coal basin area, where the lignite stocks are sufficient for the generation of electricity at the TEŠ-6 power station in the scope and time period as envisaged by the NEP.

Status indicators for air

1. Emissions of gases that cause acidification and eutrophication

Emissions of gases that cause acidification and eutrophication in the period from 1990 to 2007 decreased by 73%, mainly as a result of reductions in SO2 emissions.

2. Emissions of sulphur dioxide
In Slovenia, SO2 emissions by the year of 2007 had declined by 94% in comparison to 1980. The reduction is primarily due to lower emissions from power plants and the use of better fuels. SO2 Emissions in 2007 were 47% lower than the predicted target values.

3. Emissions of nitrogen oxides
Annual NOx emissions in Slovenia by the year 2007 dropped by almost 20% in comparison to those in 1987. The reduction is due to an increase in the proportion of vehicles with catalytic converters. NOx emissions in 2007 were 1% lower than the predicted target values.

4. Emissions of ammonia
Annual NH3 emissions in Slovenia by the year 2006 dropped by 36.5% in comparison to those in 1990. The reduction is due to the reduction in livestock numbers. NH3 emissions in 2006 were 7% lower than the predicted target values.

5. Emissions of NMVOC
Annual NMVOC emissions in Slovenia by the year 2007 dropped by 39% in comparison to those in 1990. The reduction is due to the reduction of emissions in motor vehicle transport, an increase in the number of vehicles fitted with catalytic converters, and the implementation of two regulations on the emission of volatile organic substances in the air. NMVOC emissions in 2007 were 1.7% lower than the predicted target values.

6. Air pollution by PM10 and PM2,5
Ambient air pollution levels due to particulate matter PM10 decreased in the period 2002-2008. Nevertheless, in 2008, both the statutory annual limit concentration and the number of days with daily maximum concentrations of PM10 were exceeded. The worst situation due to pollution with PM10 is encountered in the region of Zasavje (town of Zagorje). Annual PM2.5 concentrations in the period 2005-2008 decreased. In 2008, it did not exceed the statutory annual limit.

Status indicators for waters

1. Chemical status of surface water bodies

A good chemical status is defined for almost 99% of surface water bodies - rivers - while a poor chemical status is indicated for two water bodies, the Sava River near Vrhovo, due to mercury, and the Krka River near Otočec, due to tributyltin compounds. In general, Slovenian rivers are not polluted by priority or priority hazardous substances.

2. Ecological status of surface water bodies
A good ecological status of surface water bodies for the year 2009 is defined in the water management plan for the water areas of the Danube and Adriatic Sea (in adoption process).

3. Thermal pollution of surface water
The annual amount of heat discharged to the discharge of waste water from cooling systems of power generation facilities.

Status indicators for nature

1. The conservation status of species and habitat types from the Report as per Article 17 of the Habitats Directive (92/43/EEC)
According to Article 17 of the Habitats Directive EU Member States, are required to produce a report every six years on the implementation of measures under this Directive. The report includes, in particular, information concerning the conservation measures referred to in paragraph 1, Article 6; evaluation of the impacts of these measures on the conservation status of natural habitat types listed in Annex I and species listed in Annex II; and the main monitoring results from Article 11. The largest part of the report consists of the assessment of indicators of the conservation status of species and habitats listed in all Annexes in the whole country.
From the Annexes of the Habitats Directive in Slovenia there are 60 habitat types and 203 species on which it is necessary to report. Of these, 45 habitat types and 152 species are in the Alpine region, while in the continental region there are 44 habitat types and 183 species. The majority of habitat types have been granted the final assessment of "favourable" conservation status, while in most species, the final assessment of the conservation status is "inadequate".

Final conservation status of HT:
- • 44% favourable
- • 35% inadequate
- • 21% poor.

In Slovenia, the best conservation state is in forest, marine, coastal and offshore habitat types and heathland habitats. Given that the pressure on the coast and marine area is quite great, it seems that a favourable assessment of marine, coastal and offshore habitats is contradictory.

However, these estimates are based on the fact that most of these areas of habitat types are protected and have guaranteed a good status on a long term. A bad status of conservation of freshwater habitat types, grassland and scrubs, as well as of moors and marshes are shown by pressures and threats that were identified during the single assessments. Among them the most common were human activities linked to sport and leisure, with changing the hydrographic characteristics of the area, displacement of sand and gravel from streams, alteration and abandonment of agricultural land use and natural succession.

Final conservation status of species:
- • 20% favourable
- • 50% inadequate
- • 10% poor
- • 20% unknown.

As much as a half of the species have a final conservation status marked with 'inadequate'. However, we can link those species with poor conservation status with the habitat types that also have a poor conservation status. In Slovenia, according to estimates, the most alarming status is the one of crustaceans, fish, amphibians, reptiles, dragonflies, butterflies and beetles. The most common threats and pressures on the species are the changes in hydrographic features, land use changes, urbanization, and pollution and land reclamation. According to estimates made we could suppose that the best conservation status is that of the group of mammalian species. However, we have to be aware that for more than half of the species (mainly bats) the assessment has not been made. Therefore, a further research for this group may show a completely different status (Nature Protection 21, 2008).

2. Conservation status of species in the SPA areas and in the whole territory of Slovenia from the Report according to Article 12 of the Directive on the conservation of wild birds (79/409/EEC) on the implementation of this Directive in the period 2005-2007.

The report was prepared in March 2009 by the Ministry of Environment and Spatial Planning on the basis of expert groundwork prepared by the Institute of the RS for Nature Conservation and the contributions of the Slovenian Environment Agency. The Institute of the RS for Nature Conservation, in preparing the expert groundwork also included the amendments from the Slovenian Forest Service, the Bird Watching and Bird Study Society of Slovenia (DOPPS - BirdLife Slovenia), managers of some protected areas (Sečovlje Salt pans Nature Park, Regional Park of the region Notranjska, Škocjanski zatok Nature Reserve) and proposals of the amendments provided by the NIB, DOPPS and the University of Maribor, Faculty of Natural Sciences and Mathematics. In Annex 1 of the mentioned report there is a description of the conservation status of species in the SPA areas and in the whole territory of Slovenia.

Conservation status of species in the SPA areas
Conservation status of all 321 species in 26 SPA areas defined by the Decree on Special Protection Areas (areas Natura 2000) (Official Gazette of the RS, No. 49/04, Nos. 110/04, 59/07, 43/08) is discussed in Appendix A to Annex 1. It is explained through: population estimates, the results of monitoring, evaluation of a habitat and conservation status of species in each SPA area. The conservation status is given for 321 species in 26 SPA areas. For three species of the SPA Drava (lavender and little grebe, tufted duck), according to the request from the MESP, the conservation status for the wintering period has been given.

A favourable conservation status has been found in 69 species (22%) of birds in 22 SPA areas.

A bad conservation status has been found in 62 species (19 %) of birds in 19 SPA areas. Most worrying is the status of some farmland birds. Due to intensification of agriculture, in some cases also due to abandonment of the land use, a bad conservation status has been found in the case of 13 species in the SPA Snežnik - Pivka River,the Reka River valley, the region of Slovenske gorice - downhills, areas of Goričko, Mura, Drava, Krakovski gozd - Šentjernejsko polje, Ljubljana Moors, Cerknica lake, Planinsko polje and Karst. Most problematic is the intensification of agriculture, especially early mowing, excessive fertilization, reducing the share of meadows and wetlands, thus causing the diminishing of range and quality of habitats. This is reflected in a declining population trends of corn crake, Eurasian curlew, whinchat and Northern lapwing. In the case of Eurasian scops-owl, lesser grey shrike and barred warbler, as an additional negative impact there has been detected also the depletion of a mosaic cultural landscape (for example the loss of hedges, shrubs) and the disappearance of meadow orchards. European roller and lesser kestrel are already ranked among the extinct species. Problematic is also the overgrowing or abandonment of use of dry meadows, thus reducing the habitat of rock partridge, tawny pipit and ortolan bunting. Among forest bird species, there stands out the issue of grouses (hazel grouse, capercaillie, black grouse), white-backed woodpecker and three-toed woodpecker in the SPA areas of Jelovica, Pohorje, Kočevsko-Kolpa and Trnovski gozd. The key cause of declining in populations in the case of mentioned species is grubbing and fragmentation of habitat. Forest grouse populations are declining due to overgrowing of meadows, pastures, forest edges, deforestation and degradation of characteristic habitat, non-compliance of hunting activities with hunting management plans, and due to disturbances caused by mass tourism and recreation. Declining of populations of white-backed woodpecker and three-toed woodpecker is a result of grubbing of habitat represented by forests with a high proportion of dead wood mass. A bad conservation status has also been recorded in several species related to freshwater habitats and wetlands within the SPA areas of Reka River valley, Mura, Drava, Krakovski gozd - Šentjernejsko polje and Cerknica lake. The most noticeable impact and consequences are those left by regulations of low-lying sections of the river parts and their tributaries. By regulation of the river banks, the nesting opportunities for sand martin and common kingfisher have been reduced, by the change in river dynamics those of common tern, gull and common kingfisher, while the degradation of gravel bars those of little ringed plover and common sandpiper. The overgrowth of oxbows and drainage of wetlands has had a negative impact on spotted crake, little crake, little bittern, river warbler and Savi's warbler. The wintering population of bean geese on the SPA area of Drava has been drastically reduced by hunting from the Croatian side of the Ormož Lake. The nesting populations of some species of ducks, grebes and Charadriiformes in the SPA area of Cerknica lake fluctuate mainly due to environmental factors, such as dropping of water levels during the nesting period. Due to natural factors (strong storms during the nesting period, predators) also the populations of little tern and common tern fluctuate in the SPA area of Sečovlje salt pans.

A questionable conservation status has been found in 190 species (59 %) of birds in 25 SPA areas. The estimates could not be identified due to insufficient data. For the 13 species in 9 SPA areas the data on population size did not exist even at the time of defining of IBA or SPA area, while in other cases we do not possess current monitoring data from which we could draw conclusions on their conservation status.

In the Appendix B to Annex 1 there is a list of national population sizes of species from the Decree on Natura 2000 areas, which usually are listed among the better known species.

3. Conservation of important nature protection areas:

Natura 2000 areas (SCI, SPA and SPA additional features)

In Slovenia, the Decree on special protection areas (Natura 2000 areas) determined 286 Natura 2000 areas, of which 260 are defined under the Habitats Directive (SCI) and 26 under the Birds Directive (SPA). Areas cover 720,287.82 hectares, thus representing 35.5% of Slovenia's territory, of which 639,734.76 ha or 31.55% under the Habitats Directive (SCI) and 461,818.87 ha or 22.78% on the basis of the Birds Directive (SPA). Additionally, in May 2008 there were defined 17 areas that according to the European Commission qualify for special protection areas, i.e. SPA additional features, representing an additional 1.7% of Slovenia's territory or 33,989.48 ha. The majority of areas are covered with forests, there is a large share of no vegetation (mostly wall), 9% of the land is above the tree line, the proportion of grassland is also important. In protected areas (Triglav National Park, regional and landscape parks and reserves and natural monuments), 25% of the total area qualify as Natura 2000 sites. Areas (SPA and SCI) are mainly overlapping, as 60% of the area proposed under the Habitats Directive fall within the proposed Special Protection Areas under the Birds Directive.

71% of the Slovenian network of Natura 2000 sites is covered by forests, which is approximately 15% higher than the European average and it shows in general their good conservation. Nevertheless, some types of forests, particularly lowland floodplain forests, have been cleared in past and do not have a favourable conservation status. From non-forested areas in the Natura 2000 network there is included about 20% of agricultural land types, among these the most extensive are meadows. In many areas, these still have a favourable conservation status, while the pressure on diminishing the favourable conservation status are great in a natural way through overgrowth due to the abandonment of farming, as well as a result of intensification of their use. Agricultural areas with high natural value are one of the major opportunities for increasing biodiversity and for protecting endangered habitats in specific rural areas. Generally they can be characterized as typical of areas of extensive agriculture with a great diversity of species and habitats. An extremely important role in the Natura 2000 network is played by caves which are the subject of conservation in over 70 areas (out of a total of 260). Inland waters from the surface point of view represent only a percentage of the network, but their significance for the preservation of the network is immense. A great proportion of waters however is not in the most favourable conservation status. Human dwellings are important for reproduction, resting and wintering of some species, therefore in the Natura 2000 areas also some built-up areas are essential. This is particularly true for animals from the groups of birds (for example white stork, Eurasian scops-owl) and mammals (for example bats) (MESP, 2010).

Protected areas

Protected areas are a State measure to conserve natural values and biodiversity. There is a classification of wider (national, regional, landscape park) and narrower (strict nature reserves, nature reserves and natural monuments) protected areas that are subject to regulated protection arrangements. They are protected by state or municipal regulations. The proportion of protected areas by categories is shown in the figure below.

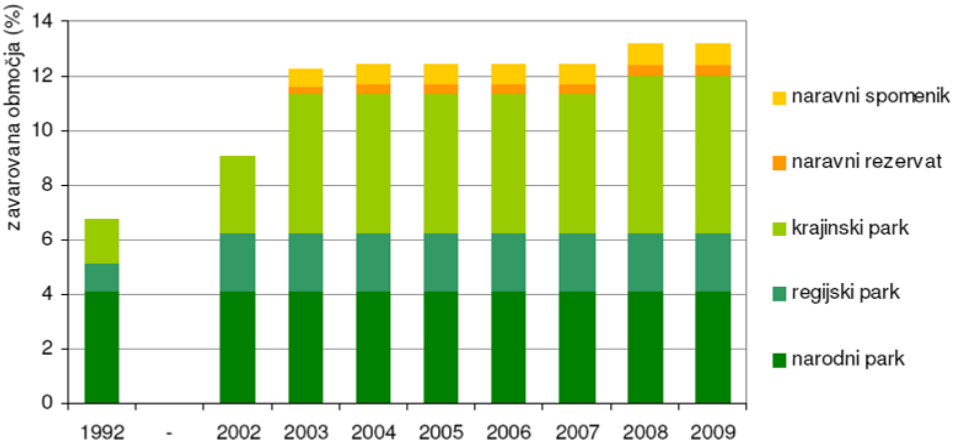


Figure 9: Proportion of protected areas by categories (MESP, 2010)

Currently, in Slovenia we have: 1 national park, 3 regional parks, 43 landscape parks, 1 strict nature reserve, 54 natural reserves and 1,277 natural monuments. Protected are 254,847 ha, which is 12.57% of the Slovenia's territory (MESP, 2010). It is also foreseen that the share of different categories of protected areas is to increase by 10% of Slovenia's territory until the year 2014 (ReNPVO, Official Gazette of the RS, No. 2/06).

Ecologically important areas

Ecologically important areas cover 52% of the territory of Slovenia. Among others, as an environmentally significant area is defined also the central part of habitat of large predators in size of 347,784 ha; 32 caves, which are marked on the map with their entrances, and sea and the shoreline with 22,545 ha. An integral part of ecologically important areas are the Natura 2000 sites, which form an ecological network at the European level (MESP, 2010).

Natural values

The Rules on the designation and protection of natural values have determined 6,519 natural values and 8,382 caves - natural values, which are shown separately. The caves were given status under the Cave Protection Act and managed in the register of underground caves. The density of caves in Slovenia amounts to 0.413 caves per km2 or one cave per 2.419 km2. In Slovenia there are 2,092 (32.09%) natural features of national importance, and 4,427 (67.91%) of local importance. Of national importance are those natural values that have an international or major national importance and are under the responsibility of the state. The rest are of local importance and are protected by the local community. All natural values in protected areas established by the state are of national importance, as well as all the underground caves are of national importance, too. The density of natural values for the entire country is of 0.32 per km2, or one natural value per 3.11 km2 (Source: MESP, 2010).

The total area of all polygons amounts to 2334.69 km2, which represents 11.52% of the country's territory. The average area of a polygon amounts to 0.805899 km2. Smaller polygons dominate, as only 338 are larger than 1 km2.

Ramsar wetlands

Ramsar wetlands in Slovenia:

- Cerknica lake with its surroundings: 7,250 ha (entry of locality: 19 January 2006)

- Salt pans in Sečovlje: 650 ha (entry of locality: 3 February 1993)
- Caves in Škocjan: 305 ha (entry of locality: 21 May 1999) (http://www.ramsar.si, quoted in September 2010; http://sl.wikipedia.org/, quoted in September 2010).

Biosphere reserves

Biosphere reserves in Slovenia:

- In July 2003, UNESCO declared Julijske Alpe to be a biosphere reserve of a world importance – the Biospherne reserve of Julian Alps. This is the first biosphere reserve in Slovenia and it comprises 195,723 hectares in the Municipalities of Bled, Bohinj, Bovec, Jesenice, Kobarid, Kranjska Gora, Radovljica, Tolmin and Žirovnica. The central and peripheral areas in the Julian Alps are defined by Law on the Triglav National Park, while the transition area comprises a wider part of the Julian Alps.
- On 29 October 2004, in the world network of biosphere reserves, also Park Škocjanske jame was accepted – its title is Karst biosphere reserve. It comprises a central area that includes a strictly protected area of the park itself, an impact area of the park that unites the parallel activities in accordance with an application by analogy, and a transition area that comprises the area of občine Divača (http://sl.wikipedia.org/, quoted in September 2010).

UNESCO natural heritage

The UNESCO natural heritage comprises areas under the protection of the organisation UNESCO in the function of both cultural and natural heritage. The UNESCO list of world heritage of year 2008 records 878 places; of these 679 are cultural monuments, 174 natural, and 25 mixed, and they are in 145 countries. Since year 1986, in the list of world heritage there have been recorded also the Škocjan caves, and until today they remain the only area of UNESCO natural heritage in Slovenia.

IBA areas

IBA areas are proposals for Specific protected areas (SPA) elaborated by the Bird Watching and Bird Study Society of Slovenia. The total surface of all IBA areas is of 496,500 ha, which represents approximately 24% of the total territory of Slovenia.

IBA areas in Slovenia are: Hills of Slovenske gorice, valley of the Dravinja River, hills of Pohorje, region of Kozjansko-Jovsi, walls of hills Posavsko hribovje, eastern part of Kamniško-Savinjske Alps and Karavanke, region of Snežnik-Pivka, region of Jelovica, southern edge of the forest Trnovski gozd and plateau Nanos, region of Banjšice, regions of Breginjski Stol and Planja, area of Škocjanski zatok, region of Goričko, the Mura River, the Drava River, region of Krakovski gozd-Šentjernejsko polje, region of Kočevsko-Kolpa, Ljubljana moors, Cerknica lake, area of Planinsko polje, drainage basin of the Nanoščica River, valley of the Reka River, Karst, the Triglav National Park and the Sečovlje salt pans (Božič, 2003; http://sl.wikipedia.org/, as quoted in September 2010).

Status indicators for cultural heritage

1. Endangerment of cultural heritage

Status indicators for cultural heritage are not formalised. In the discipline, there has been established the indicator "endangerment of cultural heritage" according to the method of "English heritage scale" to measure the endangerment based on the assessment of status and usage. Endangerment assessments for the whole territory of Slovenia are not available, existing data for individual municipalities are from different time periods. It is possible to give only a general estimate (see Section 7.1.5).

Status indicators for climatic factors

1. GHG Emissions

GHG emissions in 2007 were 20.722 kilotonnes of CO2 eq, which is 1.8% above the base year. In accordance with the obligation that requires 8% reduction in emissions, the average GHG emissions in 2008-2012 should not exceed 18,726 kilotonnes of CO2 equivalents.

Status indicators for landscape

1. Conservation of landscape features
2. Conservation and integrity of the landscape areas with distinctive features on the national level and outstanding landscapes

Status indicators for landscape are not formalised. For purposes of this assessment the general indicators of status are used that derive from defined environmental objectives. Current estimates of the status of the landscape on the national level are not available, it is possible to give only a general estimate (see Section 7.1.7).

7.3 Environment status and the environment status development without the NEP implementation

Environment status and the environment status development without the implementation of measures is shown with matrix in the tables below.

Table 10: Environment status and the environment status development without the implementation of measuresArea (aspect) of impact: natural resources.

Environmental objectives / sub-objectives	Indicator of the environment status	Environment status without the implementation of NEP
The gradual reduction of the environmental impacts due to use of energetic mineral raw materials	Wastes from coal combustion in energy generation	In case that the NEP is not adopted the use of coal in the energy sector will not decline and consequently there will be no reduction in pressures on the environment due to waste production from the combustion of coal in energy generation.
Sustainable energy use of forest biomass	Growing stock with growth and fellings	In case that the NEP is not adopted the use of forest mass for energy purposes will not increase. Forest biomass will continue to be not sufficiently exploited renewable natural resource and status of growing stock in forests will continue to be

		suboptimal.
Increasing biofuel production from proper renewable energy sources Renewable energy sources	Renewable energy sources	in case that the NEP is not adopted the production of biofuels from industrial plants and forest biomass will not increase.

Area (aspect) of impact: air.

Environmental objectives / sub-objectives	Indicator of the environment status	Environment status without the implementation of NEP
To guarantee the attainment of national emission ceilings for SO2	Annual emission of SO2	In the case the NEP is not adopted the SO2 emissions from energy generation will not be significantly altered and will remain within the foreseen national limit values of the NEC Directive.
To guarantee the attainment of national emission ceilings for NOx	Annual emission of NOx	In the case the NEP is not adopted the NOx emissions from energy generation will not be sufficiently lowered and therefore the reaching of environment goals from the NEC Directive will be endangered.
To guarantee the attainment of national emission ceilings for VOC	Annual emission of VOC	In the case the NEP is not adopted the VOC emissions from energy generation will not be significantly altered and will not have an impact on reaching the foreseen national limit values of the NEC Directive.
To guarantee the attainment of national emission ceilings for NH3	Annual emission of NH3	In the case the NEP is not adopted the NH3 emissions from energy generation will not be significantly altered and will not have an impact on reaching the foreseen national limit values of the NEC Directive.
To guarantee the attainment of national emission ceilings for particulate matter (PM TSP, PM10, PM2,5)	Annual emission (PM TSP, PM10, PM2,5)	In the case the NEP is not adopted the emissions of particulate matter (PM TSP) from energy generation will not be sufficiently lowered and therefore the reaching of environment goals from the NEC Directive will be endangered.

Area (aspect) of impact: water.

Environmental objectives / sub-objectives	Indicator of the environment status	Environment status without the implementation of NEP
To maintain a good chemical, ecological and quantitative status of surface waters.	The quality of chemical and ecological status of rivers.	In the case that the NEP is not adopted the ecological status of rivers due to unplanned construction of hydroelectric plants will deteriorate more than it is necessary to achieve the objectives of the climate-energy legislative package, which provides for mandatory share of renewable energy sources in final energy consumption.

To reduce the impact of thermal pollution of water due to water use for cooling in electrical power generation	Thermal pollution of surface water	In the case the NEP is not adopted the thermal pollution of surface water due to discharge of waste water from cooling systems of electrical power generation will not be reduced.

Area (aspect) of impact: nature.

Environmental objectives / sub-objectives	Indicator of the environment status	Environment status without the implementation of NEP
Maintaining a high level of biodiversity of flora, fauna and habitat types	Change of the conservation status of species and habitat types from the report as per Article 17 of the Habitats Directive (92/43/EEC)	In the case that the NEP is not adopted the energy facilities will be placed in the environment more randomly. It is possible that the requirements of investors for the construction of power plants will increase, and this also means an increase of pressure on the natural environment and, consequently, on the flora, fauna, habitat types and biodiversity.
Maintaining a high level of biodiversity of wild birds	Change of the conservation status of species in the SPA areas and on the territory of the whole Slovenia from the report as per Article 12 of the Directive on the conservation of wild birds (79/409/EEC)	In the case that the NEP is not adopted the energy facilities will be placed in the environment more randomly. It is possible that the requirements of investors for the construction of power plants will increase, and this also means an increase of pressure on the natural environment and, consequently, on the habitat of birds and their biodiversity.
Maintaining the size and characteristics of important nature conservation areas (on the international and national scale)	Natura 2000 areas (SCI, SPA and SPA additional features) - Ecologically important areas - Protected areas - Natural values - Ramsar wetlands - Biosphere reserves - UNESCO natural heritage - IBA areas	In the case that the NEP is not adopted the energy facilities will be placed in the environment more randomly, without pursuing the confirmed country's energy objectives. Since a large part of Slovenia constitutes important nature conservation areas, the pressure of investors for the placement of facilities in these areas will increase, so that the surface of these areas is likely to decrease.

Area (aspect) of impact: Cultural heritage

Environmental objective	Indicator of the environment status	Environment status without the implementation of NEP
Maintaining the extent and characteristics of buildings and sites of cultural heritage	Endangerment of cultural heritage: Current estimates of the status of endangerment on the national level are not	Without implementation of the NEP measures, the extent and characteristics of heritage will be maintained in the areas of measures implementation. In particular, this applies to heritage in the planned areas of

	available. In general it is agreed that the heritage is significantly endangered, in particular: - Urban heritage with newer buildings, causing changes in volumes of settlements, settlement structure, functional units and the building fabric; - Architectural heritage due to the improper use or non-use, inadequate maintenance and improper renovation; - Cultural landscape due to the overgrowing of agricultural land and urbanization.	hydropower facilities, where due to building of dams the maximum effects are expected to happen, and along power lines corridors, where the image of heritage in the wider area is expected to change. If the NEP measures fail to implement, this does not affect the actual trend of changing the level of heritage endangerment. Further devaluation is expected, mainly due to inappropriate urbanization. In the case of successful realization of the efforts to incorporate the comprehensive protection of heritage in various development programs and the appropriate spatial arrangements, of acceding to the systematic renovation of heritage sites and of the actual knowledge that the protection and conservation of heritage is a concern for all and everyone, a general reduction of heritage endangerment is expected.

Area (aspect) of impact: Climatic factors

Environmental objective	Indicator of the environment status	Environment status without the implementation of NEP
Measures to mitigate and adapt to climate change to be included	GHG Emissions	Without implementation of the NEP, the GHG emissions will be reduced in 2020 to a value determined for Slovenia in comparison to the base year of 2005.

Area (aspect) of impact: landscape.

Environmental objective	Indicator of the environment status	Environment status without the implementation of NEP
Conserving landscape features	Conservation of landscape features Current estimates of the conservation status of landscape features on the national level are not available. In general it is agreed that the landscape is threatened by: - man and his interventions in the landscape, and - nature and its ability of overgrowth. With many still preserved landscapes, particularly natural landscapes and cultural landscapes in the less developed areas, as increasing devaluation of space is becoming	Without implementation of the NEP measures, the landscape characteristics will be maintained in the areas of measures implementation. In particular, this applies to the proposed areas of wind power plants, hydroelectric power plants and power line corridors. Without implementing the measures, the trend of landscape degradation is expected, especially in conjunction with the expansion of settlement areas, overgrowth of agricultural land, intensification of

	evident. In addition to building, the facilities of energy infrastructure, especially power lines and hydroelectric power facilities, are one of those who in the last period have largely changed the function and appearance of the landscape. These interventions have affected also more remote, conserved landscape areas, and have brought major changes to space because of their extent. These changes are particularly pronounced in the landscape marked by great visual exposure, small scale and tiny fragmentation of landscape elements. Volume increase of energy transmission networks, and especially the emergence of new manifestations of energy facilities in our space, wind power and photovoltaic systems can further amend in an essential way the image of the Slovenian landscape.	agriculture and mineral extraction.
Conservation and integrity of the landscape areas with distinctive features on the national level and outstanding landscapes	Conservation and integrity of the landscape areas with distinctive features on the national level and outstanding landscapes Current estimates of the status of conservation and integrity of these areas are not available. According to data on changes in actual land use (increase of the extent of built-up areas and forest land), the trend of decreasing recognisability is evident. Current infrastructure corridors generally do not undermine the integrity of sites.	Given that some measures intervene into areas with distinctive characteristics at the national level, in these areas without the implementation of the NEP measures there will be no reduction of conservation and integrity.

Area (aspect) of impact: health.

Environmental objective	Indicator of the environment status	Environment status without the implementation of NEP
To reduce the public exposure to electromagnetic radiation of supply lines of the transmission electrical network and distribution networks for electricity	Number of buildings with protected areas that are excessively exposed to electromagnetic radiation. The proportion of network conduits for electric energy supply that are buried in the ground in the settlement areas.	In the case that the NEP is not adopted the public exposure to electromagnetic radiation from the supply lines of the transmission electrical network and distribution networks for electricity will not decrease.

7.4 Display of conservation, protected, brownfield and other sites and a summary of existing legal regimes

7.4.1 Forest reserves and protected forest

Figure 10 shows the area of forest reserves and protected forests, where the use of forest biomass for energy purposes is limited (Annex 8).

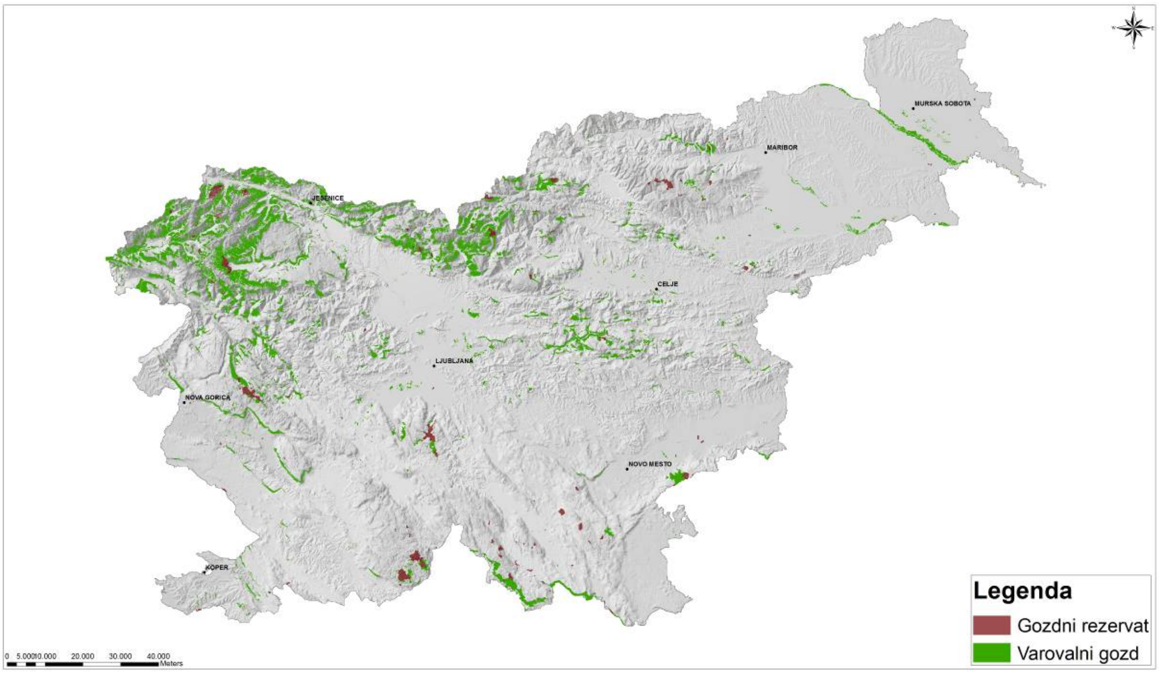


Figure 10: Display of the forest reserves and protected forests (source of bases: Forest Service)

Use of forest biomass for energy purposes is limited in the forests that are declared to be protected forests, because in the harsh ecological conditions they protect themselves, their land and low-lying land and forest where there is exceptionally accentuated any other ecological function.

Also, the use of forest biomass for energy purposes is limited in the forests that are declared to be special-purpose forests, because there are highlighted the research function, the function of protecting natural values or cultural heritage protection function, or the safety, recreational, educational, tourism functions are accentuated, or a hygiene-health, defence or aesthetic function is pointed out.

Special-purpose forests comprise also forest land on which there are storage houses or exercise facilities designed for defence needs.

7.4.2 Water protection areas

The figure below shows the water protection areas, where the geothermal energy use is restricted or prohibited, while the construction of energy facilities is permitted if it satisfies the requirements defined for each specific area of water protection in the regulation that governs the water protection regime in this specific area (Annex 2).

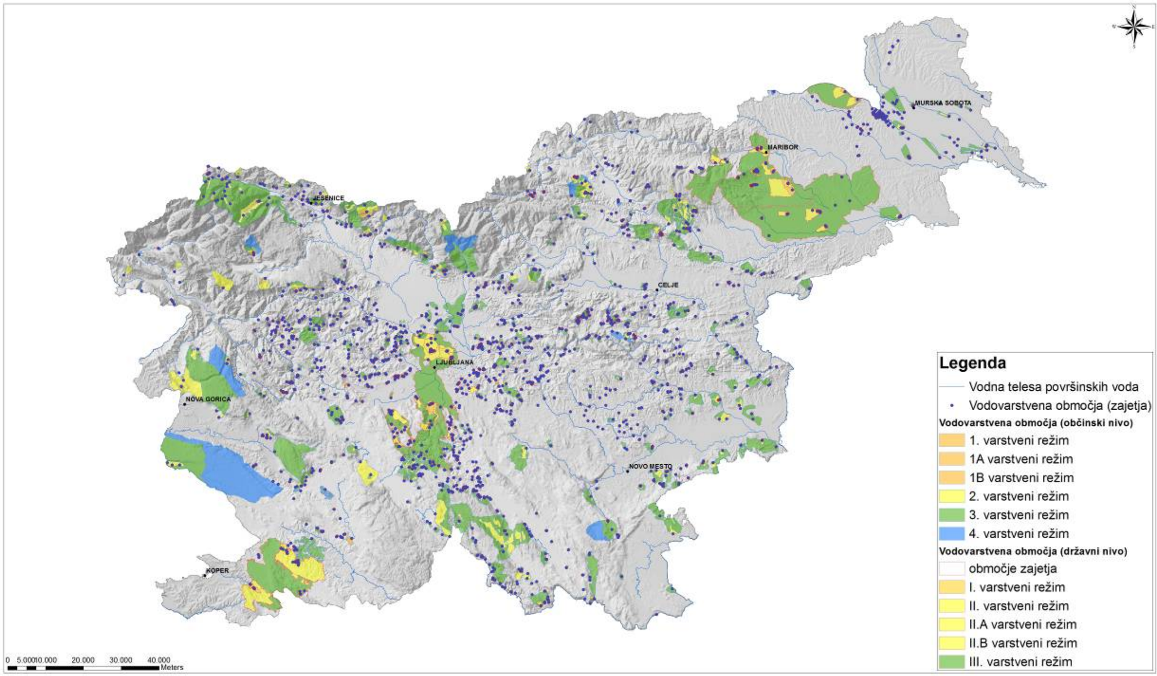


Figure 11: Display of water protection areas (source of bases: ARSO)

7.4.3 Nature and Biodiversity

Within the Natura 2000 sites (SCI and SPA areas), in accordance with Article 7 of the Decree on Special Protection Areas, interventions and activities have to planned in such a way that as much as possible:

- • the distribution of habitat types and habitats of flora and fauna is maintained,
- • an appropriate abiotic and biotic characteristics of components of habitat types and their specific structures and natural processes, and an appropriate use are maintained,
- • the quality of the habitat of plant and animal species are maintained and improved, especially those parts of the habitat which are essential for the most important stages such as breeding sites in particular, group accommodation, hibernation, migration and feeding of animals.
- • the habitat connectivity of populations of plant and animal species is maintained, and it allows the reconnection if the latter is broken.

In these areas it is necessary to carry out assessments of the acceptability of interference in nature in accordance with Article 28 of the Nature Conservation Act (ZON). In the case of intervention carried out it is necessary to foresee and implement all possible technical and other measures so as to minimise the adversely affect on the habitat types, plants and animals and their habitats. It is necessary to take particularly into account the protection objectives defined for each of the Natura sites.

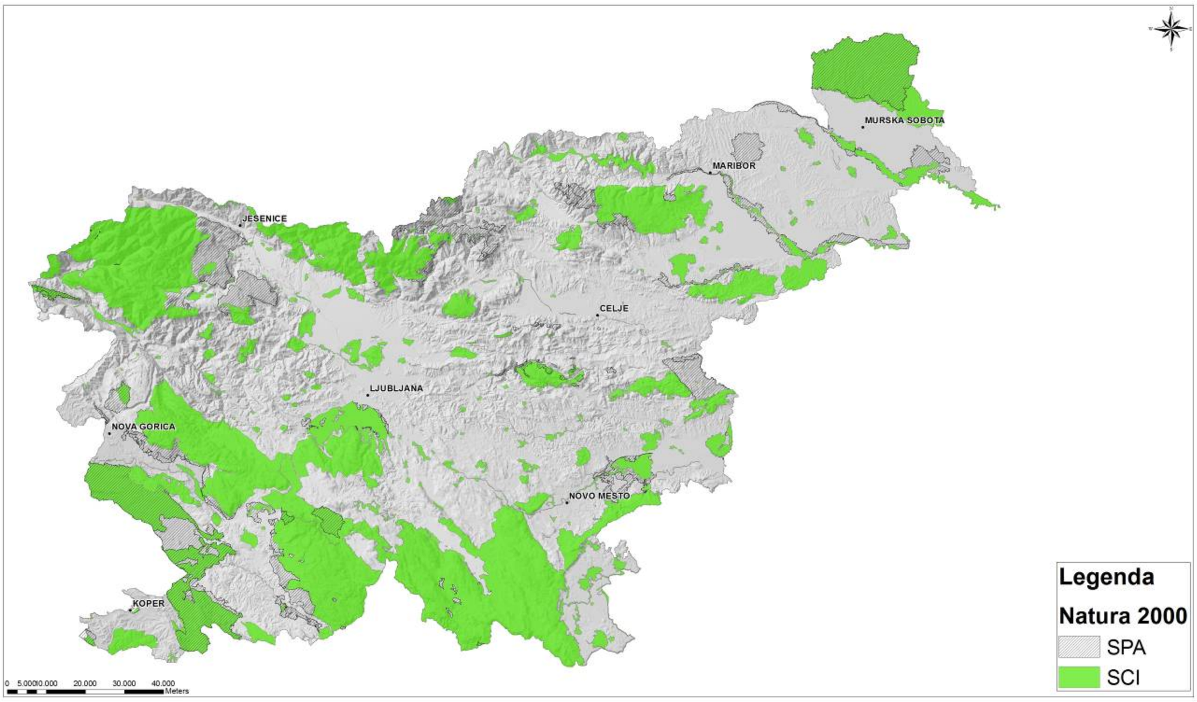


Figure 12: Display of Natura 2000 sites (source of bases: ARSO)

Interventions and activities in the protected areas must be conducted in accordance with the instrument on protection and management plan in the case a of national and regional park. (A national and regional park must have a management plan).

Small protected areas

- Natural Monument (Article 64 of the Nature Conservation Act): - a natural monument is an area that contains one or more natural values, which have an exceptional shape, size, content or location or are a rare example of natural values.

• In the protected area it is prohibited to intervene in nature in a way that may worsen the situation, change, damage or destroy the natural value, and to modify conditions or status in a way that may change, damage or destroy the natural value or reduce its aesthetic significance.

• The instrument of protection provides among other the restrictions or limits in the protected area o the following:

1. implementation of interventions in space,
2. excavation or filling of the terrain,
3. changes to the water regime,
4. causing vibrations and explosions,
5. economic exploitation of natural resources,
6. changing vegetation,
7. all other activities that may significantly threaten the protected area.

- Natural Monument (Article 65 of the Nature Conservation Act): - Strict Nature Reserve (Article 65 of the ZON): strict nature reserve is an area of naturally preserved geotypes, habitats of endangered, rare or characteristic plant or animal species, or an area important for biodiversity conservation, where natural processes take place without human influence.

• in the protected area it is prohibited to carry out activities that threaten the conservation of protected areas, to deliberately destroy plants and animals, and the retention of persons other than persons exercising control.

• the instrument of protection provides the specification of detailed rules of conduct in the strict nature reserve.

- Natural Monument (Article 66 of the Nature Conservation Act): - Nature Reserve (Article 66 of the ZON): nature reserve is an area of geotypes, habitats of endangered, rare or characteristic plant or animal species, or an area important for biodiversity conservation, which is maintained also through a balanced human activity in nature.

• In the protected area it is prohibited to carry out activities by the means and in such a way that could result in substantial changes in biodiversity, structure and function of ecosystems, and to carry out the activities in the period of time when the existence of plants or animals can be endangered.

• The instrument of protection provides among other the restrictions or limits in the protected area o the following:

1. implementation of interventions in space,
2. excavation or filling of the terrain,
3. changes to the water regime,
4. removing of debris,
5. causing of noise, vibrations and explosions,
6. economic exploitation of natural resources,
7. changing vegetation,
8. all other activities that may significantly threaten the protected area.

• In determining the prohibitions or restrictions concerning activities in the preceding paragraph, the characteristics of the protected area and the purpose of protection shall be considered.

Large protected areas (Articles 67 and 68 of Nature Conservation Act (ZON))

Large protected areas are natural areas with great abiotic, biotic and landscape diversity and high density and diversity of natural values, which can also be functionally interconnected in a complex way.

General protection regime:

• The instrument of protection of larger protected areas provides among other the prohibitions, limits or other regulation, according to the type of larger protected area, of the following:

- implementation of interventions and activities which endanger the nature elementary state,
- construction of new transit communal, energy and transport facilities,
- construction of new facilities,
- excavation or filling of the terrain,
- causing explosions or vibrations,
- economic exploitation of natural resources, except for construction in a protected area,

- changing the water regime, except for essential maintenance,
- changing vegetation,
- all other activities that may significantly threaten the protected area.

1. Natural park (Article 69 of the Nature Conservation Act): national park is a huge area with many natural values and great biodiversity. In the major part of the national park, nature in its elementary state is present with preserved ecosystems and natural processes, and in a smaller area of the park there may be areas with significant human impact, which is harmony with nature. National park, the purpose of protection, development policy, protected areas, protection regimes, manager and other shall be determined by law.

2. Regional park (Article 70 of the Nature Conservation Act): Regional Park (Article 70 of the ZON): regional park is an extensive area of regionally characteristic ecosystems and landscapes with large portions of nature in its elementary state and areas of natural values that are interwoven with parts of nature, where human influence is greater but balanced with nature. The instrument of protection provides the specification of detailed rules of conduct in the regional park area.

3. Landscape park (Article 71 of the Nature Conservation Act): Landscape Park (Article 71 of the ZON): landscape park is an area with a pronounced quality and long-term interaction of humans with nature, which has high ecological, biodiversity or landscape value.

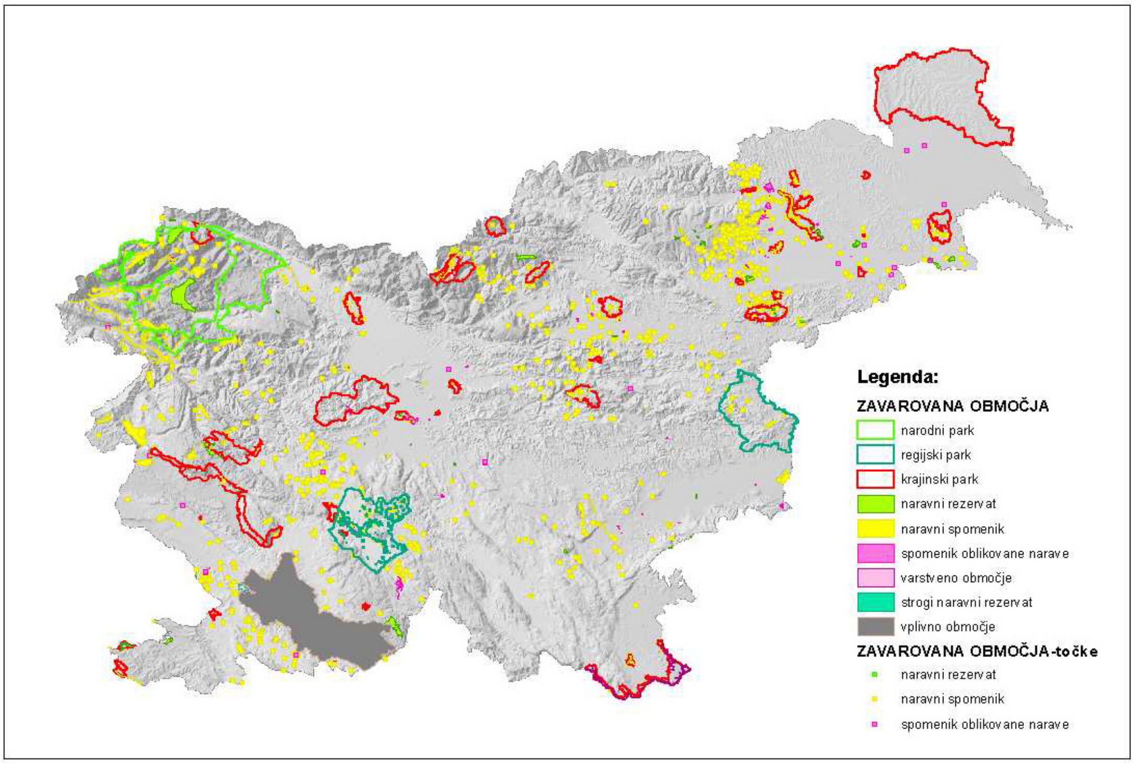


Figure 13: Display of protected areas (source of bases: ARSO)

Natural values are determined by the document Rules for designation and protection of natural values (Official Gazette of the RS, Nos. 111/04, 70/06). This document also lays down rules of conduct for the protection of natural values.

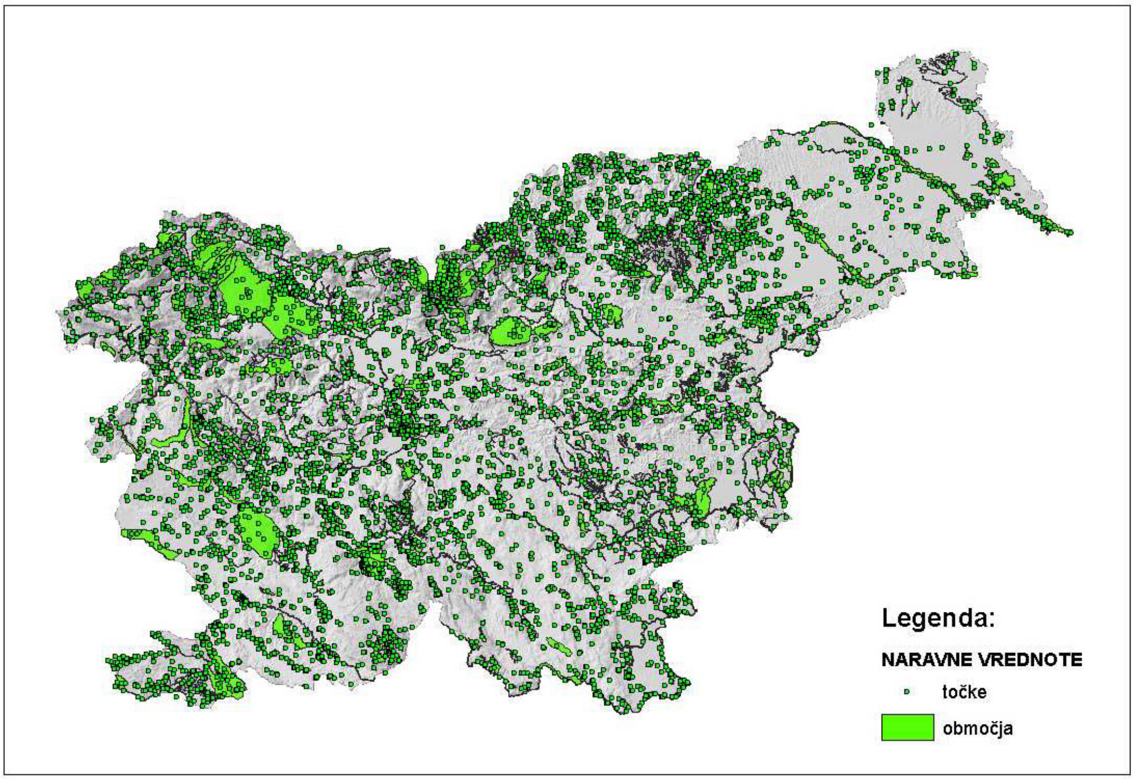


Figure 14: Display of natural values (source of bases: ARSO)

According to Article 5 of the Decree on ecologically important areas, in the **EIA** areas that in the same time are not the Natura 2000 sites different interventions and activities are possible. However, they have to be planned in such a way to preserve as much as possible the natural distribution of habitat types and habitats of flora and fauna, their quality and connectivity of populations habitats, and to facilitate the re-connection if it was interrupted by the planned intervention. For the implementation of interventions in an EIA area is not necessary to obtain the nature protection conditions and the nature protection consent.

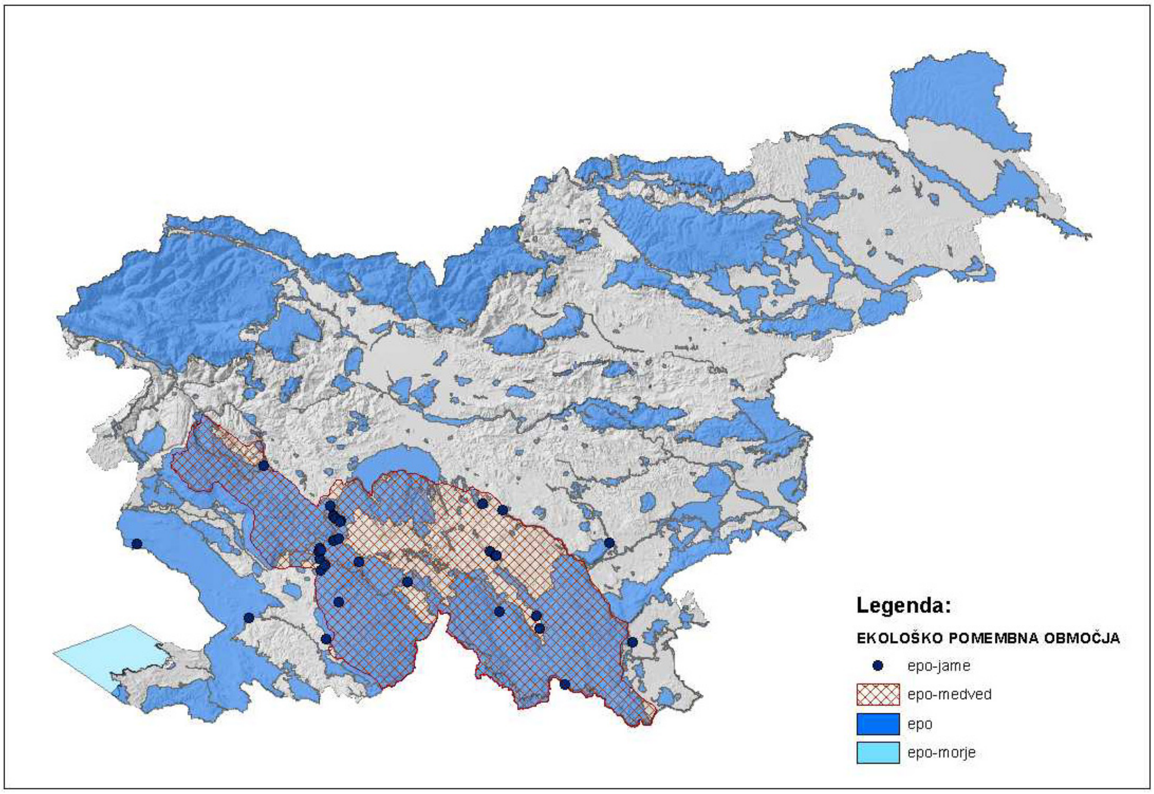


Figure 15: Display of ecologically important areas (source of bases: ARSO)

7.4.4 Cultural heritage

Heritage consists of property inherited from the past that Slovenians, members of the Italian and Hungarian national communities and the Roma community and other citizens of the Republic of Slovenia determine as a reflection and expression of their values, identities, religious and other beliefs, knowledge and traditions. Heritage includes the environmental aspects arising from the interaction between people and space through time (Article 1 of CHPA-1).

Into the heritage register are to be recorded real estate, movable property and values with characteristics of heritage as from Article 1 of the law (registered heritage). Immovable heritage is recorded in the Register as an individual real estate unit or an area of heritage (Article 9 of the ZVKD-1).

The Register of Cultural Heritage at the Ministry of Culture (RKD, August 2010) counts 31,259 units of heritage, and of this:

- - 22,014 units of architectural heritage,
- - 1,361 units of settlement heritage,
- - 225 units of cultural landscape,
- - 238 units of garden-architecture heritage,
- - 4,164 units of memorial heritage,
- - 3,088 units of archaeological heritage,
- - 40 units of historic landscape, and
- - 129 units of other types of heritage.

Registered immovable heritage that:

- - represents a striking achievement of creativity or a valuable contribution to cultural diversity,
- - is an important part of space or heritage of the Republic of Slovenia or its regions, or
- - represents a resource for understanding the historical processes, phenomena and their relationship to the current culture and space,

due to its exceptional importance for the country (a monument of national importance), or to its special importance for the region or municipality (a monument of local importance) may be declared a monument. Immovable monument can be declared as a single monument or as a monument site. Part of the immovable monument is also its immediate surroundings and fixtures that together with the immovable monument form a spatial, functional or meaningful integral feature (Article 36 of the ZVKD-1). The Register of Cultural Heritage (RKD, August 2010) there are recorded 8,140 cultural monuments.

Integrated conservation of heritage is realized in development planning and measures of state, provinces and municipalities, so that they include heritage, while respecting its special nature and social importance, in sustainable development (Article 1 of the ZVKD-1). Heritage shall be managed in a way that it ensures the utmost conservation of its cultural values for the future. A monument should be managed in a way so that its cultural values and social importance are consistently observed and maintained (Article 36 of the ZVKD-1).

Protection of cultural heritage in the processes of drafting and adopting the plan shall be guaranteed with regard to acts of declaration of immovable monuments, registered archaeological sites and acts on the protection of heritage sites (note: the latter are not defined yet), and with the heritage impact assessment (the subject of this material) (Article 73 of the ZVKD-1). **Handbook of legal protection regimes that should be taken into account in spatial planning and interventions in space in the areas of cultural heritage** (http://giskd2s.situla.org/evrdd/P_09_04_03.htm) contains a concise overview of the consolidated texts of all legal protection regimes that apply in the cultural heritage areas. The text below is an abstract from the Manual.

In the **cultural heritage** areas the legal protection regime provides for:

- - such a management of cultural monuments that strictly respects and preserves its cultural values and social importance,
- - mandatory consideration of the preservation of cultural monuments in the spatial planning documents and spatial measures issued pursuant to the provisions of the environmental planning regulation,
- - prohibition of removal (demolition) of a cultural monument.

Exceptionally, it is allowed with the consent of the minister responsible for cultural heritage to remove a cultural monument by fulfilling of the following conditions:

- - if the monument is found to be decrepit or damaged and it can not be renovated by normal means, or if the monument represents a threat to the safety of persons and property,

- - if the monument has been previously offered for sale at a price that takes into account its condition,
- - if previously a research of the monument has been carried out, and
- - if the research and the removal are supervised by a competent organization.

An additional legal protection regime is defined in a specific act on declaration of a particular area as a cultural monument. When the additional protection regime can not be inferred from the actual act of declaration (such are examples of some older acts), Cultural Heritage Protection Act in cases of certain types of immovable monuments provides for additional legal protection regimes.

In the **areas of cultural heritage identified in the expert groundwork** the legal regime provides for:

- - prohibition of removal (demolition) of registered cultural heritage,
- - prohibition of the interventions in space or ways of implementation of activities that would affect the protected values of areas and identifying characteristics and material substance that are responsible for these values,
- - in the surrounding areas of cultural heritage there shall be exercised control over land development that could adversely affect the cultural heritage area (influence area of heritage).

Allowed are interventions in space and spatial solutions that:

- - contribute to sustainable conservation of heritage or to the increase of its value,
- - protect and preserve the heritage of the site (in situ).

The Manual defines the exceptions related to the removal of cultural heritage, as well as additional legal protection regimes for individual types of heritage.

Registered archaeological sites are subject to a legal protection regime that requires their conservation be strictly considered in the spatial planning documents and spatial measures issued pursuant to the provisions on spatial planning.

In the **influence area of a cultural monument** the legal protection regime applies as defined by the concrete act on declaration of a cultural monument.

The **influence areas of heritage** are subject to the following legal protection regime:

- - spatial integrity, testimony feature and the dominance of heritage shall be conserved,
- - arrangements and intervention, which could have negative consequences on the properties, meaning or material substance of the cultural heritage, are prohibited.

Arrangements are permitted to encourage the development and reuse of cultural heritage.

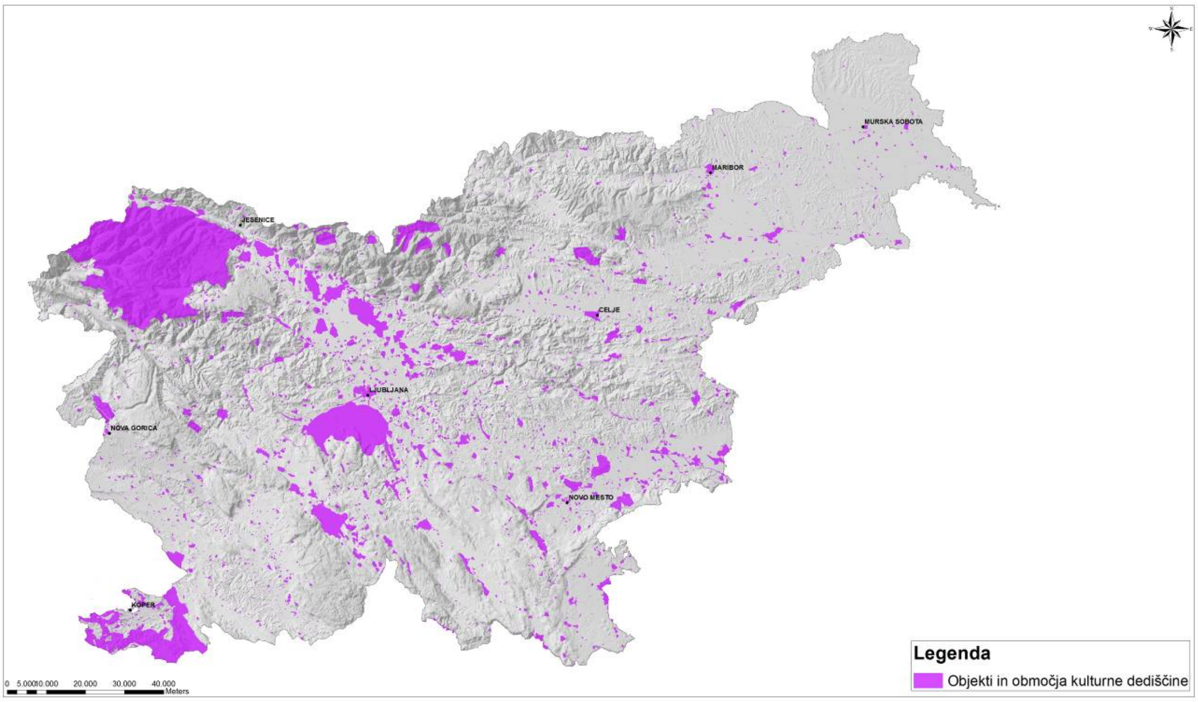


Figure 16: Display of facilities and areas of cultural heritage (source of bases: Register of Immovable Cultural Heritage (RKD), Ministry of Culture, status as per 24/8/2010)

7.4.5 Landscape

The Spatial Development Strategy of Slovenia (Official Gazette of RS, No. 76/2004) identifies 71 landscape areas with distinguishing features on the national level. These are areas that include distinctive and representative parts of the Slovenian landscape, with well-preserved landscape elements; in particular, these are areas of outstanding landscape, with rare or unique patterns of landscape structure and a spatially underlined cultural heritage of high testimonial and memorial value, in combination with exceptional forms of natural elements, and with natural values.

The spatial planning procedures consider the landscape areas with distinctive characteristics to be delineated landscape areas and provide or such a spatial development to maintain their overall visibility. General guidelines for maintaining of the visibility of landscape areas are to be considered in the programs and plans of individual sectors and local communities in such a way to ensure the observance of recognisable and typological characteristics of the landscape areas and landscape amenity. Adequacy of their placement shall be verified in terms of contribution to strengthening the visibility of the landscape.

When planning the infrastructure facilities or other facilities or interventions for the needs of specific activities that constitute comprehensive arrangement interventions in space, the negative impacts shall be prevented and solutions that least affect the visibility of landscape factors shall be selected. By rule, any intervention on forests on the slopes should not be carried out, however, when necessary, the risk of erosion hotspots formation shall be prevented and the minimal visibility of the interventions shall be guaranteed. By rule, any intervention on relief or geomorphologically exposed and visible areas should not be carried out, exceptions apply for facilities that shall be highlighted in space as dominants. In some landscape regions their specific characteristics shall also be considered.

In the municipal spatial planning documents, in addition to the above areas also locally important landscape-specific areas can be defined, while the legal regime for the development and protection of the landscape is reflected in the spatial implementation conditions.

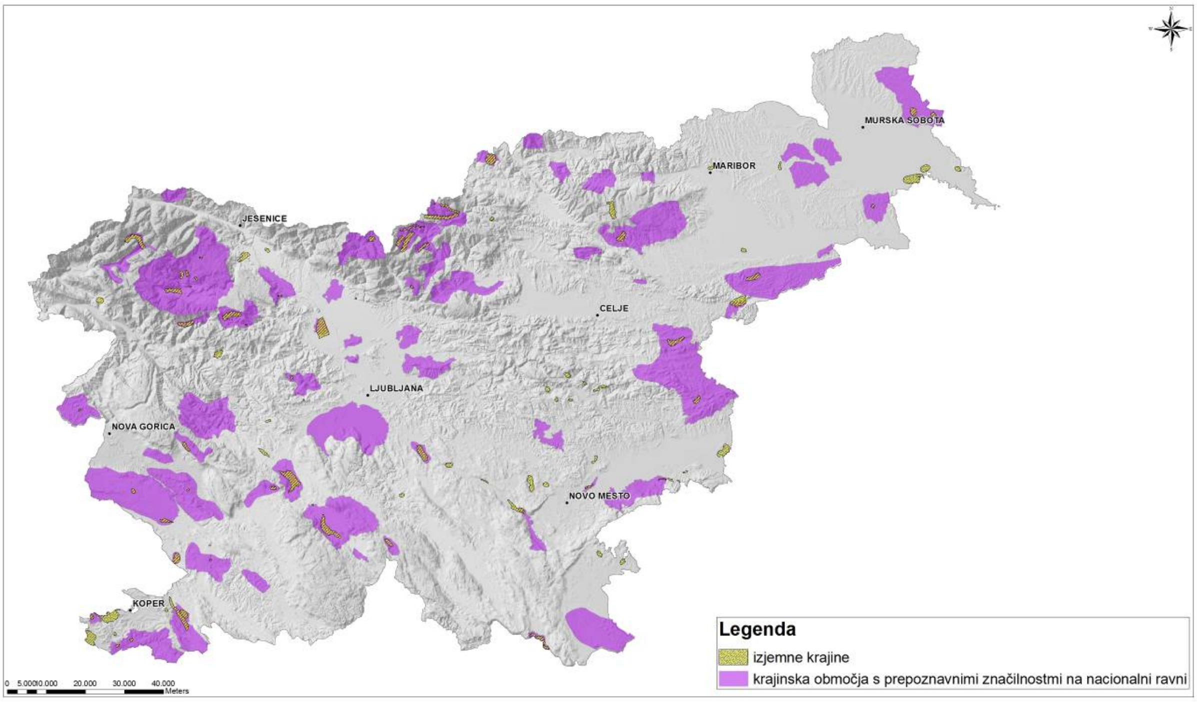


Figure 17: Display of exceptional landscapes and landscape areas with distinctive characteristics at the national level (source of bases: SDSS 2004, MESP 2000)

8 Description of the impacts of the NEP sub-programmes on the environment

In Annex 4 to this Environmental Report there are listed summaries of potential environmental impacts due to the implementation of single NEP sub-program or the implementation of measures that compose it, where the summary description refers to the relationship between sources of influence, way of influence and the receiver of the impact consequences. The description summaries also contain notions on the duration, extent and level of environmental impact management.

The environmental report has evaluated the proposal of the National Energy Programme for the period 2010 - 2030 - the draft drawn up by the Jožef Stefan Institute in May 2011. Evaluated measures are shown in Annex 5, where also significant environmental impacts of actions on the environment are shown.

8.1 Sub-programme - efficient use of energy

The sub-programme "efficient use of energy" includes the following measures:

- - construction of low-energy, passive and almost zero energy buildings (4% of housing fund per year),
- - measures to improve the efficiency of buildings,
- - energy-efficient appliances,

- \- EUE measures in service activities,
- \- measures for enhancing efficient use in energy intensive sectors of manufacturing industry,
- \- horizontal measures for enhancing efficient use in industry, and
- \- energy-efficient public lighting.

The majority of the measures within the sub-programme "efficient use of energy" has already been assessed in the context of a comprehensive assessment of OP ETID, in particular measures relating to the construction of low-energy, passive and almost zero energy buildings (4% of housing fund per year), measures to improve the efficiency of buildings and horizontal measures for enhancing efficient use in industry.

The measures "energy-efficient appliances" and "EUE measures in service activities" have been assessed in the framework of the impact assessment of the draft amendments to the Directive 72/75/EEC.

Environmental impacts of the sub-programme "efficient use of energy" in terms of impact on natural resources, air, water, nature, health, landscape and protection of material assets are insignificant, and the consequences of these impacts on the environment are not essential to be included in the valuation of NEP scenarios.

Significant effects on the environment of the sub-programme "efficient use of energy" are impacts in terms of cultural heritage and climatic factors.

In assessing the environmental impact of the sub-programme "efficient use of energy" no significant cumulative impacts on the environment have been detected.

In assessing the environmental impact of the sub-programme "efficient use of energy" cumulative and synergy impacts on cultural heritage have been detected. These can be caused by the renovation of heritage buildings in order to improve efficiency in buildings, and they can be reflected throughout the fund of the architectural heritage; they are more pronounced if they are carried out concurrently with measures of exploitation of energy from solar power plants and solar thermal collectors. No other significant cumulative environmental impacts have been identified.

8.1.1 Description of impacts of the sub-programme "efficient use of energy" on cultural heritage

Measures to improve the efficiency of buildings (window replacement, insulation of facades), if the curator bases are not observed, can have an impact on a protected features of the buildings of architectural heritage. Because of observation of curator bases and limited technical possibilities, it has to be taken into account that the optimal implementation of the measures is not always possible.

Lighting is an important element of the presentation of a heritage building, due to restrictions that may result from the energy efficient public lighting the latter may no longer be optimal. The problem of installing energy saving light bulbs in the protected type of lamps can arise, but as a rule it can already be solved with newer forms of light bulbs.

The measures for enhancing efficient use in energy intensive sectors of manufacturing industry may represent replacement of devices that are defined as technical heritage. Such a device is no longer in function, the destruction of heritage is also possible.

Cultural Heritage:
key strategic emphasis in relation to efficient use of energy

Measures to improve the efficiency of buildings (window replacement, insulation of facades) can affect the protected features of buildings of architectural heritage and the curator bases should be considered when renovating such buildings.

8.1.2 Description of impacts of the sub-programme "efficient use of energy" on climatic factors

In assessing the impact on climatic factors resulting from the implementation of the sub-programme "efficient use of energy" the total carbon footprint of each measure shall be taken into account, including GHG emissions over the lifetime of the products that are used for the implementation of a particular measure of the efficient use of energy (emissions from production, installation and decommissioning of products to implement the measures of efficient use of energy).

Although the share of GHG emissions resulting from production and of products used to implement the measures of efficient use of energy usually is not extensive in comparison to the overall reduction of GHG emissions due to implementation of measures for efficient use of energy, only a carbon footprint of a measure for efficient use of energy can show its real impact on climatic factors. In selecting the measures for efficient use of energy, those should be prioritized whose carbon footprint does not exceed more than few percent of the total reduction in GHG emissions resulting from the use of the measure.

In the diagram of the below picture, the annual proportion of GHG emissions for thermal insulation of polyurethane is shown, resulting from production and decommissioning of this insulation, in relation to the level of the measure for efficient use of energy on a typical one-dwelling building in a temperate continental climate with a lifetime of 60 years. Rates of the measure for efficient use of energy in a residential building are expressed as average annual GHG emissions due to the buildings heating (heating gas oil). From the diagram it appears that at the lowest GHG emission due to gas use for buildings heating (that is, at the higher thermal insulation of buildings), the proportion of GHG emissions resulting from production and decommissioning of heat insulation amount to about 5% of GHG emissions from the use of heating gas[14].
Regardless of the fact that the carbon footprint of thermal insulation materials results in the range of 0.2 kg CO2 eq / kg for the wooden isolation, up to 0.8 kg CO2 eq / kg for the insulation of glass wool, and from 2 to 10 kg CO2 eq / kg for the isolation of polystyrenes and polyurethanes, the amount of carbon footprint of thermal insulation is not crucial in the evaluation of measures for efficient use of energy relating to the construction of low-energy, passive and almost zero energy buildings.

[14]Accordng to calculations from study Combining building thermal simulation methods

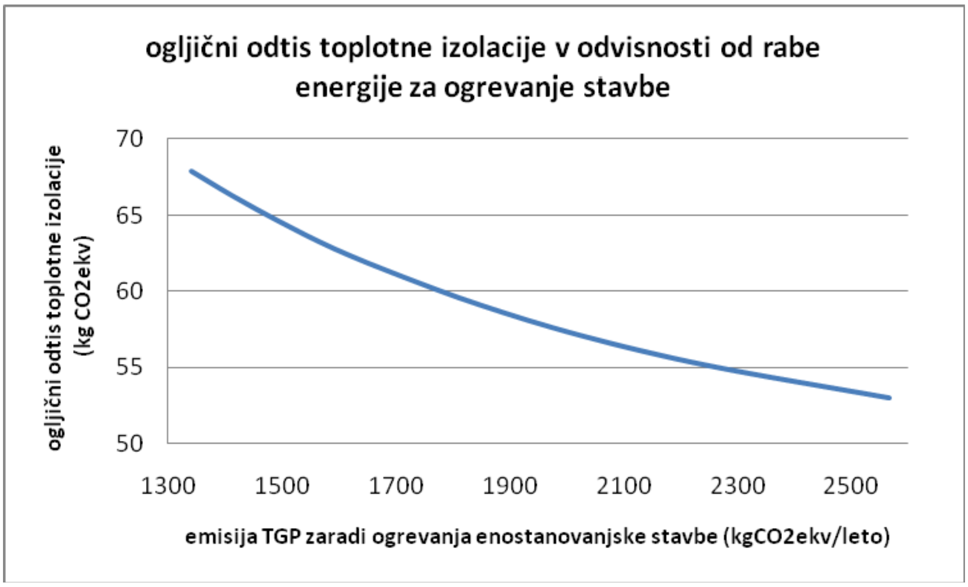


Figure 18: Carbon footprint of thermal insulation of buildings (Frank Pedersen et al., 2008)

In case of installation of thermal insulation in residential buildings, the measure for efficient use of energy, which reduces energy use for buildings heating for two times (GHG emissions due to gas consumption is reduced from 2,600 to 1,300 kg CO2 eq / year), in terms of impact on climatic factors is acceptable, because the proportion of carbon footprint of the built-in material due to the additional insulation material in relation to the savings in energy use for heating is less than 2%.

Impacts on climatic factors of the sub-programme of the efficient use of energy by 2016 are defined in detail in the Action Plan AP EUE, while in the NEP scenarios there is a planned similar dynamics of introducing these measures until 2020 and a slightly lower rate of introduction of these measures over the period 2020-2030.

Measures of the sub-programme of the efficient use of energy also have a significant synergistic effect on reducing potential impacts on nature due to the use of renewable resources. The need to use renewable sources in all NEP scenarios is inversely proportional to the introduction of efficient use of energy; namely, the measures of efficient use of energy are depleting the final use of energy, which is proportional to the requirement to use renewable resources (the goal of all NEP scenarios in relation to renewable energy sources is to reach 25% share of renewable sources in final energy consumption in 2020).

Climatic factors:
key strategic emphasis in relation to efficient use of energy

In planning the measures for efficient use of energy, the basis for the estimates of the measurement effectiveness should be the GHG emissions in the whole lifetime of the measure, including the carbon footprint of materials that are used to implement the measure. The measures for the efficient use of energy where the proportion of the carbon footprint of the used materials is greater than 50% of the reduction in GHG emissions achieved through the implementation of the measure, should be avoided.

8.2 Sub-programme - use of energy in transport

The sub-programme "use of energy in transport" includes the following measures:

- - introduction of biofuels – admixture of biodiesel to diesel, and of bioethanol to petrols,
- promotion of biofuels use for specific areas: agriculture, public transport,
- - improvement of vehicle energy efficiency and introduction of energy-efficient pneumatics,
- - electric battery vehicles,
- - hybrid vehicles,
- - hybrid vehicle with jack,
- - hydrogen-powered vehicles,
- - LPG-powered vehicles,
- - CNG-powered vehicles, and
- - charging infrastructure for electric vehicles, hydrogen-powered vehicles, LPG-powered vehicles, CNG-powered vehicles.

The measure to improve the energy efficiency of vehicles and the introduction of energy efficient tyres in terms of environmental impacts has been assessed in the context of assessing the impacts of the EU Strategy to reduce CO2 emissions from vehicles (passenger, light and heavy freight) and in the context of the impact assessment of the proposal of the Decree on Labelling Tyres.

Environmental impacts of the sub-programme "use of energy in transport" in terms of impact on natural resources, air, water, nature, health, landscape and protection of material assets are insignificant, and the consequences of these impacts on the environment are not essential to be included in the valuation of NEP scenarios.

Significant effects on the environment of the sub-programme "use of energy in transport" are impacts in terms of air and climatic factors.

In assessing the environmental impact of the sub-programme "use of energy in transport" no significant cumulative impacts on the environment have been detected.

8.2.1 Description of the impacts of the sub-programme "use of energy in transport" on air

In assessing the impacts on air due to the implementation of the measures of the sub-programme "use of energy in transport" it is assumed that the emission of pollutants due to biofuels use is equal to the emission of pollutants due to the use of fossil liquid fuels. It is also assumed that the introduction and promotion of biofuels for energy use in transport has no impact on the planned replacement of used vehicles with newer ones, more efficient and well equipped with filter devices for preventing the emission of PM2.5.

Promotion and introduction of biofuels in transport therefore does not affect the emission of pollutants into the air, which in the NEP scenarios is foreseen due to energy use in transport. The use of biofuels in transport in relation to air pollution is estimated with the grade of significance of environmental impacts A, as the promotion and introduction of biofuels in transport has no impact on air pollution from energy use in transport.

The introduction of energy-efficient vehicles and tyres contributes in a medium-term way to the achievement of national emission ceilings for ambient air pollutants (NEC OP), this is why this measure of the sub-programme "use of energy in transport" is assessed and given the grade of the significance of environmental impacts A, as it represents an opportunity to improve the environmental status.

The introduction of battery electric vehicles, hybrid vehicles with jack, and LPG-powered and CNG-powered vehicles in the densely populated areas can contribute in a short-term way to the reduction of ambient air pollution with PM10. Also, this measure contributes to achieving national emission ceilings for ambient air pollutants (NEC OP), which are expected to extend also on the emissions of PM10 and PM2.5. The introduction of battery electric vehicles, hybrid vehicles with jack, and LPG-powered and CNG-powered vehicles is a measure of the sub-programme "use of energy in transport", which is assessed with the grade of the significance of the environmental impacts A, as it represents an opportunity to improve the environmental status.

8.2.2 Description of the impacts of the sub-programme "use of energy in transport" on climatic factors

Achieving the goals of energy policy embedded in the NEP measures strongly depends on the measures of use of energy in transport. Measures of the sub-programme "use of energy in transport" reduce the use of fossil fuels, which reduces the pressure on achieving the national target related to greenhouse gas emissions.

Carbon footprint is used for the comparative evaluation of alternative transport fuels and technologies that are expected to be available during the evaluation of the NEP measures (2010-2030). At the moment about 97% of energy consumed in road transport is based on oil derivatives. In the evaluation of road transport fuels by the means of LCA method there are calculated the total GHG emissions due to fuel consumption, i.e. including the GHG emissions from the production, transportation and distribution of fuel to the end user.

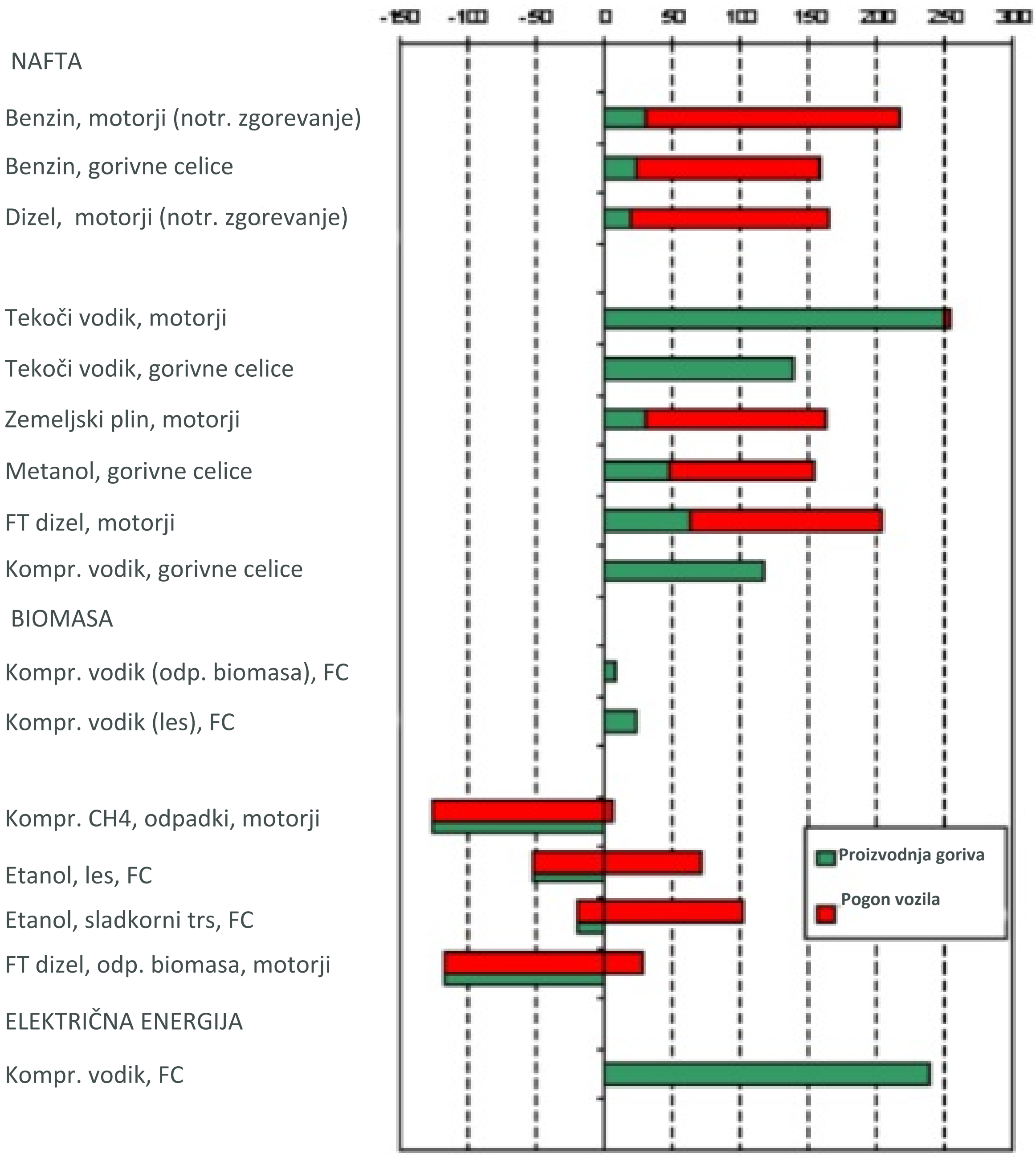
The term "alternative transport fuels" includes the use of alternative sources of primary energy, innovative technologies to produce fuels, new fuels for vehicles, or innovative automotive vehicles in road traffic. As primary energy sources, in addition to crude oil, are considered also in particular natural gas, biomass, hydropower, wind or solar energy.

Since for many road vehicles there are a lot of combinations fuel-power, the assessment of GHG emissions for fuel over the lifetime is carried out in two phases. The first phase ("well-to-tank" in the figure below) includes GHG emissions from the production, transportation and distribution of fuel, while the second phase ("tank-to-wheel" in the figure below) includes converting fuel energy into vehicle motion. Typical estimates of GHG emissions from selected fuels included in the measures o the sub-programme "use of energy in transport" for the most probable combination of vehicles in the road traffic are shown in the figure[15] below.

[15] **COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.**

The current method of production of biofuels in Slovenia (production from vegetable oils) from the perspective of the impact on climatic factors is assessed with the grade of significance of the impact on the environment B, because this way of biofuel production only partially serves the achievement of the environmental objective. For Slovenia in the period 2010-2020 based on the relative abundance of forest biomass, the possibility of introducing diesel production from waste biomass or forest waste wood from Fischer-Tropsch process exists, which means a significant environmental improvement in production of biofuels. The introduction of biofuels of second and third generation primarily from the forest biomass represents for Slovenia also an economic opportunity for sustainable development.

The Fischer-Tropsch process is one of the advanced biofuel conversion technologies involving gasification or liquefaction of raw materials. As raw material any biomass is used, including biomass from wood and agricultural crops. Biomass is gasified in a mixture of carbon monoxide and hydrogen, the liquefaction of this gas produces very pure liquid hydrocarbons that are suitable for further conversion to motor fuels.



(tags: FC = fuel cell, conv.= conventional motor with internal combustion, FT dizel = Fischer-Tropsch)

Figure 19: GHG emissions for road vehicles fuel over the whole lifetime

Climatic factors:

key strategic emphasis in relation to use of biofuels in transport

When planning to promote the use of biofuels in transport in relation to the selection of biofuel type it is necessary to ensue from GHG emissions in the whole lifetime of fuel and the availability of domestic renewable resources. In the medium-term period the priority is given to the use of biodiesel produced from forest biomass with the Fischer-Tropsch process.

8.2.3 Sub-programme - Renewable energy sources

Energy generation from renewable energy sources causes quite a lot of environmental impacts over the whole lifetime of a single project, which according to the nature and modality of energy generation in the NEP are classified into two main categories (electricity and heat generation) and several sub-groups (depending on the type of renewable energy source), as follows:

1. micro, small and medium-size power plants:
- - wind farms,
- - small hydroelectric power plants,
- - solar power stations,
- - geothermal power stations,
- - wooden biomass CHP,
- - landfill gas,
- - other biogasses and TP;
2. heating systems that use renewable energy sources by year 2020:
- - geothermal heating systems: 10 systems with a total heat generation of 114 TJ,
- - solar thermal collectors: 561,000 m2,
- - wooden biomass boilers (WBM) in households, 67,800 units,
- - WBM boilers in the service activities, 7,700 units,
- - WBM boilers in industry, 130 units,
- - BDH systems (> 1 MW), 42 systems,
- - local BDH systems (> 1 MW), 280 systems,
- - heat pumps, 53,000 units, with a total generation of heat of 10 TJ.

In assessing the environmental impacts in the process of a comprehensive environmental impact assessment there are included usually larger devices for producing electricity and heat from renewable energy sources and facilities for the transmission and distribution of this energy and all those interventions in the environment caused by the use of renewable energy sources, which have an impact on safeguarded and protected areas under the regulations governing the protection of nature.

Measures relating to the use of WBM for energy purposes in the terms of environmental impacts have been evaluated in the context of a comprehensive Impact Assessment of the EU Action Plan for Biomass and Environmental Impact Assessment, which for the use of forest biomass is defined in the Resolution on the National Forest Programme.

8.2.4 Wind farms

The actual effect of the environmental impacts depends on the location of the wind farm itself, on the duration of each stage of construction or decommissioning, on the sensitivity of the adverse effects receiver and also on the pressure exercised on the existing status of the environment due to the implementation of other forms of activities in the area of impact of wind farms. The area of impact of wind power plants, on which the implementation of certain other activities may be limited, is considered to be the area surrounding the wind farm with a radius of at least three times larger than that of wind turbines.

Potential significant environmental impacts are identified on the basis of a review of studies and expert opinions on the consequences of the effects of typical wind farm techniques and of their installation.

Environmental impacts of wind farms in terms of impacts on air, water and health are insignificant, while the consequences of these impacts on the environment are not essential and therefore are not included in the valuation of NEP scenarios.

Significant environmental impacts of the measures from the sub-programme "renewable energy sources" related on wind farms, are those impacts in terms of natural resources, nature, cultural, climatic factors, landscape and protection of material goods.

In assessing the environmental impact of the sub-programme "renewable energy sources" no significant cumulative impacts on the environment have been detected.

In assessing the environmental impact of the sub-programme "renewable energy sources" related to wind farms, significant cumulative and synergistic impacts on the landscape have been detected. These impacts may result from the sub-programme measures whose impacts occur over the entire territory of the country and in the case of great extent and spatial coincidence of several different interventions (due to other measures of renewable energy sources, measures of electricity generation and transmission and distribution of electricity) can significantly degrade the general image of Slovenian landscapes.

8.2.4.1 Description of the impacts of wind farms on natural resources

Impacts on soils are present mainly in the construction phase and decommissioning phase of wind farms and supporting infrastructure. Interventions in the soil due to the construction of wind farms may cause further soil erosion especially on steep slopes because of access to hardly accessible locations of wind farms and demand to bury the power lines. Operation of wind farms has no effect on soil conditions in the area of wind farms.

Impacts on soil are particularly important because of the geological composition of soil in areas that are suitable for electricity generation in wind farms with the power of 10 MW or more. These are more or less mountainous areas prone to erosion due to leaching of thin humus layers on the surface.

Natural resources:
key strategic emphasis related to electricity generation in wind farms
Geological and geomorphological features can be affected with the placement of wind farms in certain areas.
In construction of foundations for wind farms and construction of associated road and electricity infrastructure it is necessary to prevent the soil erosion.

8.2.4.2 Description of the impacts of wind farms on nature

Wind farms have a potential impact on biodiversity, flora and fauna. During the construction phase of wind farms the impacts induced may be permanent and are manifested primarily as an impact on habitat types and consequently on the habitats of the wild plant and animal species living there. Adverse effects during the operation period can be reflected mainly in birds, bats and large mammals, in the first two groups primarily because of possible collisions with the rotor (propeller), and in the third group due to increased noise pollution, especially with the lower frequencies. These impacts may directly or indirectly affect the reducing of populations of certain species or in the case of rare and endangered species even the loss of an entire population, and therefore on the lower biodiversity in the wider area.

Nature protection important areas

Construction of wind farms in protected areas may permanently, directly and indirectly affect the Natura 2000 site. An impact may affect the integrity and coherence of the Natura sites. Principally, a greater impact is expected in areas important for birds (SPA areas and IBA areas). Due to the widespread impacts of wind farms on birds it is important to choose such a location that will be of least disturbance for birds, which makes the placement of wind farms suitable outside the SPA areas.

Even the construction of wind farms in a SCI area or protected area may cause a permanent impact. In particular, the impacts are expected in areas important for bats and large carnivores, and in areas with wetlands, caves, coastal habitats, protected habitats and similar.

Interventions and activities in the protected areas must be conducted in accordance with the instrument on protection and management plan in the case of a national and regional park. The planning must also take into account the international agreements defining the Ramsar wetlands, biosphere reserves and UNESCO natural heritage. Placing of wind farms in these areas would mean their degradation and devaluation.

In the protected areas it is necessary to carry out assessments of the acceptability of interference in nature in accordance with Article 28 of the Nature Conservation Act. In the case of intervention carried out it is necessary to foresee and implement all possible technical and other measures so as to minimise the adversely affect on the habitat types, plants and animals and their habitats.

Placing of wind farms in the EPO can permanently affect the natural distribution of habitat types and habitats of flora and fauna, their quality and connectivity of population habitats. The most important would be the impact on large predators due to the restricted spatial integrity. Closing the corridors of large carnivores might permanently disable the transition of individuals between populations.

Construction of wind farms on an area of natural value can permanently degrade the degree of natural conservation and adversely affect the vital part of the natural value.

Impact on the fragmentation of forest habitats

As far as the impact of wind farms is concerned, it is particularly important the fragmentation of dense forest stands, which are very important for large carnivores. Fragmentation of the natural environment is a negative and inevitable phenomenon of urbanization, which has negative impacts on both individual populations as well as on a society as a whole. Living space is becoming structured, with the result that certain types of animal quarters appear as appropriate spots (habitat spots) in an unsuitable environment (matrix). As a result of fragmentation of the environment, a species in a given area emerges in the form of single sub-populations. These sub-populations can communicate through the matrix and form the so-called meta-population, which has many inherent biological regularities. The impact of environment fragmentation and the creation of meta-populations is most notable in mammals, particularly in large carnivores. These represent an umbrella species that for their survival need large areas. Large carnivores are the key species that through their activity raise the quality of the entire ecosystem. Conservation of large carnivores therefore represents an integral part of interventions for the conservation of national biodiversity.

Alignment of propellers with the impact area represents a matrix, which could permanently reduce the space of animal species and prevent the migration of certain more timid species. For these species (wild boar, wolf, lynx, red deer), the intervention to approximately 500 m from the standing point of wind turbines would represent a loss of quarters and partially of feeding environment (up to about 100 m from the standing points). Less timid animal species (for example bears, roe deer) would avoid the area of wind turbines, but not to the extent that the migration would be prevented.

Large forest complexes represent an exceptional natural value because of the rarity, complexity and exceptional difficulties in their conservation. They are important in terms of further development of life (evolution) in moderate climate environments and of conservation of ecosystem functions that are linked to many surface events and because of human activities are among the most endangered natural systems. Such a large forest complexes in the southern part of Slovenia are included in the Natura 2000 sites and EPO central area of the habitat of large predators. These are parts of the inner part of plateau Snežnik and Goteniški Snežnik, of the area Kočevski Rog and the forest Trnovski gozd.

Conservation of corridors of large carnivores in the long term is an important nature conservation task, since they allow the transition of individuals between single populations. Relationship between the newly emerging populations of large carnivores in the wider Alpine areas and vital Dinaric populations is of key importance for the continued existence of large carnivores in central Europe. In the system of interconnections between spots due to transitivity it is necessary to evaluate each spot separately. It is necessary to evaluate the position of individual spots in terms of the relationship between them and with that the guaranteed transitivity of forest species.

Impact on flora, fauna and HTA wind farm can have a significant impact on flora, fauna and HT, in particular if foreseen in the sites or habitats of endangered and protected species (Decree on protected wild animal species (Official Gazette of the RS, Nos. 46/04, 109/04, 84/05, 115/07, Decision of the C.C. of 13/03/2008, 96/08, 36/09), Decree on protected wild plant species (Official Gazette of the RS, Nos. 46/04, 110/04, 115/07, 36/09), the Regulation on the classification of endangered plant and animal species in the Red List (Official Gazette of the RS, Nos. 82/02, 42/10) or on priority habitats (Regulation on habitat types (Official Gazette of the RS, no. 112/03, 36/09).

For the Slovenian and broader European populations of large carnivores the most important are areas of the inner part of plateau Snežnik and Goteniški Snežnik, of the area Kočevski Rog and the forest Trnovski gozd. These areas are dominated by forested landscape (integrated forest stands), where the conflicts between man and bear, wolf and lynx are minimized. Degradation of forest space primarily means an increased pressure of animals on more populated areas, and consequently an increased pressure on authorized and unauthorized shooting and a general increase in negative attitudes towards large carnivores. On a long-term run, degradation of the forest environment reduces the carrying capacity of the environment and it increases the risk of extinction of populations. The area is widely recognized and included in the Natura 2000 sites and EPO central area of habitat of large predators.

In terms of planned interventions in wind farms, it is important to point out the bats that in Europe are an endangered animal group. In the event that the area is an important life habitat of protected species of bats, it can be assumed that the operation of propellers will have a negative impact, as during the overflights and eating fatal collisions could occur. In the case of building illumination of a transformer station and wind turbines, the night light would attract many insects, especially moths, flies, some bugs and neuroptera. These represent the prey of bats, which could attract bats near the wind turbines thus increasing the potential risk of collision of bats with the rotor blade.

Impact on wild birds

So far four basic impacts of wind farms on birds have been recorded (the report does not cover the offshore facilities, which for Slovenia are probably not interesting):

- - Collisions: The most important are collisions with the rotor. Although the rotor on the turbine tower rotates relatively slowly, some birds can not avoid it. It should be noted that although the rotation speed at the axis is really small, at the end of the rotor blades is already significantly higher. The tendency of development of wind farms is heading towards the increase of wind turbines and thus of the rotor blades also, which in itself increases the speed and the potential impact on birds. In addition to collisions with rotors, birds are colliding also into columns and electric wires, but this risk is significantly lower than the risk of colliding with the rotor.
- - Disturbance: Disturbance can drive away from the area more sensitive bird species. If birds can find good enough substitute areas in the vicinity the impact is small, otherwise it may cause a permanent reduction in the population. This may be due to disturbance of the rotor, which causes some lighting and sound effects, as well as disturbance in the presence of maintenance personnel. Both forms of disturbance are permanent. The biggest is the disturbance during construction period, but it is only temporary.
- - Obstruction: Especially in the case when the wind farm consists of a chain of wind turbines erected close to each other this may represent a significant barrier to the birds in the space. The barrier can divert them during their route to feeding, breeding, wintering areas, etc. In order to avoid an obstacle, birds choose a longer route, which may be less favourable in terms of exploitation of air flows. Route changes in some species have only a minimal impact, while in others this may cause a reduction in breeding success.
- - Loss of habitat: With placing of wind farms in the environment, the habitat for species that live there changes. The greatest are the impacts of wind farms placed in the middle of forests, whiles smaller are the impacts of those facilities built on meadows. The impact on some species may be insignificant, and major on some other.

Because of potential negative impacts on birds due to building wind farms it is important to choose such a location that will be of least disturbance for birds. Wind turbines should be located, designed and maintained in such a way that they do not worsen the possibility of bird conservation.

In the study of "Comprehensive review of potentially suitable areas for wind farms, Expert groundwork for the National Energy Plan (2010 - 2030), Aquarius d.o.o. Ljubljana, February 2011) there have been selected 14 areas as potentially appropriate in relation to the protection criteria. Coverage of wind areas with potential wind fields, given the nature and dynamism of the area, is substantially smaller than the total surface of the wind area. Estimated area coverage thus represents:
- between 10% (smaller coverage) and 20% (greater coverage) of the total surface of wind area for very hilly and inaccessible areas, and
- between 20 % (smaller coverage) and 40 % (greater coverage) of the total surface of wind area for grass areas and easily accessible areas.

Thus, at a certain potential location at a low density of wind farms (3 turbines/km2) and with only 10% coverage of the area (the minimum number of units per very hilly areas) the installed capacity can be 4 times lower in comparison to the case of medium density (5 turbines/km2) and 20% coverage area with wind fields (grass and easily accessible areas).

Nature:

key strategic emphasis related to electricity generation in wind farms

In the placement of wind farms, special attention shall be given to birds, bats and large mammals, their possible migration corridors shall be identified avoided, regardless of the actual area status. In the case of placing wind farms in protected areas a thorough assessment of impacts on species and habitat types is required, in accordance with the Rules on the acceptability assessment of impacts caused by the implementation of plans and interventions in nature on protected areas (Official Gazette of the RS, Nos. 130/04, 53/06, 38/10). In protected areas and natural values also the instrument of protection should be taken into account and the vital part of the protected area or natural value should be preserved. In the area of intervention it is necessary to examine the impacts on other habitats of protected and endangered species and priority habitat types.

In order to properly evaluate the potential impact of wind farms in particular on animals, a gradual placement of individual units (wind turbines) in space would be most appropriate, while closely monitoring and assessing impacts. Based on the continuous results, then perhaps with fewer complications and opposition, the final extent of the wind farm would be determined.

8.2.4.3 Description of the impacts of wind farms on cultural heritage

Most of the impacts on areas and buildings of cultural heritage, including archaeological heritage, emerge as a consequence of physical intervention and the consequent damage during construction or decommissioning of wind farms and associated road or electricity infrastructure. The presence of roads and electricity infrastructure due to the possible occurrence of soil erosion could threaten individual heritage buildings and areas of archaeological heritage in their vicinity, and thus indirectly has a negative impact on cultural heritage.

The impact may result from changes of the characteristic image of buildings and areas of cultural heritage in wider area or due to disturbed views on buildings and areas of cultural heritage. These impacts are particularly pronounced in areas of heritage and historic landscapes.

Cultural Heritage:

key strategic emphasis related to electricity generation in wind farms

The major part of potential areas for placing of wind farms comprises areas without cultural heritage or those with low density of buildings and sites of cultural heritage.

Within the potential areas for placing wind farms there are present individual areas and objects of cultural heritage that could and must be considered in a detailed placement of wind farms in space.

In the framework of a detailed planning of wind farms and associated infrastructure expectedly a preliminary archaeological research will be necessary.

8.2.4.4 Description of the impacts of wind farms on climatic factors

Wind farms contribute to mitigating climate changes, as they generate electricity from renewable energy sources. However, greenhouse gas emissions throughout the lifetime of the wind farm should be taken into account that is from its manufacturing, construction, maintenance and decommissioning.

The diagram in the figure below shows the GHG emissions for electricity generation from renewable energy sources and electricity generation from nuclear energy in a way that allows the comparison of the impacts of climatic factors between these alternatives of electricity generation. A common feature of these electrical power sources is that the major part of GHG emissions is produced in other phases of the lifetime of the electrical power source such as electricity generation period. These lifetime phases of an electrical power source are recovery of raw materials, production of components, fuels and materials, transportation and construction and disposal of facilities of the electrical power source. GHG emissions from these lifetime phases of the electrical power source depend on many factors, such as for individual countries in particular the mixture of electricity generation used to produce components, fuels and materials.

In this Environmental Report are taken the above values of carbon footprints from the diagram[16] shown below, as the calculated reference examples for the above values of carbon footprint of both the power of the electric power source as well as a geographically and in terms of annual operating hours of power plants reflect those production conditions that are close to the actual Slovenian situation of potential exploitation of renewable sources respectively of electricity generation from nuclear energy, namely:

- - operating hours of hydroelectric power plants comprise between 35 and 45% of annual time,
- - operating hours of wind farms comprise about 25 % of annual time,
- - for solar power stations for the reference calculation is produces for the area of Germany that is close to the Slovenian situation both in terms of latitude as well as of the number of sunny days,
- - operating hours of the referential nuclear power plant is 80%, while the power of the nuclear power plant is close to the existing Slovenian nuclear power plant.

[16] **COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.**

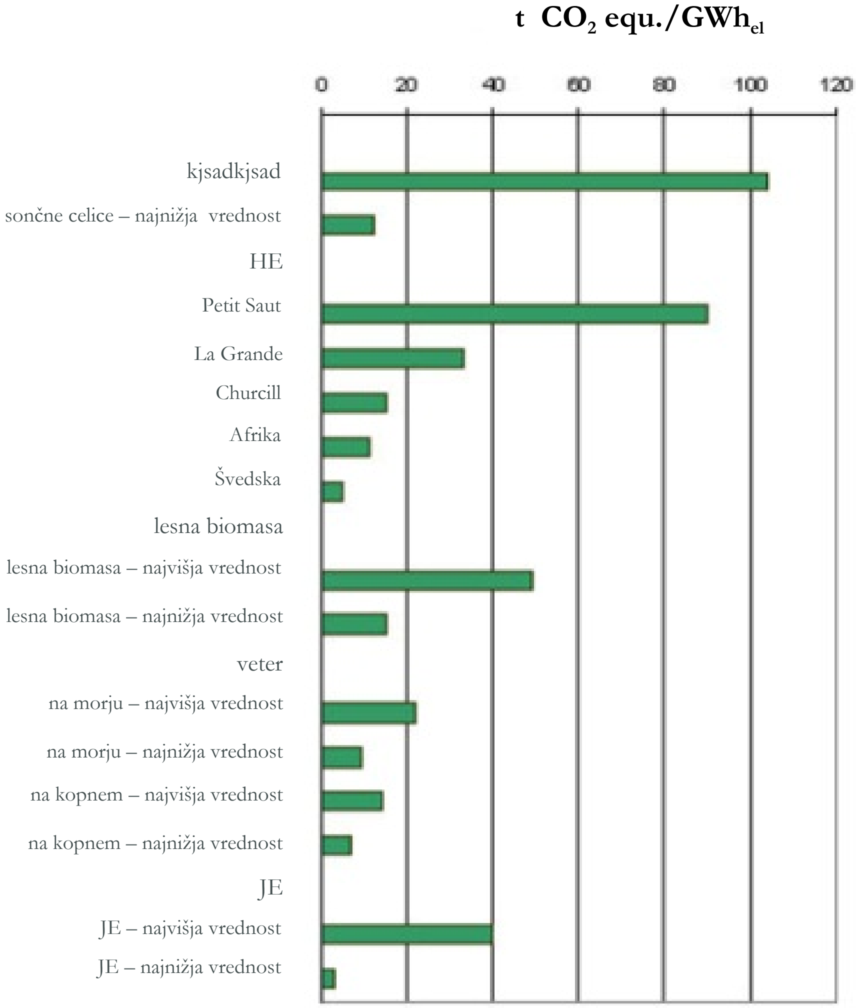


Figure 20: GHG emissions throughout the lifetime of power plants using renewable energy sources and nuclear energy

Assessment of greenhouse gas emissions over the lifetime of a wind farm on the level of strategic environmental impact assessment is very important particularly for the comparison of the electricity generation from wind farms to the electricity generation from other renewable energy sources, nuclear energy respectively. Such a comparison shows that wind farms have one of the smallest carbon footprints.

Climatic factors:
key strategic emphasis related to electricity generation in wind farms

Generation of electricity in wind farms contributes to a greater use of renewable energy sources.Generation of electricity in wind farms is an important part of the Action Plan for the use of renewable energy sources adopted with the aim of reducing the emission of greenhouse gases and thus mitigating the impacts of climate change.

Due to the technological development of wind farms and to ensure maximum efficiency of a relatively modest potential for wind energy in Slovenia, it is suggested that the planned NEP measures in the field of wind farms be flexible enough an in terms of time evenly spread throughout the implementation period.

8.2.4.5 Description of the impacts of wind farms on nature

Temporary impacts on landscape features and visual space qualities are present during the construction of wind farms and during their decommissioning because of removal of landscape elements and the presence of construction machinery. The most important permanent impact on the landscape due to the presence of wind turbines is changed landscape image and, consequently, of spatial relationships, symbolic values and culture of the space.

The indirect impact may be reflected on the health of population, especially the well-being of recreationists and tourists, as well as on material goods, tourism activities in areas of high landscape value. Tourists and recreationists are more comfortable in a visually appealing landscape, while the presence of wind farms as possible disturbing space elements may reduce the level of comfort in the space. The potential for tourism activities may be limited due to reduction of the visual attractiveness by placing the wind farms.

Wind turbines are generally classified as a disturbing element in the space. In this type of assessment we pass though into a field of aesthetic assessment, which is certainly one of the most subjective in assessing changes in the environment. Objectification is possible by the use of the so-called imaging surveys. Such research has been conducted in our country. The study results do not provide unequivocal answer on the acceptability of wind turbines in the landscape, however the assumption on disturbing elements in the natural landscape has been confirmed (Golobič M., Marušič I., 2000).

Considering all of the above, we allow the possibility that the wind turbines in particular contexts can also contribute positively to the visual image or at least are not disturbing, especially in urban and industrial environments and in the flat world. However, such a spatial situation in our country is only hypothetical, as such areas are positioned outside of areas with favourable wind conditions. It must be pointed out that an objective assessment of impacts on visual features only can only be one-time performance, thus targeting a specific problem of spatial planning, and in this also various contemporary design solutions for devices exploiting wind energy should be taken into account. As a rule, the negative impacts are considered to be more pronounced:

- - in landscapes with more preserved nature;
- - in landscapes with a strong symbolic value and in wider landscape recognisable areas;
- - in open (grassy, rocky) landscapes or less diverse landscape areas, where the degree of visible absorption is smaller,
- - on exposed areas from the visibility point of view, especially if wind turbines are in the "first plan" of the most frequent points of view,
- - if the turbines are installed in large numbers in a continuous field of wind farms.

Landscape:
key strategic emphasis related to electricity generation in wind farms

Wind farms substantially change the landscape image. They are usually labelled as a disturbing element, but in certain circumstances, they can positively contribute to the visual image, or at least they are not disturbing.

Identified potential areas for wind farms do not interfere with exceptional landscapes. From these areas, by analogy also landscape areas with distinctive characteristics at the national level are left out.

The impact of wind farms on the landscape can be alleviated by optimizing the placement of wind turbines in the space and with their design.

8.2.4.6 Description of the impacts of wind farms on material assets

The possibility of a significant impact on material assets can emerge due to restrictions on tourist activities in areas of wind farms. Not just a visual change in the landscape and the noise disturbance in the vicinity of wind farms are concerned, but there is also an objective danger that due to ice falling off the turbines threatens tourists (ski tourists) at a distance of up to three times the diameter of the turbine.

The presence of wind farms with the associated road and electricity infrastructure can also limit the forestry, but to a lesser extent, as the areas of this infrastructure are relatively small when compared with the available woodland in areas that are windy and suitable for electricity generation from wind.

Material assets:
key strategic emphasis related to electricity generation in wind farms
It is necessary to identify the potential conflicts between the implementation of tourism and recreational activities and the presence of wind farms.
It is necessary to guarantee the safety of skiers and recreationists in the areas positioned near the wind farms.

8.2.5 Sub-programme "renewable energy sources" and sub-programme "electricity generation" – small hydroelectric power plants and hydroelectric power plants

The sub-programme "renewable energy sources" includes the reconstruction measures (both from technical and environmental point of view) of existing small hydroelectric power plants (sHEP – a hydroelectric power plant with a nominal output of 10 MW) and the construction of new sHEPs. Renovation of hydroelectric power plants (HEP - a hydroelectric power plant with a nominal output higher that 10 MW), definition of the area of potential possibilities of use – the border section with Austria to the motorway bridge near the village Vučja vas in the mid-section of the Mura River, and the construction of new HEPs on the Sava River is included in the sub-programme "electricity generation". In the sub-programme "electricity generation" also pumping power plants (PP) are included.

The effect of the environmental impacts of hydroelectric power plants depends not only on the location of hydroelectric power plants, but also on the existing environmental status and protection level of aquatic environment in the area of the hydroelectric power plant, as well as on the environmental status and protection level of environment in the impact area of the hydroelectric power plant.

Environmental impacts of hydroelectric power plants depend on the type of techniques implemented for water use in hydroelectric power plants (accumulation, flow, derivative and pumping hydroelectric power plants), the duration of each stage of construction or the decommissioning, on the sensitivity of the receiver experiencing the adverse effects, and also on the pressure on the existing status of the environment due to the implementation of other forms of activities. The impact area of the hydroelectric power plant where the implementation of certain other activities may be limited, is considered to be an area of water facilities for water retention or recovery and the water discharge area from the hydroelectric power plant.

Possible significant environmental impacts are identified on the basis of a review of studies on the environmental impacts made in the context of CEIA spatial plans for the placement of existing HEPs or HEPs under construction in the space.

Environmental impacts of hydroelectric power plants in terms of impacts on air, water and health are insignificant, while the consequences of these impacts on the environment are not essential and therefore are not included in the valuation of NEP scenarios.

Significant environmental impacts of the measures from the sub-programme "renewable energy sources" and the sub-programme "electricity generation" related on hydroelectric power plants, are those impacts in terms of waters, nature, cultural heritage, climatic factors, landscape and protection of material goods.

In assessing the environmental impacts of the measures of the sub-programme "renewable energy sources" and the sub-programme "electricity generation" related to HEP or sHEP, there have been detected significant cumulative environmental impacts related to the effects on the quantitative status of waters due to water use in carrying out other activities, i.e. due to the use of water in drinking water supply and process water supply, as well as for irrigation in agriculture. Cumulative and synergistic effects on nature and biodiversity may be caused by a successive placement of sHEPs and hydroelectric power plants on watercourses.

8.2.5.1 Description of the impacts of hydroelectric power plants on natural resources

In the placement of hydroelectric power plants in space, a negative impact on natural resources can be noticeable in case of occupation of the best agricultural land or requirements of establishing alternative habitats. Replacement of agricultural land or creation of new habitats significantly interfere with the existing land use and are often infeasible because of unacceptable requirements for the existing land use.

In the placement of hydroelectric power plants in space the following shall be taken into account:
- facilities for the retention of water are situated outside the areas of best agricultural land,
- alternative habitats are situated outside the areas of agricultural land on which the measures of agricultural policy are carried out and have the function of food production.

Natural resources:

key strategic emphasis related to electricity generation in HEPs

The placement of hydroelectric power plants in the space must not directly or indirectly endanger the agricultural land on which the measures of agricultural policy are carried out and have the function of food production.

8.2.5.2 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on waters

The impacts of sHEPs and HEPs on waters shall be assessed, in accordance with Article 4(1) of Directive 2000/60/EC, in the light of the following environmental objectives:

- - surface and underground water status must not worsen, while the status of water bodies that do not have good status needs to improve,
- - good water status shall be achieved by the year 2015,
- - it is necessary to reduce gradually water pollution from priority substances and to progressively omit priority hazardous substances if they are polluting surface and groundwater,
- - the upward trend of pollutants in groundwater must be reversed,
- - it is necessary to guarantee the compliance with the standards and objectives set for protected areas in accordance with the regulations governing the conservation of nature.

To evaluate the impact of sHEPs and HEPs on water, the environmental goals in the first, second and last indent of the preceding paragraph are important.

Consequences of the placement of sHEPs and HEPs in the aquatic environment are shown as heavily modified and artificial water bodies, for which in accordance with Article 4(1) of Directive 2000/60/EC Article "specific environmental objectives" are defined. In order to achieve specific objectives for heavily modified and artificial water bodies (this is a good ecological potential and a good chemical status), the provisions concerning the definition of heavily modified and artificial water bodies (Article 4(3) of Directive 2000/60/EC) also contain elements to compare the consequences of achieving "good ecological status" for many aspects, including economic considerations. In addition, the rating of "good ecological potential" for heavily modified and artificial water bodies is associated with the possible implementation of mitigation measures.

How should we interpret the provisions contained in Article 4(3) of Directive 2000/60/EC on the specific environmental objectives, i.e. are they "alternative objectives" or "exceptions"? It is understood that for the artificial and heavily modified water bodies, provisions in Article 4(3) of Directive 2000/60/EC are no conventional objectives or exceptions. Artificial and heavily modified water bodies are a specific category of water bodies – with their own classification and objective – which is related to other exceptions in fulfilling the adopted socio-economic conditions that had to be achieved before this particular category of water bodies was introduced.

An integral part of the environmental objectives set out in Article 4 of Directive 2000/60/EC Article are the so-called exceptions. In Articles 4(4), 4(5), 4(6) and 4(7) of Directive 2000/60/EC the conditions and procedures under which such exceptions may apply are described.

These exceptions include temporary exemptions for medium-term and long-term derogations from achieving good water status in 2015 and include the following aspects:

- - extension of the deadline for achieving good status to be achieved by 2021 or not later than 2027 or as soon as natural conditions permit it (Article 4(4)),
- - achievement of less stringent objectives under certain conditions (Article 4(5)),
- - a temporary status deterioration in the event of natural causes or "force majeure" (Article 4(6)),
- - new (planned) changes of the physical characteristics of a surface water body or changes in the level of the groundwater body or failure to prevent deterioration of surface water bodies status (also from very good to good condition) due to the implementation of sustainable development activities (Article 4(7)).

A common feature of all these exceptions is that they meet the strict conditions laid down for these exemptions and the reasoning upon which they shall be included in the Water Management Plan (WMP).

According to the Slovenian legal order, derogations from the environmental objectives (in accordance with Article 4(7) of Water Directive) should only be permitted if the conditions of the Waters Act (Official Gazette of the RS, Nos. 67/2002, 110/2002-ZGO-1, 2/2004-ZZdrI-A, 41/2004-ZVO-1, 57/2008), of the Decree on detailed contents and method of preparing the water management plan (Official Gazette of the RS, Nos. 26/06, 5/09) and of the Water Directive are fulfilled.

The derogations from the environmental objectives under Article 4(7) of Directive 2000/60/EC are defined in detail by the draft of the Decree on water management plan for the Danube River aquatic area and the Adriatic Sea aquatic area, namely:

"In the event of future interventions in the space of energy sector, the Government of the Republic of Slovenia will adopt the decision about derogation from the achievement of environmental objectives for water bodies of surface waters in accordance with the provisions of the water regulations, in case that:

- with the national energy program the public interest will be shown,
- the national energy program and the comprehensive assessment of the impacts of this program show that the beneficial objectives to be achieved through the new transformations, due to technical impossibility or disproportionate costs can not be ensured in another way, which is a better environmental option,
- the national spatial plan and the comprehensive assessment of the impacts of this plan will ensure that all technically feasible and reasonable measures to mitigate adverse impacts on water status will be implemented, and
- the national energy program, the national spatial plan, or the comprehensive assessment of the impact of the program or the plan will ensure that the realization of environmental objectives in other water bodies in the same aquatic area will not be threatened.

The Government of the Republic of Slovenia in the case of fulfilment of all statutory conditions will have the opportunity to define by its decision that the public interest in renewable energy sources in this case outweighs the public interest to achieve a good water status.

When using exceptions to the achievement of environmental objectives under Article 4(4) and Article 4(5) of Directive 2000/60/EC there is no hierarchy in terms of the need to demonstrate that the use of one exemption excludes the use of others. A combination of the two exceptions can be used provided that for each phase of the planning of measures to achieve a good ecological potential all the eligibility conditions of the exemption use under the process shown in the picture below are fulfilled. However, the application of less stringent objectives as of Article 4(5) requires more information and an in-depth evaluation of alternatives to the use of the deadline extension as referred to in Article 4(4).

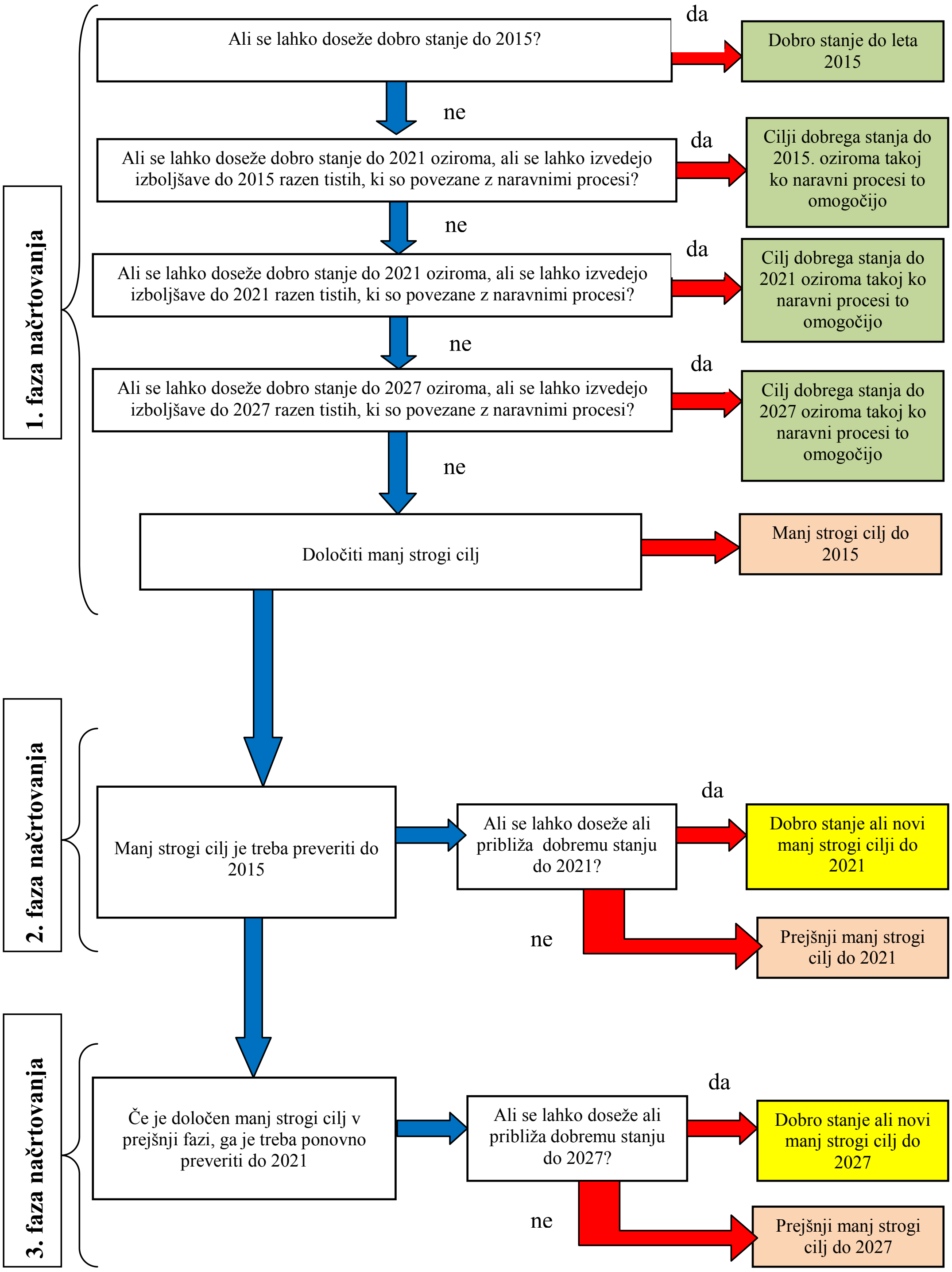


Figure 21: Use of exemptions under Article 4(4) and 4(5) of Directive 2000/60/EC

Use of exemptions under Article 4(7) of Directive 2000/60/EC

In the placement of new sHEPs and HEPs in the aquatic area, primarily the impacts on water in terms of compliance with the conditions for exemptions from Article 4(7) of Directive 2000/60/EC shall be assessed, in relation to changes of physical characteristics of the surface water body due to the implementation of sustainable development activities of ensuring the renewable electricity from hydroelectric power plants.

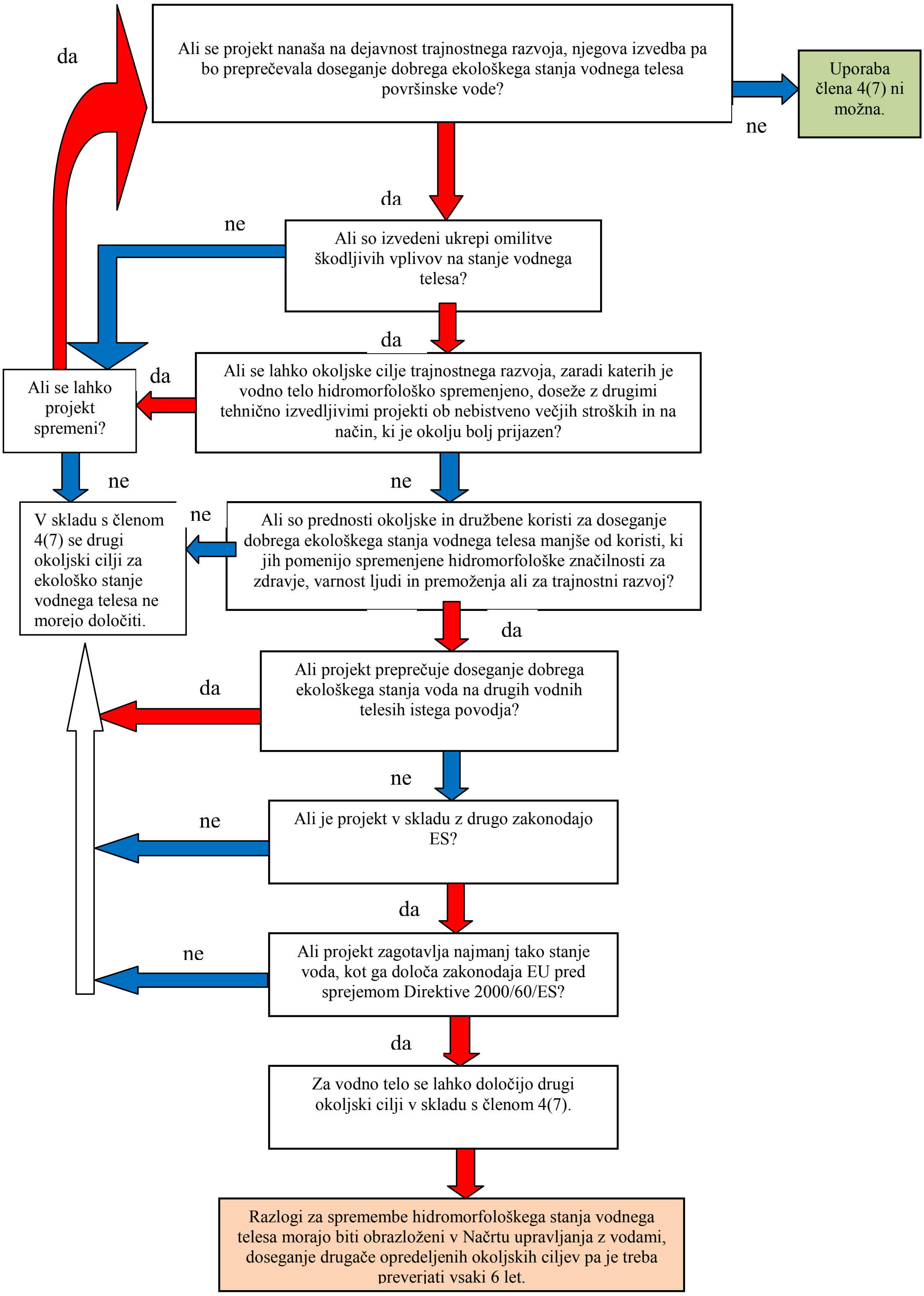


Figure 22: Process of determining the exemptions under Article 4(7) of Directive 2000/60/EC

The exemptions as in Article 4(7) of Directive 2000/60/EC apply to the new changes in the aquatic area and to the new sustainable development activities. The main principles of use as of Article 4(7) of Directive 2000/60/EC relating to the placement of hydroelectric power plants in the aquatic area, are as follows:

- - changes in physical characteristics of water bodies constitute a change of hydro-morphological characteristics of the water body. In this, the impacts of hydroelectric power plants should be taken into account that directly result from changes in hydro-morphological characteristics, or due to changes in water quality brought about by the modification or alteration of the water body. For example, altered hydro-morphological characteristics of an artificial lake can affect the oxygen content and temperature of surface water, which in turn worsens the ecological status of water,
- - Directive 2000/60/EC does not define the sustainable development activities, for which the exemptions from Article 4(7) may apply. In accordance with these principles, the placement of hydroelectric power plants in order to achieve the objectives of Directive 2009/55/EC on the promotion of energy use from renewable sources is eligible for exemption from Article 4(7), which also applies to a generic assessment of the impact acceptability of several sHEPs in the aquatic area of the same water body,
- - the ecological status of water or water potential (for heavily modified water bodies) is expressed as a "class" of status or potential (for example high, good, moderate, depleted or bad). Classes of ecological status of water and the potential of heavily modified water bodies are determined on the basis of specific criteria and constraints in accordance with Annex V to Directive 2000/60/EC. In the framework of the exemptions as in Article 4(7) of Directive 2000/60/EC the environmental objective to prevent the deterioration of ecological status of water (or potential) relates to changes between classes and not within individual classes, therefore Article 4(7) of Directive 2000/60 / EC does not apply to negative changes within a single class,
- - fluctuations in the ecological status of water bodies sometimes occur as a result of short-term human activities such as construction of water facilities or maintenance work. If the ecological status of water bodies experience a negative impact for a short time only and the status is restored within a short period of time without the implementation of restoration measures, such variations do not constitute a deterioration of the ecological status of water bodies. Application of Article 4(7) of Directive 2000/60/EC is not required for temporary impacts on the aquatic area resulting from changes in the stage of construction of water facilities because they are not to be treated as a deterioration of the ecological status of waters or potential of a heavily modified water body,
- - about the size of the project introducing the interventions in the aquatic area there are no established criteria for the application of Article 4(7) of Directive 2000/60/EC. Thus the impacts of sHEP projects on water, regardless of sHEP capacity, can be assessed as an exemption in accordance with Article 4(7) of Directive 2000/60/EC.

The conditions under which the provisions of Article 4(7) of Directive 2000/60/EC can be applied, are shown in the diagram of the figure below. This diagram shows a tool that has been used in this Environmental Report to assess the acceptability of impacts in terms of water for the placement of new sHEPs under the sub-programme "renewable energy sources" and new HEPs under the sub-programme "electricity generation" in the aquatic area.

As shown in Box 2 in Figure 22, all feasible measures to mitigate adverse impacts on the status of water bodies shall be adopted. As in accordance with Article 4(7) of Directive 2000/60/EC only the mitigation the impacts related to the placement of hydroelectric power plants in the aquatic area is required, it is important to clearly distinguish between the following:

- \- mitigation measures that aim to minimize or even prevent adverse impacts on the status of water bodies, and
- \- compensatory measures aimed at replacing the "net negative impacts" of the placement of a hydroelectric power plant in the aquatic area and the related measures to mitigate impacts on the aquatic area.

Article 4(7) of Directive 2000/60/EC therefore does not require compensatory measures.

Waters:
key strategic emphasis related to electricity generation in sHEPs and HEPs
The placement of hydroelectric power plants must not prevent the achievement of compliance with the standards and objectives set for protected areas in accordance with the regulations governing the conservation of nature.

For the hydroelectric power plants such techniques of water use shall be chosen (preferably a decanted or derivative type of hydroelectric power plant) that the planned hydro-morphological changes in the water body in the hydroelectric power plant area, including mitigation measures, are minimized.

The placement of a hydroelectric power plant in the aquatic area must undergo the water impact assessment according to Article 4(7) of Directive 2000/60/EC that sets out criteria for application of exemptions to the new (planned) changes of physical characteristics of surface water bodies due to the implementation of sustainable development, and in this the environmental objectives should be considered or less stringent objectives in the case of existing or heavily modified water bodies.

8.2.5.3 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on waters

Small hydroelectric power plants

The impact of sHEP construction can be seen as the imminent destruction of aquatic and riparian habitats and interruptions to the watercourse transitivity for aquatic organisms, especially fish. In the case of placement in the area of a natural value there is a possibility to destroy its vital part or category of natural value. Such negative impacts, as for example permanent changes in aquatic and riparian habitats, occur already during the construction.

In the operation of small HEPs the most problematic step is an excessive water recovery from the watercourse during low flows (it is necessary to guarantee an ecologically acceptable flow) and the erection of impassable barriers in streams – a dam (the interruption of transitivity for fish and other aquatic organisms). In case of installing several sHEPs in a row some cumulative and synergistic impacts are expected to occur. The impact on the qualifying species is permanent, direct and long-distance, an impact on the connectivity of the Natura 2000 area is possible.

Storage hydroelectric power plants and HEP reconstructions

Construction/renovation and operation of HEP due to the large-scale interventions cause extensive direct and indirect impact on important nature conservation areas. On the surface the most extensive impact is that of accumulation, as a dam produces a lake and thus leads to the destruction of important aquatic habitats of animals and plants and it soaks large areas of generally highly valued riparian habitat types and species habitats in terms of important nature conservation areas. Because of the chain of reservoirs also cumulative and synergistic impacts on migratory species of mammals (for example wolf, bear, deer, roe deer, wild boar) are possible. Specimens of these species cross the watercourses in the shallow and less torrential areas. To the bats, the watercourses represent a line that indicates their migratory route. By damming and removal of vegetation, these lines might be blurred.

The changes in habitat adversely affect the populations of aquatic organisms. The change of river habitat into an almost still one mostly affects river species that lose their habitat. The loss of riverside and riparian habitats (for example riparian vegetation, gravel bars, natural banks, flooded forests, oxbows, branches, tributaries, grassland habitats along rivers, etc.) can highly affect aquatic and riparian birds, mammals such as bats, otters, beavers, amphibians, reptiles such as dice snakes, grass snakes, European pond turtles, dragonflies, beetles, molluscs and crustaceans. Given the magnitude of intervention and the loss of suitable habitat may reduce the density of individual populations, and extinction of some local populations is also possible.

In the area of newly established banks, due to the hardened banks and water level fluctuations the development of native riparian vegetation is made difficult or even permanently impossible. Accumulation in addition to the physical destruction of aquatic and riparian habitats can also represent a serious threat to the dry lowland grasslands outside the area of a permanent lake (remote impact) due to changes in ground water level.

The most devastating impact is the one on aquatic organisms produced by the construction of reservoirs. After building the accumulation reservoir the species composition of the watercourse and its tributaries permanently changes. Reduced flow velocities in the accumulation lead to increased sedimentation and thus the accumulation of organic and inorganic substances at the bottom of reservoirs, resulting in modifications to the original mosaic structure, which in turn affects the species composition. Populations of fish species of fast moving waters in the areas of accumulation are highly affected. Populations of fish species of stagnant and slowly running waters or species tolerant to changes in water regime do increase.

During the construction of reservoirs (gravel extraction, river bed expansion), also the existing spawning grounds are physically destroyed or damaged. After the construction of reservoirs certain types of adult fish remain for some time in the accumulation, but gradually they disappear due to spawning areas submerged.

One of the most dramatic consequences of watercourse damming or building of dam structures or other barriers (high floor sleepers, gravel barriers on tributaries) that prevent the watercourse transitivity is the interruption of migratory routes of fish and other aquatic organisms. In the case of building several dams on the watercourse populations become even more divided and vulnerable, the impact is cumulative and synergistic.

Due to slow water flow or longer retention time of water, the likelihood of eutrophication of all possible negative effects on populations of aquatic organisms, especially the more vulnerable ones, increases.

Pumping power plants

A permanent impact on aquatic organisms may be represented by the construction of reservoirs due to changes in water regime and building of an impassable barrier in the watercourse. During the operation, the impact of water recovery from the watercourse occurs, especially during low flows, and it is therefore necessary to provide an ecologically acceptable flow.

Construction of an underground pressure pipeline may cause permanent impact on habitats outside the waterside areas especially if it is arranged through the priority habitat types or through habitats of endangered and protected species.

Changing the water regime in the watercourse causes a permanent impact on aquatic organisms and on flora and fauna on the banks. In the case of the pumping power plant built in a SCI area, an extensive impact on qualifications aquatic species may occur. Consequences of the intervention may also indirectly be expressed also on the hydrological or natural values or protected areas, especially if the watercourse in protected.

Nature:
key strategic emphasis related to electricity generation in sHEPs and HEPs
Construction/renovation and operation of hydroelectric power plants due to the large-scale interventions cause extensive direct and indirect impact on functionality and integrity of important nature conservation areas. The most extensive impact is represented by the change of aquatic habitat on populations of aquatic organisms and wildlife having their habitat near the water (banks, gravel bars). In terms of strategic positioning of hydroelectric power plants in the space, the following features are important:

- - that the hydroelectric power plants be placed in the environment so as not to affect the distinctive characteristics of important nature conservation areas and their biodiversity (Natura, Ramsar, IBA, UNESCO, EPO areas, natural values, protected areas),
- - that the conservation of qualifications species and HT in the Natura 2000 areas be preserved;
- - that the conservation of habitats of endangered and protected species and priority HT on narrower and wider area of intervention be preserved;
- - that the the transitivity and connectivity of watercourses for fish be preserved;
- - that the dynamics of the river and the gravel production or sediment deposition be preserved as much as possible;
- - that the negative consequences due to habitat loss be mitigated by replacing the lost surfaces.

8.2.5.4 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on cultural heritage

The impact of the construction of small hydroelectric power plants and hydroelectric power plants on the cultural heritage is reflected as the destruction or damage to buildings and areas of cultural heritage or the individual elements that require protection. The direct destruction can occur because of flooding some individual areas, rising groundwater (and resulting damage of archaeological remains, foundations of buildings of heritage) and the implementation of construction works (construction of dams, supporting infrastructure arrangements). Possible are destruction of or damage to archaeological remains discovered during the construction.

There are potential indirect impacts on cultural heritage objects or their spheres of influence, mainly due to the proximity of the construction site, new arrangements in the immediate vicinity, due to disturbed or prevented views of these facilities during construction or after it.

In the renovation of existing hydroelectric power plants, which are defined as heritage, destruction or damage to protected features can occur.

Cultural Heritage:
key strategic emphasis related to electricity generation in sHEPs and HEPs
The impact of the construction of hydroelectric power plants on the cultural heritage is reflected as the destruction or damage to buildings and areas of cultural heritage or the individual elements that require protection.

The density of sites and objects of cultural heritage in the potential area of the dam construction on the middle section of the Sava and Mura Rivers is relatively small. Impacts will be mainly a consequence of interventions on the two protected bridges and several archaeological sites along the Sava River, and the mill and the archaeological site near the Mura River. Smaller and marginal parts of the archaeological sites may be flooded, while larger parts may experience the impacts of rising groundwater and those occurring due to the construction.

The fundamental starting point for protection is that the locations of intended sHEPs and HEPs must avoid protected areas and objects of cultural heritage, while the solutions must take into account the conservation of protected heritage features.

In the detailed planning of hydroelectric power plants and associated infrastructure,probably some preliminary archaeological research will be necessary, when required, also adjustments to the solution and rescue excavations.

8.2.5.5 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on climatic factors

Generation of electricity from sHEPs and HEPs contributes to mitigate climate changes, because hydroelectric power plants generate electricity from renewable energy sources. However, greenhouse gas emissions throughout the lifetime of the hydroelectric power plant should be taken into account, that is from its manufacturing, construction, maintenance and decommissioning.

For the carbon footprint of electricity generation in Slovenian hydroelectric power plants, according to the opening hours of hydroelectric power plants, the maximum values are taken into account from the diagram in Figure 20 of the present Environmental Report, i.e. for electricity from HEP 75 g CO2 eq / kWh and for electricity from sHEP 100 g CO2 eq / kWh.

A comparison of the carbon footprint of electricity from HEP and sHEP shows that the hydroelectric power plants among the renewable energy sources have one of the largest carbon footprints, which however is still far smaller than the carbon footprint of co-generation using fossil fuel, as shown in the diagram in Figure 23 for electricity generation and from the diagram in Figure 25 for heat generation.

Climatic factors:
key strategic emphasis related to electricity generation in sHEPs and HEPs
Generation of electricity in sHEPs and HEPs contributes to a greater use of renewable energy sources.

Generation of electricity in sHEPs and HEPs is an important part of the Action Plan for the use of renewable energy sources (AP RES) adopted with the aim of reducing the emission of greenhouse gases and thus mitigating the impacts of climate changes.

To ensure the greatest possible utilization of the limited remaining potential for the placement of sHEPs and HEPs in the aquatic environment in Slovenia and the restrictions on placing new sHEPs and HEPs resulting from the environmental objectives of Directive 2000/60/EC, it is suggested that the planned NEP measures in the field of sHEPs and HEPs may be uniformly distributed over the entire period of the NEP implementation.

8.2.5.6 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on waters

The placement of hydroelectric power plants as large-scale infrastructure and the implementation of all the accompanying arrangements cause major changes in landscape structure and spatial relationships, and visibility elements of the space. Impacts of small hydroelectric power plants are of minor extent, but when they occur in a significant number and resulting in number of changes to riparian landscapes, their cumulative impact needs to be taken into account.

During the construction the impacts on the landscape occur due to the removal of riparian vegetation, extensive earthworks (excavation of construction holes, construction of dam facilities and dams, regulation of dam constructions and of new banks, arrangement of tributaries, of temporary disposal of material in the riparian area, etc.) and to the presence of construction sites and machinery.

Permanent impacts on the landscape are a consequence of placement of barriers and ancillary facilities and reservoirs, which generally represent a substantial expansion of existing river beds and a marked change of the character of these rivers. Due to rising levels, flooding of the rock bottom of the river bed and its banks occurs so the characteristic landscape elements – rocks, rapids and gravel bars are no longer visible. Impacts on the landscape are stronger in cases where the implementation of additional arrangements along the dam constructions is planned - energy and water economy embankments.

Water bodies usually represent an asset that positively affects the quality of landscape image. It is therefore necessary to allow for the possibility that the accumulations may increase the visibility of the landscape. To the quality of landscape image, also quality architecture of the barrier can contribute a lot.

Landscape:
key strategic emphasis related to electricity generation in sHEPs and HEPs

The placement of hydroelectric power plants as large-scale infrastructure and the implementation of all the accompanying arrangements cause major changes in landscape structure and spatial relationships, and visibility elements of the space.

Construction of hydroelectric power plants on the middle section of the Sava River does not interfere in the areas of outstanding landscape and landscape areas with distinctive characteristics on the national level, but will result in a significant change in river character. In addition to the optimization of hydro-energetic arrangements, for the reduction of the impacts on the landscape and thus increase of the acceptability level of the intervention a programme upgrade of the pace is of key importance, particularly with recreational facilities arising from the belief that the construction of HEP chain on the Sava River can not be viewed in a narrow energy sense, but in the broadest physical and social context.

The Mura River with its flood areas, oxbows, gravel bars, flooded forests and preserved cultural landscape is a unique landscape in the Slovenian territory. Energy utilisation of the Mura River could lead to irreversible and essential changes in landscape structure and spatial relationships, and visibility elements of the space. Given the importance of the Mura River, an intensive energy utilisation of the river or construction of the chain of electric power plants is unacceptable. Grounds for the interventions to the Mura River can only be rehabilitation, establishment of comprehensive measures to ensure the desired water regime and the groundwater status and the conservation of lowland forests. The hydroenergetic utilisation can only be allowed as a parallel part of the integral spatial arrangement.

Impacts can be mitigated by a comprehensive landscape architectural arrangement of the space along the dam construction and thus a new distinctive landscape can be established.

8.2.5.7 Description of the impacts of small hydroelectric power plants and hydroelectric power plants on material assets

Restriction of the general use and other uses of water

The possibility of a significant impact on material assets can emerge due to a general restriction on water use and in some cases also of specific water use in the affected area of hydroelectric power plants.

Due to the mitigation of the hydroelectric power plant impacts on other water use, the planning of water use for the generation of electricity in hydroelectric power plants must be subordinated to the use of water for drinking water supply and water use for irrigation in agricultural generation for food purposes.

Planning of water facilities of hydroelectric power plants must provide synergistic effects in terms of material assets protection against flooding in such a way that the water facilities of the hydroelectric power plant perform also the function of water facilities protecting against flood or retention of high water wave.

Reduction of risks against flood damage
Floods are natural phenomena that can not be prevented. However, placement of hydroelectric power plants in the aquatic environment can result in reduction of the natural water spills, which together with climate changes contributes to the increase in the likelihood of occurrence and adverse impacts of floods. A visible consequence of climate changes is more intense rainfall at the time of otherwise normally stronger rainfall and consequently occurrence of high water. Placement of hydroelectric power plants in the aquatic environment in terms of impact on material assets is acceptable, if measures are taken to reduce the risk of adverse consequences associated with floods, especially for health and life of people, the environment, cultural heritage, economic activity and infrastructure.

In order that measures for reducing risks from floods caused by placing of hydroelectric power plants be successful, it is necessary to coordinate such measures as much as possible throughout the whole river basin where the hydroelectric power plants are placed. Plans for the management of flood risks due to the placement of hydroelectric power plants should focus on prevention of and protection against floods. In order to guarantee more space to the surface waters for spilling or retention, in the planning of hydroelectric power plants it should be considered that the existing flood plains are maintained and/or restored or otherwise it should be provided for sufficient retention volume for the increased water flow. Similarly, in the affected area of the hydroelectric power plants it should be guaranteed the implementation of measures to prevent and reduce damage to human health, environment, cultural heritage and economic activity. It is also necessary to guarantee that the plans for flood risk management are regularly reviewed and updated where necessary, taking into account the likely effects of climate changes on the occurrence of floods.

In the case of multi-purpose use of water bodies in the impact area of the hydroelectric power plants, for various forms of activities using water assets to flood risk management, maintenance of ecosystems, general use, water use in agriculture or industry, the procedures laid down in Directive 2000/60/EC shall be applied to address such uses, including the possible derogations from objectives of "good status" or "non deterioration of status" as per Article 4 of this Directive.

Material assets:
key strategic emphasis related to electricity generation in sHEPs and HEPs
It is necessary to identify the conflicts between water use for drinking water supply and water for irrigation of agricultural land on one side and water use for the electricity generation in hydroelectric power plants on the other.

It is necessary to guarantee the flood protection function against floods in the affected area of hydroelectric power plants with water facilities of hydroelectric power plants and related facilities to prevent flooding or reduce the adverse consequences of flooding.

8.2.6 Solar power stations and solar thermal collectors

In the sub-programme "renewable energy sources" as a measure the following is provided for:
- - electricity generation in solar power plants (337 MW by 2020 and 567 MW by 2030), and
- - generation of heat in solar thermal collectors: 561,000 m2.

Environmental impacts of the electricity generation in solar power plants and heat generation in solar thermal collectors in terms of impact on natural resources, air, water, nature, health, landscape and protection of material assets are insignificant, and the consequences of these impacts on the environment are not essential to be included in the valuation of NEP scenarios.

Significant environmental impacts of measures of electricity generation in solar power plants and heat generation in solar thermal collectors of the sub-programme "renewable energy sources" are impacts in terms of cultural heritage, climatic factors and landscape.

In assessing the environmental impact of measures of electricity generation in solar power plants and heat generation in solar thermal collectors of the sub-programme "renewable energy sources" no significant cumulative impacts on the environment have been detected, except for impacts on cultural heritage (see Section 8.1) and the impact on the landscape (see Section 8.3.1).

8.2.6.1 Description of the impacts of solar power plants and solar thermal collectors on cultural heritage

Installation of solar power plants and solar thermal collectors on buildings of architectural heritage can constitute a devaluation of the protected heritage features. The shape of the roof and roof elements are generally protected elements of the buildings heritage; by installing the equipment for the use of solar energy significant alterations to the image of the building can occur. A negative impact on the image of heritage buildings in a wider area may also occur in the event of placement of solar power plants and solar thermal collectors in impact areas of heritage sites and in heritage cultural and historical landscapes.

Cultural Heritage:
key strategic emphasis related to solar power plants and solar thermal collectors
Installation of solar power plants and solar thermal collectors on buildings of architectural heritage can constitute a devaluation of the protected heritage features.

The spatial planning documents should determine the spatial implementation conditions in a way that the placement solar power plants and solar thermal collectors will not affect the protected features of buildings and sites of cultural heritage.

8.2.6.2 Description of the impacts of solar power plants and solar thermal collectors on climatic factors

Generation of electricity in solar power plants and heat generation in the solar thermal collectors contribute to mitigate the climate changes, since the electricity and heat are produced from renewable energy sources.

Although the carbon footprint of electricity generation in solar power plants is the largest of all power plants using renewable energy sources, and it amounts to cca. 100 g CO2 eq / KWh, the environmental pollution by the emission of GHG from wind farms is much smaller than the pollution caused by electricity generation from fossil fuels, as shown in the figure[17] below.

Climatic factors:

key strategic emphasis related to solar power plants and solar thermal collectors

Generation of electricity in solar power plants and heat generation in solar thermal collectors contribute to a greater use of renewable energy sources.

Generation of electricity in solar power plants and heat generation in solar thermal collectors are an important part of the Action Plan for the use of renewable energy sources (AP RES) adopted with the aim of reducing the emission of greenhouse gases and thus mitigating the impacts of climate changes.

[17] **COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.**

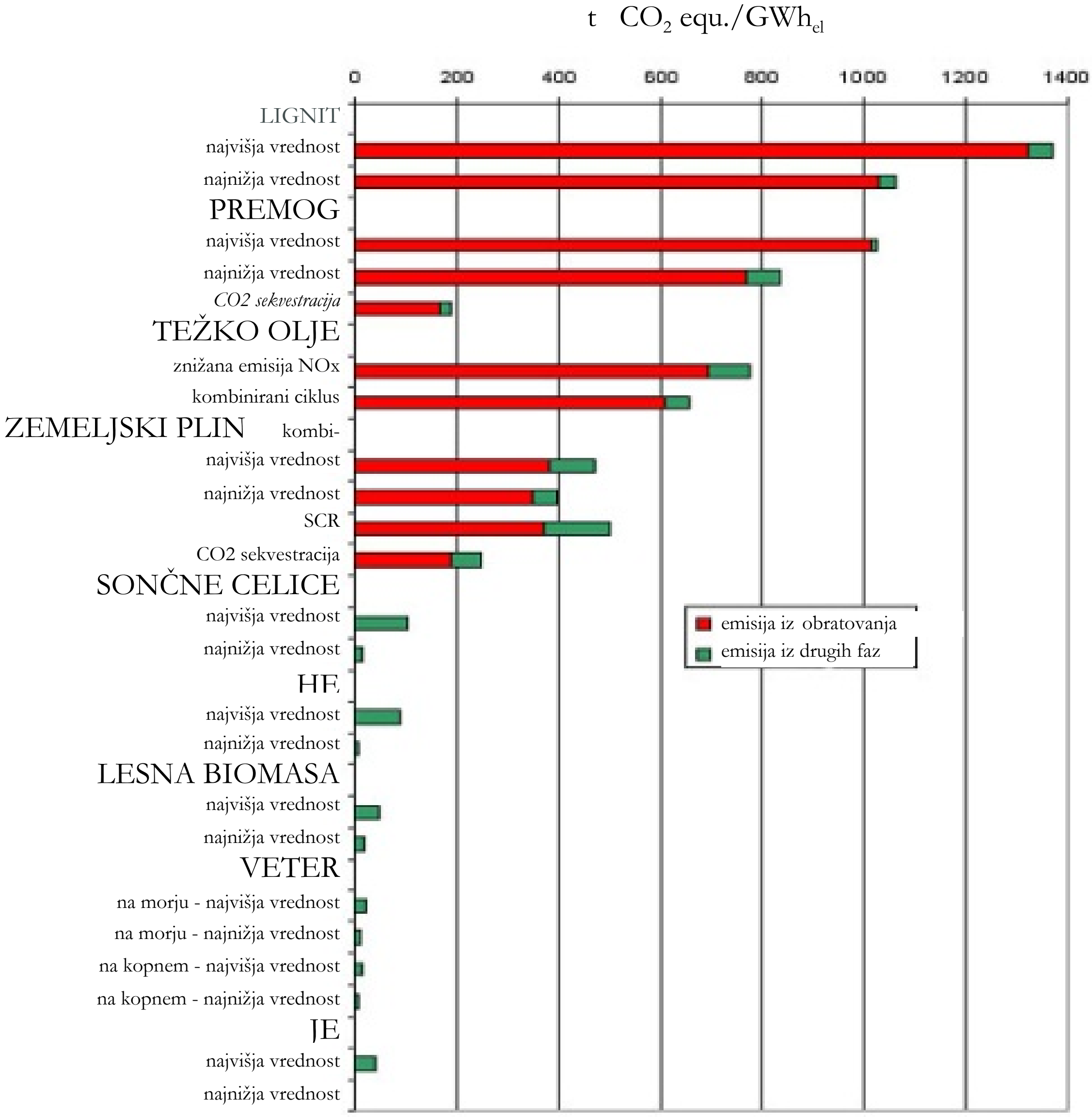


Figure 23: GHG emissions from different systems of electricity generation

8.2.6.3 Description of the impacts of solar power plants and solar thermal collectors on landscape

Placement of solar power plants and solar thermal collectors in the landscape represents the destruction of landscape elements in the placement area and usually degradation of the landscape image. Given the possibility of placing solar power plants and solar thermal collectors on buildings it is estimated that placement in the landscape has no meaning, and in exceptional and distinctive landscape it is unacceptable. An exception might be the placement in degraded areas - such as a rehabilitation of landfills, opened mines within the industrial areas, logistic terminals, along the transport infrastructure facilities (for example in the simultaneous function of sound barriers), in case when they are not sites of nature conservation importance or otherwise important, which is determined through a detailed assessment.

Landscape:
key strategic emphasis related to solar power plants and solar thermal collectors
Solar power plants and solar thermal collectors placed in a landscape, change significantly and generally undermine the landscape image.

Solar power plants and solar thermal collectors should be installed only on facilities, exceptionally into degraded landscape areas (in case when they are not sites of nature conservation importance or otherwise important).

Placement of solar power plants and solar thermal collectors needs to be regulated with provisions of spatial planning documents in a manner that does not lead to unnecessary degradation of the landscape.

8.2.7 Geothermal power plants and geothermal heating systems

The actual effect of the environmental impacts depends on the location of the geothermal heat source, on the duration of each stage of construction or decommissioning, on the sensitivity of the adverse effects receiver and also on the pressure exercised on the existing status of the environment from other forms of activities. In the sub-programme "renewable energy sources" the construction of 10 geothermal heating systems is planned with a total annual generation of 114 TJ of heat till 2020 and the construction of one geothermal power plant with a capacity of 25 MWe in the period 2020-2030.

Potential significant environmental impacts of geothermal heat are identified on the basis of a review of studies and expert opinions on the consequences of the effects of typical geothermal power plant techniques and of their installation.

Environmental impacts of the measure "geothermal power plants and geothermal heating systems" in terms of impacts on air, nature, cultural heritage, human health and the landscape are insignificant, the potential consequences of these impacts on the environment are identified and therefore not included in the strategic evaluation of the NEP scenarios.

Significant environmental impacts of geothermal power plants and geothermal heating systems are constituted by impacts in terms of natural resources, water, climatic factors and protection of material assets.

In assessing the environmental impact of geothermal power plants and geothermal heating systems no significant cumulative impacts on the environment have been detected.

8.2.7.1 Description of the impacts of geothermal power plants and geothermal heating systems on natural resources

There are no significant impacts on natural resources if the level and the method of geothermal heat use ensures that the potential geothermal heat is restored and that the medium for transmission of geothermal heat to the surface is returned back into the subsoil.

Operation of the geothermal heat source facilities in the event of medium re-injection for the geothermal heat transmission does not affect natural resources.

Natural resources:
key strategic emphasis related to geothermal power plants and geothermal heating systems
Geothermal heat should be utilized so that the geothermal heat potential is restored and that the medium for geothermal heat transmission is returned back from the surface into the subsoil.

8.2.7.2 Description of the impacts of geothermal power plants and geothermal heating systems on waters

In the exploitation of geothermal energy sources there are no significant impacts on surface and groundwater if the method of exploitation ensures that the medium for geothermal heat transmission is returned back from the surface into the subsoil. Operation of the geothermal heat source facilities in the event of medium re-injection for the geothermal heat transmission therefore has no significant impact on ground and surface waters.

Re-injection is particularly important in the generation of electricity in geothermal power plants, where steam from the hot thermal water is driving the turbine generator. The remaining water is returned together with the condensed steam to the aquifer, where it is heated again. During the pumping of the aquifer, as well as during the re-injection the water it is separated from the surroundings. Sealed tubes through which the two processes take place, ensure that the potentially harmful water does not penetrate in the groundwater, into surface water or into surface soil. Typically, the boreholes for pumping water and for its return to the aquifer are separated, so that the two processes can run separately, which is important because of separate chemical processing. For the operation of geothermal power plants also the surface or underground water is important, but the impacts on water because of its use are negligible.

Requirements for re-injection of water in geothermal heating systems are implemented with similar technology, but the completion of re-injections is less demanding and less expensive than in geothermal power plants.

The impacts on water resources occur in geothermal energy sources mostly in the period of the plant construction, so they are temporary. Water is used during the construction of boreholes, but this is a limited period of time, and the water consumption is low.

Waters:
key strategic emphasis related to geothermal power plants and geothermal heating systems
In planning and operation of geothermal power plants and geothermal heating systems the re-injection of the transmission medium of geothermal heat has to be guaranteed so that the use of geothermal energy source has no significant impact on groundwater and surface water.

8.2.7.3 Description of the impacts of geothermal power plants and geothermal heating systems on climatic factors

Geothermal power plants and geothermal heating systems contribute to mitigate climate changes as they produce electricity and heat from renewable energy sources, but their foreseen contribution in the NEP is the smallest among all renewable energy sources.

Geothermal power plants and geothermal heating systems are considered to be renewable energy sources; in evaluating their contribution to the impact on climatic factors, the carbon footprint of the so produced heat or electricity should be considered. For the Slovenian context, is assumed that the carbon footprint of electricity from geothermal power plants is approx. 150 g CO2 eq / KWh, and for geothermal heating systems, approx. 50 g CO2 eq / kWht (including the energy used for re-injection of the heat transmission medium).

Climatic factors:

key strategic emphasis related to geothermal power plants and geothermal heating systems

The generation of electricity in a geothermal power plant and heat generation from geothermal heating systems contribute to a greater use of renewable energy sources.

The generation of electricity in geothermal power plants and heat generation in geothermal heating systems is an important part of the Action Plan for the use of renewable energy sources (AP RES), adopted with the aim of reducing greenhouse gas emissions and thus mitigating the impacts of climate change.

8.2.7.4 Description of the impacts of geothermal power plants and geothermal heating systems on material assets

In the area of geothermal heat source exploitation (of a geothermal power plant or a geothermal heating systems), during the period of construction and operation of geothermal power plants, disturbances of groundwater use under existing water rights can occur, or limitations on certain uses of groundwater can appear.

Material assets:

key strategic emphasis related to geothermal power plants and geothermal heating systems

Geothermal heat source exploitation (of a geothermal power plant or a geothermal heating system) should be designed in such a way that, during the period of construction and operation of geothermal heat systems, there are no unreasonable disturbances to the use of groundwater under existing water rights, nor unreasonable limitations on the use of groundwater.

8.2.8 Sub-programme "renewable energy sources – heating systems using wood biomass" and sub-programme "electricity generation – wood biomass in large CHP units with high useful efficiency"

The sub-programme "renewable energy sources" includes the following measures of wood biomass utilisation as a renewable energy source:

- construction of CHP plants using wood biomass (14 MW by 2020 and 20 MW by 2030),
- introduction of wooden biomass boilers (WBM) in households, 67,800 units,
- introduction of WBM boilers in the service activities, 7,700 units,
- introduction of WBM boilers in industry, 130 units,

- construction of BDH systems (> 1 MW), 42 systems with WBM energy use,
- construction of local BDH systems (> 1 MW), 280 systems with WBM energy use.

The sub-programme "electricity generation" foresees the WBM use in large CHP units with high useful efficiency.

The environmental impacts of the use of WBM in heating systems, CHP plants and in large CHP units with high useful efficiency of hydroelectric power plants are considered irrelevant in terms of impacts on water, nature, cultural heritage and health if the devices for WBM energy use are installed at existing energy or industrial locations, or are part of the communal structures in built-up urban areas and are intended for heating buildings.

The assumption of an environmental impact assessment in this Environmental Report is that the devices for WBM energy use will be installed in urban environments of existing energy sources, or industrial locations, or be part of the communal structure facilities in built-up urban areas, so that the environmental impacts in terms of water, nature, cultural heritage and health are insignificant.

The significant environmental impacts of devices using WBM energy are on natural resources (forest wood biomass), air, climatic factors, landscape and protection of material assets.

In assessing the environmental impacts of devices using WBM energy, significant cumulative environmental impacts related to impacts on the sustainable use of WBM due to simultaneous demands for the use of wood in the implementation of wood-processing activities have been detected.

8.2.8.1 Description of the impacts of heating systems using wood biomass and wood biomass use in large-scale CHP with high useful efficiency on natural resources

The impacts of WBM use in heating systems and large CHP units with high useful efficiency on the sustainable use of forest biomass are estimated based on attaining the following objectives of sustainable use of forest biomass:

- - exploitation of forest biomass for the manufacture of articles and for energy recovery must comply with the objectives of the EU Action Plan on Forests (COM (2006) 302 final), which sets out the objectives related to improving long-term competitiveness by strengthening the forest sector and sustainable use of products and services associated with forests, and the conservation and appropriate enhancement of biodiversity, carbon sequestration, integrity, health and resilience of forest ecosystems at all geographic levels;
- - use of forest biomass for energy generation, including the use of forest biomass for biofuels and other liquid biofuels production, must be in accordance with the objectives set out in Directive 2009/28/EC on the promotion of energy use from renewable sources,
- - due to the requirement of reducing the cumulative impacts on the sustainable use of forest biomass, the WBM use for energy purposes shall be subject to the use of forest biomass in the wood processing industry; while doing this, WBM energy use should be channelled into the exploitation of forest biomass waste or of forest biomass of lower quality, and into the use of solid fuels manufactured from waste wood products, and

- - the use of forest biomass for energy purposes must be in accordance with the objectives of the Action Plan on the use of renewable energy sources for Slovenia (elaborated in accordance with Directive 2009/28/EC), which determine that the direct energy use of WBM is justified for smaller combustion installations for building heating, while in other types (medium and large combustion plants and CHP plants) only if the energy use of WBM demonstrates a high useful efficiency of CHP facilities (at least 65%, calculated in accordance with the criteria laid down in Directive 2008/98/EC on waste management).

Natural resources:
key strategic emphasis related to the use of WBM in heating systems and in large-scale CHP units with high using efficiency
The WBM use for energy purposes should not lead to pressures on the sustainable use of forest biomass.

WBM use for energy purposes must be subordinated to the use of forest mass for the wood processing industry, and focused on the exploitation of forest biomass waste or forest biomass of lower quality, and on the use of solid fuels manufactured from waste wood products.
In the use of WBM for biofuel production in relation to the sustainable use of forest biomass, the criteria laid down in Directive 2009/28/EC on the promotion of energy from renewable sources should be taken into account.

8.2.8.2 Description of the impacts of heating systems using wood biomass and wood biomass use in large-scale CHP with high useful efficiency on air

The impacts of WBM energy use on air, due to the emissions of total dust, are usually greater than the impact on air due to the use of liquid or gaseous fuel in heating systems and in large-scale CHP units with high using efficiency. The WBM energy use in terms of the impacts on air is acceptable if the concentration of total dust in flue gasses for the new combustion installations in the first decade of NEP implementation does not exceed the following values:

- - 90 mg/m3 for small combustion installations built by 2017,
- - 20 mg/m3 for small combustion installations built after 2017,
- - 50 mg/m3 for medium combustion installations built by 2017,
- - 30 mg/m3 for medium combustion installations built after 2017, and
- - 30 mg/m3 for large combustion installations between 50 and 100 MWth and 20 mg/m3 for large combustion installations above 100 MWth installed after the implementation of the new Directive on emission of pollutants from industrial pollution sources (the new IPPC Directive) (presumably in 2012)[18].

[18] Draft Directive on industrial emissions (IPPC - integrated pollution prevention and control) [COM(2007) 843 final].

WBM energy use is a measure of the sub-programme "renewable energy sources", respectively of the sub-programme "electricity generation"; in terms of the impact on air, it is considered an acceptable heat and electricity generation method if the average of total dust emissions from combustion installations does not exceed the above-mentioned limits already prescribed for the installation of combustion plants with new techniques. Although total dust emissions due to WBM energy use are greater than total dust emissions due to the energy use of liquid and gaseous fossil fuels, WBM energy use is justified by the benefits of such use in improving the environmental status in the area of climatic factors.

Air:

key strategic emphasis related to the use of WBM in heating systems and in large-scale CHP units with high using efficiency

WBM energy use is acceptable in terms of the impacts on air, provided it is used in technologically advanced combustion installations with low emissions of total dust.

The proportion of total annual emissions of dust from WBM combustion installations must not compromise the national emission ceilings for PM10 or PM2.5 planned to be set for each EU Member State individually in accordance with the provisions of the PEN Directive restored.

8.2.8.3 Description of the impacts of heating systems using wood biomass and wood biomass in large-scale CHPs with high useful efficiency on climatic factors

WBM energy use in heating systems and in large-scale CHP units with high using efficiency is a key contributor to mitigating climate change, although greenhouse gas emissions throughout the lifetime of the heating system or a CHP plant should be taken into account, i.e. from the production of these devices or equipment, to construction, fuel preparation, maintenance and decommissioning.

In accordance with Directive 2009/28/EC on the promotion of energy use from renewable energy sources, the only appropriate method for assessing the effectiveness of bio-energy on climatic factors in comparison with fossil alternatives is the calculation of GHG emissions throughout the lifetime of a renewable energy source. GHG emissions of biological renewable energy sources vary according to the type of raw material, changes in carbon stocks due to land use, transportation, processing of raw materials, and technology for the biological conversion of a renewable energy source into heat or electricity.

The method of calculating GHG emissions over the lifetime of a biological renewable energy source (LCA method) provided for in Directive 2009/28/EC, follows the energy chain from the source to final energy use. In the case of solid biomass used to produce electricity and heat, the final energy is considered to be produced electricity or used heat. To assess the impact performance on climatic factors due to WBM energy use, the calculation methodology for GHG emissions should be extended so as to include WBM conversion into electricity and useful heat.

Based on the Commission Report on the use of the method for calculating GHG emissions over the lifetime of a biological renewable energy source (LCA[19] method), for the production of fuel from WBM in the continental part of Europe, a typical value of GHG emissions is around 2g CO_2 eq / MJ, or 8g CO_2 eq / kWh. To this value, GHG emissions from the device for converting WBM fuel into electricity or heat should be added, and total GHG emissions from the preparation of fuel to the conversion into final energy conversion should be divided by the energy useful efficiency of the WBM fuel conversion into the final energy, which in CHP is around 60% (in the generation of electricity, conversion efficiency is around 25% in heat; and in heat generation, it is about 85%).

The carbon footprint of heat and electricity generation from WBM is assessed on the basis of the following calculation:

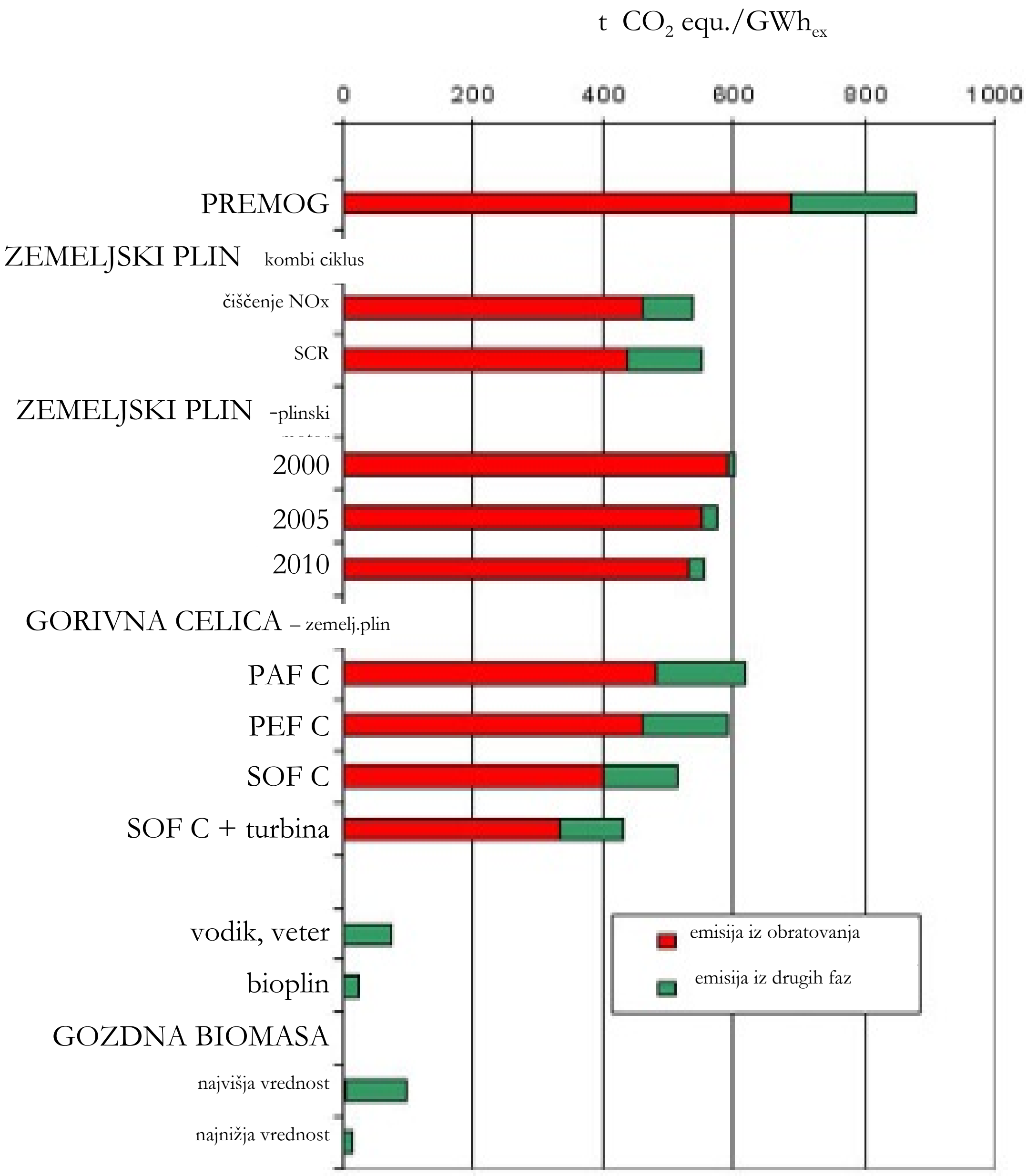
$$A_{LBM} = \left(e_{gorivo} + e_{pretvorba}\right) / \eta_{pretvorba}$$

where:
ALBM is the carbon footprint of the heat and electricity generation from WBM
egorivo are GHG emissions over the lifetime of the fuel preparation from WBM
epretvorba are GHG emissions over the lifetime of the device for converting WBM into the final energy
 pretvorba is the energy efficiency of WBM fuel conversion into final energy

The carbon footprint of heat and electricity generation in heating systems using WBMs and in CHPs using WBM is shown in the diagrams and figures below. For the Slovenian context, it is assumed that the carbon footprint of heat generation in the heating systems is about 50g CO2 eq / kWht; and for electricity produced in CHPs using WBMs with high using efficiency, it is around 100g CO2 eq / KWh.

The comparison of carbon footprints of electricity produced by CHPs using WBMs shows that WBM energy use has one of the largest carbon footprints as compared to the carbon footprints of electricity generation by CHPs using renewable energy sources, as shown in the figures[20] below.

[19] REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling - SEC(2010) 65 final.
[20] COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.



(definitions: ex = energy or available energy from CHP)

Figure 24: Carbon footprint of electricity generation in CHP

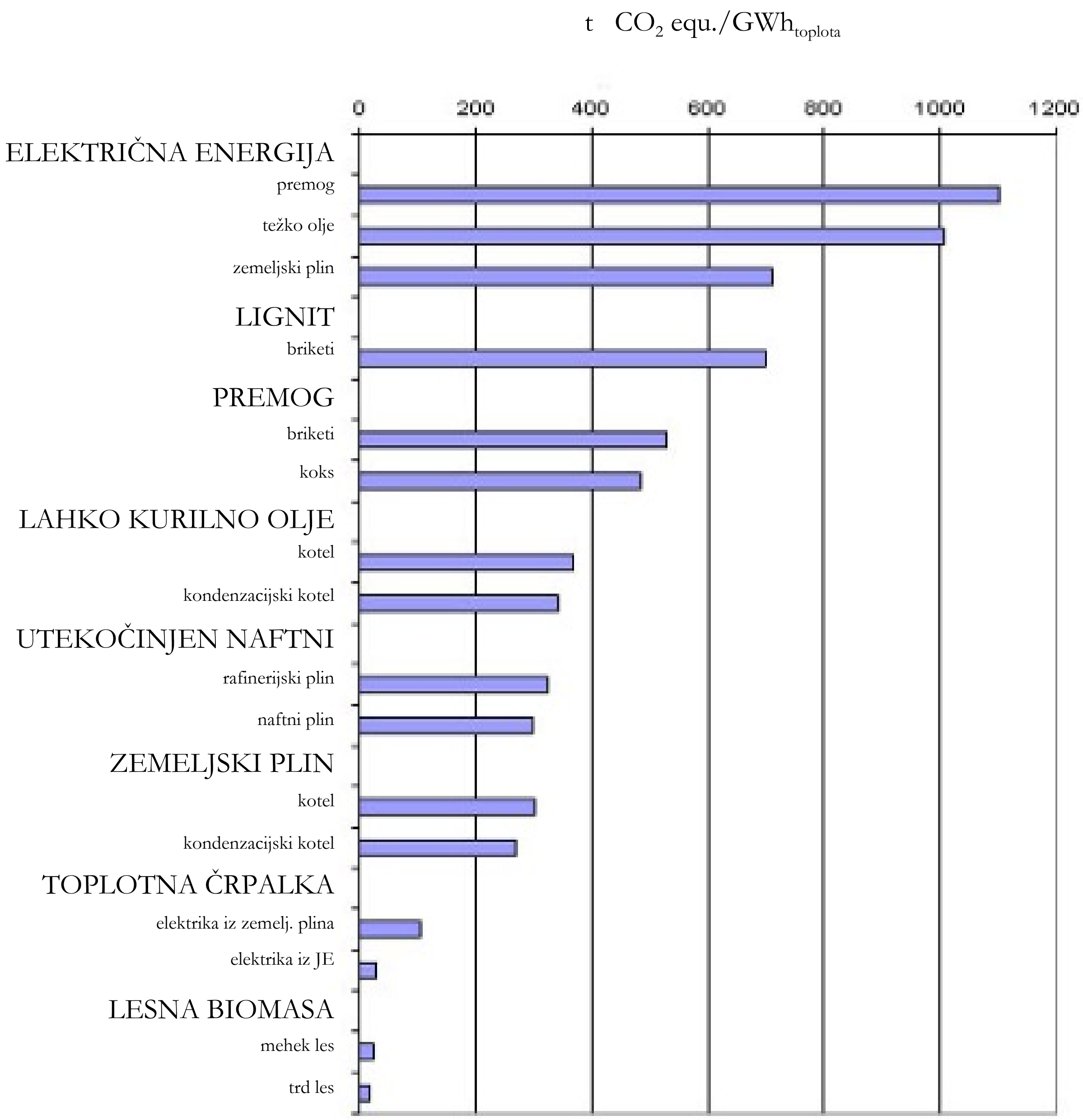


Figure 25: Carbon footprints of heat generation in terms of energy source

Climatic factors:

key strategic emphasis related to the use of WBM in heating systems and in large-scale CHP units with high using efficiency

WBM energy use in heating systems and in large-scale CHP units with high using efficiency contributes to a greater use of renewable energy sources.

WBM energy use in heating systems and in large-scale CHP units with a high using efficiency is an important part of the Action Plan for the use of renewable energy sources (AP RES) adopted with the aim of reducing the emission of greenhouse gases and thus mitigating the impacts of climate change.

8.2.8.4 Description of the impacts of heating systems using wood biomass and wood biomass use in large-scale CHPs with high useful efficiency on air

The exploitation of forest biomass can affect the characteristics of the forest landscape, where the exploitation of wood biomass from forests is not sustainable. We assume that the use of forest biomass in the future will also be in accordance with the status of growing stock and the increment of growing stock in forests, and thus will not have adverse impacts on the status of forests and their ecological functions and, consequently, on the characteristics of the forest landscape.

It is estimated that the potential use of biomass obtained by clearing surfaces in the framework of restoration or maintenance of cultural landscapes in overgrown areas in heating systems using biomass and in large-scale CHP units with high using efficiency is not real or rational.

Biomass exploitation may lead to the introduction of new crops in the agricultural landscape. There may be an abandonment of traditional crops and changes in the arable model (for example, land consolidation for the purpose of more rational production), which in turn may affect the features of the landscape.

Landscape:

key strategic emphasis related to the use of WBM in heating systems and in large-scale CHP units with high using efficiency

We assume that the use of forest biomass will be in accordance with the status of growing stock and the increment of growing stock in forests, and thus will not have adverse impacts on the status of forests and, consequently, on the characteristics of the forest landscape.

In cases of the introduction of agricultural crops for the purpose of biomass exploitation, and of parallel changes in agricultural production, the principles of a comprehensive landscape arrangement should be taken into consideration.

8.2.8.5 Description of the impacts of heating systems using wood biomass and wood biomass use in large-scale CHP with high useful efficiency on material assets

The possibility of a significant effect on material assets can be caused by restrictions on the sustainable use of forest biomass, where the WBM energy use would be an obstacle to the use of forest biomass in the wood processing industry.

WBM use for energy purposes must be subordinate to the use of forest biomass for the wood processing industry, while the incentives to use WBMs for energy purposes must not cause economically unjustified obstacles to the wood processing industry in accessing the forest mass. In order to reduce or prevent the impacts of WMB energy use on the asset that is provided by the forest biomass to the wood processing industry, WBM energy use should be channelled towards the exploitation of forest biomass waste or forest biomass of lower quality, and towards the use of solid fuels manufactured from waste wood products.

Material assets:

key strategic emphasis related to the use of WBM in heating systems and in large-scale CHP units with high using efficiency

The conflicts between WBM energy use and the use of forest biomass in the wood processing industry should be defined.

WBM energy use should be directed toward the exploitation of forest biomass waste or forest biomass of lower quality, and towards the use of solid fuels manufactured from waste wood products.

8.2.9 Sub-programme "electricity generation from landfill gas, other biogasses and biogas from biological waste water treatment plants"

8.2.9.1 Description of the impacts of electricity generation from landfill gas, other biogasses and biogas from biological waste water treatment plants on air

Facilities for the generation of electricity from landfill gas, other biogasses and biogas from biological waste-water treatment plants pollute the environment with the discharge of substances into the air that cause bad odours, which are primarily detrimental to human well-being. Typical odour flows from these facilities are from 1500 to 6000 EV/h (EV is an odour unit) if the facilities are not sealed or the recovery of biogas is not perfect. It is considered that an average facility for the generation of electricity from landfill gas, other biogasses and biogas from biological waste water treatment plants does not result in exceeding the limits set for bad odours in areas of urban settlement (from 1 to 3 EV), at a distance of 350 m or more.

Air:

key strategic emphasis related to electricity generation from landfill gas, other biogasses and biogas from biological waste water treatment plants

The generation of electricity from landfill gas, other biogasses and biogas from biological waste water treatment plants is a part of the Action Plan for the use of renewable energy sources (AP RES) adopted with the aim of reducing the emission of greenhouse gases and thus mitigating the consequences of climate changes.

8.2.9.2 Description of the impacts of electricity generation from landfill gas, other biogasses and biogas from biological waste water treatment plants on climatic factors

Electricity generation from landfill gas, other biogasses and biogas from biological waste-water treatment plants contributes to mitigating climate changes, but this contribution is relatively limited because of the limited quantities of biodegradable materials that are available for biogas production. The use of landfill gas is feasible only near old landfills which operated more than five years ago.

In accordance with Directive 1999/31/EC, the disposal of biodegradable material at landfills is limited, so that the biodegradable material can be disposed of in 2020 in a quantity smaller than 35% in comparison to the amount disposed of in 1995.

Climatic factors:

key strategic emphasis related to electricity generation from landfill gas, other biogasses and biogas from biological waste water treatment plants

The minimum distance between facilities for such generation and housing should be considered, to ensure that odours are diluted enough for the dispersion of substances that cause unpleasant odours in ambient air.

8.3 Sub-programme "local energy supply"

The "local power supply" sub-programme includes the following measures of district heating:

- - customers connecting,
- - expansion of district heating networks,
- - efficient energy use in district heating and cooling systems,
- - construction of district cooling systems,
- - construction of district heating systems:

- small district heating systems with an average heat output of 500 kWt,
- larger systems with an average size of 4 MWt,

- - exploitation of waste for energy purposes (measures are included in the operational programs of waste management).

The environmental impacts of the sub-programme "local energy supply" in terms of impacts on natural resources, water, nature, cultural heritage, health, landscape and material assets are considered irrelevant if district heating systems are part of communal structures in populated areas and are designed for heating or cooling buildings.

The assumption of the environmental impact assessment in the Environmental Report is that district heating systems will be installed in urban populated areas in such a way that the impacts on the environment in terms of natural resources, water, nature, cultural heritage, health, landscape and material assets are irrelevant.

The significant effects on the environment of the "local energy supply" sub-programme are impacts on air and climatic factors.

In assessing the environmental impact of the "local energy supply" sub-programme, no significant cumulative impacts on the environment have been detected.

8.3.1 Description of the impacts of the "local energy supply" sub-programme on air

The environmental impacts of the "local energy supply" sub-programme in terms of impacts on air, - usually due to lower specific emissions of pollutants converted to useful heat usage for heating - are smaller in comparison to the total environmental impacts of combustion installations intended for the individual heating of single buildings.

Air:

key strategic emphasis related to the "local energy supply" sub-programme

Air pollution in district heating is less than air pollution caused entirely by the emission of pollutants from the combustion chambers for the individual heating of single buildings.

8.3.2 Description of the impacts of the "local energy supply" sub-programme on climatic factors

The establishment of new district heating systems to be implemented within the measures of the sub-programme "local energy supply" will partially contribute to mitigating climate changes, because this type of building heating is more energy-efficient in comparison to building heating with individual heat generation in smaller combustion installations.

Climatic factors:
key strategic emphasis related to the sub-programme "local energy supply"
District heating, due to greater energy-efficiency in building heating, is an important part of measures to reduce greenhouse gas emissions.

8.4 Sub-programme "co-generation" of heat and electricity

The "co-generation" sub-programme includes the following actions for the replacement or modernisation of existing systems for heat supply:

- - introduction of CHP using natural gas in industry: 165 MW by 2020 and 95 MW by 2030,
- - introduction of CHP using natural gas in district heating systems of 20 MW by 2020 and of 17 MW by 2030 (excluding TE-TOL),
- - introduction of CHP using natural gas in service activities: 28 MW by 2020 and 27 MW by 2030,
- - introduction of CHP using natural gas in households: 11 MW by 2020 and 27 MW by 2030.

The measures of the "co-generation" sub-programme combine the introduction of different techniques of high-efficiency CHP using natural gas.

The measures of the "co-generation" sub-programme in terms of impacts on natural resources, water, nature, cultural heritage, health, landscape and material assets are considered to be irrelevant when implemented on existing or new industrial sites or are part of the communal structure in populated areas where they are intended for use in building heating.

The assumption of the environmental impact assessment in the Environmental Report is that the facilities for the implementation of measures of the sub-programme "co-generation" will be installed in areas intended for industrial purposes, or in urban populated areas in such a way that the impacts on the environment in terms of natural resources, water, nature, cultural heritage, health, landscape and material assets are irrelevant.

Significant effects on the environment of the "co-generation" sub-programme are impacts in terms of air and climatic factors.

In assessing the environmental impact of the "co-generation" sub-programme no significant cumulative impacts on the environment have been detected.

8.4.1 Description of the impacts of the "co-generation" sub-programme on air

The environmental impacts of the "co-generation" sub-programme in terms of impacts on air, generally due to lower specific emissions of pollutants converted to beneficial heat usage and electricity, are smaller in comparison to the total environmental impacts from pollutant emissions from facilities in which the same amount of heat and electricity are produced separately.

The measures of the "co-generation" sub-programme are based on the energy use of natural gas, which in terms of impacts on air is an additional advantage over other methods of generation of heat and electricity using fossil fuels. A significant impact on ambient air pollution within the measures of this sub-programme arises only due to emissions of nitrogen oxides.

Air:

key strategic emphasis related to the sub-programme "co-generation"

Air pollution in CHPs using natural gas is smaller than air pollution caused entirely by the emission of pollutants from the combustion chambers for separate heat and electricity generation using natural gas. CHPs using natural gas pollute the ambient air significantly less than CHPs using other fossil fuels.

8.4.2 Description of the impacts of the "co-generation" sub-programme on climatic factors

The establishment of new facilities for CHP which will be implemented within the co-generation" sub-programme will partially contribute to mitigating climate changes, because this method of producing heat and electricity is more energy-efficient compared to separated heat and electricity generation.

Climatic factors:

key strategic emphasis related to the sub-programme "co-generation"

Co-generation using natural gas - due to increased energy efficiency in using energy-generating products in heat and electricity generation - is an important part of the measures to reduce greenhouse gas emissions.

8.5 Sub-programme "electricity generation from fossil fuels"

The sub-programme "electricity generation from fossil fuels" involves the following measures of electricity generation from fossil fuels:

- - construction and operation of TEŠ6, 549 MW, year 2014,
- TET: further exploitation of the site for energy purposes:
- (optional 290 MW, gas-steam power plant, year 2015,
- optional 130-190 MW of tertiary reserves, etc.),
- - construction and operation of TE-TOL, up to 134 MW, year 2015, and up to 134 MW by year 2018,

- - TEB, replacement of existing units (for example 153 MW, gas turbine, 2015),
- - construction and operation of gas-steam power plants, two gas-steam power plants, 2 x 396 MW, from 2020 to 2030 (the existing industrial and energy sites).

The measures of the sub-programme "electricity generation from fossil fuels" in terms of impact on nature, cultural heritage, health, landscape and material assets are considered to be irrelevant if they are implemented at existing industrial sites.

The assumption of the environmental impact assessment in the Environmental Report is that facilities for the implementation of measures of the sub-programme "electricity generation from fossil fuels" will be installed in areas intended for existing industrial purposes in such a way that the impacts on the environment in terms of natural resources, cultural heritage, health, landscape and material assets are irrelevant.

The significant environmental impacts of the sub-programme "electricity generation from fossil fuels" are impacts in terms of natural resources, air, water and climatic factors.

In assessing the environmental impacts of the sub-programme "electricity generation from fossil fuels" significant cumulative impacts on the environment have been detected, namely:

- - in the disposal of ash and flue gas cleaning residues at the local level regarding the impacts on natural resources,
- - in impacts of pollutants emitted into the air both at the local, regional and national levels of management of ambient air quality,
- - in impacts of pollutants with the discharge of waste-water into surface waters, and
- - in impacts of greenhouse gas emissions in relation to the achievement of national environmental objectives to reduce impacts on climatic factors.

The cumulative impacts on the environment of the sub-programme "electricity generation from fossil fuels" are important due to the dominant contribution of this sub-programme to the cumulative effects in all areas of pollution (natural resources - waste disposal, air, water and climatic factors).

8.5.1 Description of impacts of the sub-programme "electricity generation from fossil fuels" on natural resources

National management programme for mineral resources

In the sub-programme "electricity generation from fossil fuels" a continued use of brown coal in the coal-bearing area of Velenjska kadunja is foreseen. Use of this coal for energy purposes is specified by the National Programme of mineral resources management (NPMRM), which is the national plan for the management of mineral resources in Slovenia. This plan takes into account the specificities and prevalence of individual mineral raw materials in individual areas, and market demands for their economic exploitation. The NPMRM defines the strategic development policies that will be taken into account in (operational) management plans for individual mineral raw materials.

The primary objective of the NPMRM is the management of mineral raw materials, which leads to the provision of mineral raw materials and the conservation of natural resources availability for the next generation according to the principles of sustainable development. The NPMRM derives from the fundamental principles of sustainable development in the management of mineral raw materials, which combines a balance between economic, environmental and social aspects. The NPMRM also identifies the environmental aspects of mineral extraction in such a way that mineral extraction does not cause unacceptable damage to the environment in any aspects of environmental impact.

The NPMRM defines the starting points, objectives, means and conditions of implementation, and also provides for emergency measures to meet these programme objectives. The use of fossil fuels, as defined in the sub-programme "electricity generation from fossil fuels", must take into account the starting points, objectives, methods and conditions that are defined in the NPMRM for the exploitation of coal in the coal-bearing area of Velenjska kadunja.

Mining waste management

Special attention in the exploitation of coal from the coal-bearing area of Velenjska kadunja should be given to the management of mining waste generated in this exploitation. This area is covered by Directive 2006/21/EC of the European Parliament and Council on the management of waste from extractive industries.

In accordance with Directive 2006/21/EC, managers of mining activities must control the monitoring and management of facilities for the management of mining waste, to prevent water and soil pollution, and to identify any adverse effects that their facilities for such waste may have on the environment or human health. To minimise water pollution, the discharge of waste into a receiving body of water shall be done in accordance with Directive 2000/60/EC.

Operators of facilities for the management of mining waste must also lodge a financial guarantee or equivalent, to ensure that they comply with all obligations under the permit, including those relating to the closure and management of the facility for managing waste after its closure. The financial guarantee should be sufficient to cover the cost of rehabilitating land affected by the facility for waste management, which includes the facility for mining waste management itself.

Management of waste from burning fossil fuels

The management of ash, including flue gas cleaning residues generated in the energy use of fossil solid fuels, requires measures to prevent further soil degradation and to enable the rehabilitation of already degraded soil in the area of disposal of solid residues from the energy use of fossil fuels. The disposal of ash from the perspective of impacts on natural resources is acceptable if there are considered starting points, objectives, conditions and methods of disposal of OP for waste disposal with the aim of reducing quantities of biodegradable waste.

Natural resources:
key strategic emphasis of the sub-programme "electricity generation from fossil fuels"

The use of fossil fuels, as defined in the sub-programme "electricity generation from fossil fuels" must take into account the starting points, objectives, methods and conditions defined in the NPMRM for the exploitation of coal in the coal-bearing area of Velenjska kadunja.

In accordance with Directive 2006/21/EC, managers of mining activities must control the monitoring and management of facilities for the management of mining waste, to prevent water and soil pollution, and to identify any adverse effects that the mining waste may have on the environment, human health and material assets.

In the disposal of ash, the starting points, objectives, conditions and methods of disposal from OP waste disposal with the aim of reducing quantities of biodegradable waste shall be considered.

8.5.2 Description of impacts of the sub-programme "electricity generation from fossil fuels" on air

Air pollution caused by emissions of pollutants from thermal power plants and co-generation plants using fossil fuels can have many impacts: damage to human health, acidification, eutrophication, damage to other ecosystems such as forests, and damage to materials, buildings and cultural heritage.

Air pollution is a particularly important public health problem. Air pollution from these sources of pollution is co-responsible for a significant reduction in average life expectancy, for a high level of premature deaths and additional hospital admissions, for an increased use of drugs, and millions of days per year there is a restriction on activities when in areas of increased pollution.

The greatest concern to human health is caused by ozone and airborne particles.

In fact, there are many sources of air pollution, but the largest contributions are from traffic, electricity generation, industry, agriculture and space heating. All these sectors emit different pollutants; however, for emissions in the energy sector, the most important are releases of sulphur dioxide, nitrogen oxides and particulates.

Airborne particles in the size range of PM10-PM2.5 consist of primary particles emitted directly into the atmosphere from combustion process in the combustion chambers of energy generating facilities, and of secondary particles generated by chemical reactions in the atmosphere from gaseous pollutants such as sulphur dioxide (SO2), nitrogen oxides (NOx) and ammonia (NH3). Total pollution by atmospheric aerosol particles in the air depends on the total emissions of primary particles and the contribution of secondary particles.

Ozone occurs in the stratosphere and troposphere, but for ecosystems and human health, concentrations of ground-level ozone (troposphere) are harmful. Ground level ozone is formed from complex chemical reactions between volatile organic compounds (VOC) and NOx in the presence of sunlight. For VOC emissions, electricity generation from fossil fuels is not relevant, because they arise from different sources, such as petrol filling stations and emissions from motor vehicle, and from the use of solvents in paints and varnishes.

Although the effects of pollutants in ambient air are assessed on the basis of five important aspects, namely two of them affect health (due to particulate matter and ozone), and three impacts affect ecosystems (due to ozone, eutrophication and acidification)[21], in view of the importance of these impacts, the assessment of the sub-programme "electricity generation from fossil fuels" for the three pollutants is carried out for three pollutants with regard to five aspects of influence, as shown in the table below (yellow background).

Table 11: Assessment of pollutant emissions from electricity generation from fossil fuels in terms of impacts on air

[21] Evaluation of impacts of the thematic strategy for the pollution of air (*Tematska strategija o onesnaževanju zraka*) and the Directive on ambient air quality and cleaner air for Europe; SEC (2005) 1133.

Emissions/impacts	**primarny PM**	**SO_2**	**NO_x**	**VOC**	**NH_3**
Impacts on health					
Particles	✓ (22%)	✓ (19%)	✓ (13%)		✓ (46%)
Ground-level ozone			✓	✓	
Impacts on ecosystems					
Ground-level ozone			✓	✓	
Eutrophication		✓ (27%)	✓ (24%)		✓ (49%)
Acidification			✓ (37%)		✓ (63%)

Average rates of contribution of a pollutant to the individual impact in the EU are shown in percentages.

Despite economic growth, a reduction in emissions of most air pollutants is projected. Forecasts for emissions in the EU-25, according to the baseline scenario in the Thematic Strategy on Air Pollution (2005) are as follows:

- - reduction of sulphur dioxide (SO2) emissions (68% by year 2020 compared to 2000) as a result of reductions in coal use and consistent implementation of the Directive on large combustion facilities,
- - reduction of nitrogen oxides (NOx) emissions, expected by 49% during the period 2000-2020 due to a decline in traditional emissions (for example, from road traffic), so that in the future, contributions from other sectors such as space heating, combustion in chambers and industrial furnaces, maritime and non-road transport will be more important,
- - reduction in emissions of NMVOC by 45% during the period 2000-2020, with a maximum reduction from mobile sources and the use of solvents and paints,
- - emissions of ammonia (NH3) are not expected to change,
- - primary particles PM10 emissions in the EU are projected to decrease by 39% during the period 2000-2020. The reductions are envisaged in particular in the electricity and transport sectors. Emissions of fine particulate fractions (PM2.5) are expected to decrease by approximately 45%, which will largely be the result of the implementation of stricter emission standards for road vehicles.

The projected reductions in emissions from electricity generation from fossil fuels in the EU25 according to individual pollutant, is shown in the table below.

Table 12: Emissions from the energy sector in the EU25

	SO_2		NO_x		NMVOC		NH_3		$PM_{2,5}$	
	2000	2020	2000	2020	2000	2020	2000	2020	2000	2020
Electricity generation	57.4	21.6	17.8	13.6	0.9	1.3	0.4	0.6	8.5	5.7

The measures of the sub-programme "electricity generation from fossil fuels" in relation to the environmental impacts are acceptable if emissions of SO2, NOx and PM2,5 in the period 2000-2020 show approximately the same downward trend as envisaged for the electricity generation sector in the EU25, in accordance with the Thematic Strategy of air pollution in the EU. Subject to compliance with this condition, the measures of the sub-programme "electricity generation from fossil fuels" in relation to the impacts on air are assessed as acceptable for the environment, because they constitute an improvement in the environmental status of ambient air pollution.

Air:
key strategic emphasis of the sub-programme "electricity generation from fossil fuels"
Air pollution by emissions of SO2, NOx and PM2.5 in the implementation of the measures of the sub-programme "electricity generation from fossil fuels" for the period 2000-2020 must show the same downward trend as planned for this period for the electricity sector in the EU25.

8.5.3 Description of impacts of the sub-programme "electricity generation from fossil fuels" on air

Electricity generation from fossil fuels is an important pollutant of waters due to the discharge of cooling water from thermal power plants. Techniques of the surface water usage for cooling purposes which are acceptable in terms of impacts on waters are shown in the table below, marked with a yellow background. The characteristic of acceptable techniques of surface water usage for cooling purposes of energy-generating facilities for electricity generation from fossil fuels consists in the fact that water is a secondary cooling medium, which in a cooling system is mostly recirculated.

Table 13: Acceptable techniques for surface water usage for the cooling purposes of energy-generating facilities for electricity generation from fossil fuels

Cooling system type	Cooling medium	Primary cooling technique
Once-through system of direct cooling	water	Water heat conduction / convection
Once-through system of indirect cooling	water	Water heat conduction / convection
Once-through cooling system with water recycling - direct cooling water*	water* air **	evaporation***
Once-through cooling system with water recycling - direct cooling water*	water* air **	evaporation***

* water is the secondary cooling medium and is mostly recirculated, vaporised water dissipates heat into the air;
** air is the cooling medium by which heat is dissipated into the environment;
*** evaporation of water is the primary means of cooling. The heat is partly dissipated also by heat conduction or convection, but this is not the primary means of cooling.

The measures of the sub-programme "electricity generation from fossil fuels" in relation to the impacts on waters are assessed to be environmentally acceptable, provided that the cooling of energy-generating facilities for electricity generation is guaranteed by cooling systems where water is the secondary cooling medium, and mainly recirculated.

The cooling of energy-generating facilities for the electricity generation with a cooling system where water is the main cooling medium (once-through system of a direct or indirect cooling) is admissible in thermal power plants using fossil fuel in a thermal power plant operating for less than 800 hours per year.

Waters:
key strategic emphasis of the sub-programme "electricity generation from fossil fuels"
Water use in the cooling systems of energy-generating facilities for electricity generation with cooling systems can only be a secondary cooling medium, which mostly recirculates, while water evaporation is the main means of cooling.

8.5.4 Description of impacts of the sub-programme "electricity generation from fossil fuels" on climatic factors

The measures of the sub-programme "electricity generation" must contribute to mitigating climate change, at least at a level projected, due to attaining the objectives of the climate-energy package of European legislation for greenhouse gases emissions from industrial and energy-generating facilities included in the European trading scheme of greenhouse gas emission allowances (by 2020, a reduction of at least 21% in greenhouse gas emissions).

The measures of the sub-programme "electricity generation", in terms of the impact on climatic factors, are considered acceptable for the environment if by 2020 emissions of greenhouse gases from electricity generation from fossil fuels are reduced by at least 21% over the baseline period 2005-2006, and the average specific emissions of greenhouse gasses in that year is less than 0.8 kg CO2eq/kWh.

In assessing the impacts in terms of climatic factors, the environmental objectives of Directive 2009/31/EC on the geological storage of carbon dioxide are not included. Carbon dioxide capture and geological storage (CCS) is considered to be a bridging technology that will contribute to climate change mitigation, but this technology should not act as an incentive to increase the share of electricity generation within power plants using fossil fuel. The possible development and deployment of CCS in Slovenia should not diminish efforts to implement the NEP planned energy saving measures, renewable energy sources and other safe and sustainable technologies with low-carbon emissions, either in research or in financing incentives for the use of technology with low-carbon emissions.

Climatic factors:
key strategic emphasis of the sub-programme "electricity generation from fossil fuels"

The measures of the sub-programme "electricity generation" must contribute by 2020 to mitigating climate change in an amount at least equal to a 21% reduction in greenhouse gas emissions relative to emissions from this energy sector in the base period of 2005.

The possible development and deployment of CCS in Slovenia should not diminish efforts to implement the NEP planned energy saving measures, renewable energy sources and introduction of other safe and sustainable technologies with low-carbon emissions.

8.6 Sub-programmes "electricity transmission" and "electricity distribution network"

Electricity transmission

The "electricity transmission" sub-programme includes the following facilities for electricity transmission:
- - long-distance power line 2x400 kV Beričevo - Krško, until 2012,
- - long-distance power line 2x400 kV Podlog - Šoštanj (transition from 220 kV to 400 kV, inclusion of TEŠ6), by 2014,
- - long-distance power line 2x400 kV Cirkovce - Pince (connection to Hungary), by 2016,
- - long-distance power line 2x400 kV Okroglo - Udine (connection to Italy), by 2018,
- - inclusion of PSP on the Drava River and a power-line connection to the TS in Maribor,
- - long-distance power line 2x400 kV Divača - Beričevo - Podlog - Cirkovce (transition from 220 kV to 400 kV and TS Kleče), year 2020,
- - DS and junctions,
- - lines: long-distance power line 110 kV, long-distance power line 2x110 kV, CC 110 kV, CC 2x110 kV [looping] - new construction and reconstruction, in accordance with business development plans, and
- - DS 110/20 kV, TS 110 kV - the type of location, in line with business development plans.

Most long-distance power lines are already in the construction stage, or their CEIA is on-going; for DS and junctions, it is considered that the environmental impact is assessed under the CAEI of those PLs, or lines to which the latter are technologically connected.

For long-distance power line 2x400 kV Okroglo - Udine (connection to Italy) and related DS and junctions, CEIA has not yet been implemented and is subject to the assessment under the NEP. The route is defined in two corridors:
- - the route G runs from Okroglo near Kranj, passes Dolenja vas in the valley of the Selška Sora River, runs north of Blegoš, south of Cerkno, along the valley of the Idrijca River, south of Most na Soči, across the slopes of Mt Kolovrat to the connection to the Italian network south of Livek;
- - the route H runs from Okroglo near Kranj, passes Bukovnica in the valley of the Selška Sora River, runs south of Blegoš, south of Cerkno, along the valley of the Bača River, south of Tolmin, across the slopes of Mt Kolovrat to the connection to the Italian network south of Livek.

Also subject to assessment under the NEP is the PL 220 kV in the Cirkovce – Podlog section. The route runs through the corridor of the existing power line, which runs from Cirkovci through the valley of Ložnica, north of Poljčane, south of Loče, north of Dramlje, and south of Vojnik up to TS Podlog.

The measures of the sub-programme "electricity transmission" in terms of impacts on natural resources, air, water and climatic factors are considered to be irrelevant.
The significant effects on the environment of the sub-programme "electricity transmission" are impacts on nature, cultural heritage, health, landscape and material assets.

Electricity distribution network

The sub-programme "electricity distribution network" includes the following distribution facilities:

- - high voltage network of 110 kV: long-distance power line 110 kV, long-distance power line 2x110 kV, KBV 110 kV, KBV 2x110 kV (new construction and reconstruction, in accordance with business development plans),
- - transformer stations 110 kV/medium-voltage power line,
- - other investments in the reconstruction of the 110 kV network, and capacity increments and reconstruction of TS 110 kV/medium-voltage power line by the year 2020:
- 7,000 km of new medium-voltage power lines,
- 5,600 km reconstruction of medium-voltage power lines,
- 40 new medium-voltage distribution stations,
- 35 reconstructions of medium-voltage distribution stations,
- 5,300 new medium-voltage transformer stations of 0.4 kV,
- 2,200 reconstructions of medium-voltage transformer stations of 0.4 kV,
- 3,700 km of new low- voltage lines,
- 8,300 km reconstruction of low- voltage lines.

The measures of the sub-programme "electricity distribution network" in terms of impacts on natural resources, air, waters, climatic factors and material assets are considered to be irrelevant.

The significant effects on the environment of the sub-programme "electricity distribution network" are impacts on nature, cultural heritage, health and landscape.

In assessing the environmental impact of the sub-programmes "electricity distribution" and "electricity distribution network", significant cumulative and synergistic impacts on the landscape have been detected. These impacts may arise because these measures appear over the entire territory of the state, and in the case of a great extent of new facilities, a large number of existing facilities for electricity transmission, and in the case of spatial overlapping with other measures from the NEP, especially measures relating to renewable energy sources, can significantly degrade the general image of Slovenian landscapes.

8.6.1 Description of impacts of the sub-programmes "electricity transmission" and "electricity distribution network" on nature

The establishment of a DS, power line or cable conduit in a nature protection area constitutes a degradation of the area and has a potential negative impact on birds. In the case of laying electricity cables, there are no impacts on birds, but negative impacts on habitat types may remain, especially if the route passes through a compact forest stand, wetland or an important habitat of plant species.
In cases of locating a power line on a Natura 2000 area, the impact on the qualification species and HT may be negative due to habitat fragmentation and, consequently, impacts on the coherence and integrity of populations, permanent loss of habitat areas, and specifically with regard to an individual group of the qualification species.

In the area of the construction site during construction, plant species and parts of their habitats are destroyed. At the point where pylons are located, the impacts are permanent. The impact on wildlife is mainly expressed as a disturbance in the daily rhythms and rituals of animals, such as mating, breeding, parturition, feeding etc. Construction disturbs wildlife, especially mammals and birds. In the case of interventions in a forest area, the impact during the construction period is greater, and due to changes in local climate and habitat, the entire animal organization in the impact area can be disturbed. Pylons and power line buffer corridors have permanent effects during operation. The impact is more extensive if corridors run through forest. During maintenance work, mowing, felling of wood vegetation and similar is carried out in this area.

A power line is a permanent lethal obstacle to birds, and fragments their habitat. In particular, it is necessary to highlight flight corridors along streams, wintering areas near water, flight areas of large birds, and power lines located in forest areas and similar. In terms of power line operation, SPA and IBA areas are especially critical, with the focus on areas where large groups of birds concentrate to winter.

According to data from the Winter Ornithological Atlas and the Winter Waterfowl Census in the period from 1997 to 1999, areas of higher concentrations of birds are as follows (the maximum number of birds of each species sighted in one day is given in brackets for all locations); data summarised according to Štumberger (1997, 1998, 1999):
- near the Drava River: - near the Mura River: the surroundings of Veržej (112), the surroundings of Lake Ledavsko (1402), between the areas of Srednja Bistrica and Orlovšček (2247), the gravel areas of Bakovci (550) and Dokležovje (254). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos) and cormorants (Phalacrocorax carbo), and in individual years, bean geese (Anser fabalis).
- near the Drava River: Ptuj Lake (13224) Ormož Lake (5634), Melje accumulation (1568), along the old riverbed between Markovci and Ormož (1654). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos), common teals (Anas crecca), common pochards (Aythya Ferina) and cormorants (Phalacrocorax carbo), a small number of mute swans (Cygnus olor), tufted ducks (Aythya fuligula), common goldeneyes (Bucephala Clangula), black-headed gulls (Larus ridibundus), smews and goosanders (Mergus albellus, M. merganser), and others.
- near the Drava River: - near the Savinja River: surroundings of Celje (1227), lakes in Velenje and Šoštanj (in total over 1000 specimens), Lake Slivnica (333). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos), cormorants (Phalacrocorax carbo) and coots (Fulica atra).

- near the lower section of the Sava River: hydroelectric power plant Vrhovo (1295), near the Krka River between Soteska and Čatež (1900). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos) and cormorants (Phalacrocorax carbo).
- near the lower section of the Sava River: - near the upper section of the Sava River: Lake Zbilje (1451), Lake Trbovlje (534), on the Ljubljanica River up to the estuary of the Sava River (1114). Large numbers of the following wintering birds arrive here: little grebes (Tachybaptus ruficollis), mallards (Anas platyrhynchos), coots (Fulica atra), cormorants (Phalacrocorax carbo) and wigeons (Anas penelope).
- in the regions of Primorje and Notranjska: Lake Cerknica (1273), accumulation of Most na Soči (248), accumulation Vogeršček (252). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos) and coots (Fulica atra).
- on the coast: Sečovlje salt pans (5336), the inlet Škocjanski zatok (1967). Large numbers of the following wintering birds arrive here: mallards (Anas platyrhynchos), teals (Anas crecca), coots (Fulica atra), wigeons (Anas penelope), little egrets (Egretta garzetta), black-headed gulls (Larus ridibundus), yellow-legged gulls (Larus michahellis).

So far, three basic impacts of power lines on birds have been detected:

1. electrocutions
Birds that sit on pylons or electrical wires die if during a place change they create a short circuit between conductors or between a conductor and the ground. Larger species which often choose to gather around exposed areas are particularly at risk. Electrocution is a common phenomenon in birds, but very poorly documented. Virtually every accident is fatal.

2. collisions
Birds can collide with electric conduits, whose visibility in air is often poor. In most cases, accidents are fatal or cause injuries that lead to rapid death, because the area with which a bird collides is relatively small (the impact is on a small part of the body), while the speeds of birds in flight are relatively high.

3. predation
The number of bird collisions with electric conduits and numerous examples of mortality due to electrocution increase the number of predators in the vicinity of power lines, which exploit carcasses for food. More predators in the area means a greater probability that a bird will find itself in a predation area, especially when resting or wintering, when it can spend time on the ground.

Nature:

key strategic emphasis of the sub-programmes "electricity transmission" and "electricity distribution network"

The placing of power lines above ground results in a degradation of the space and a permanent lethal obstacle to birds. When locating power lines, the following guidelines should be taken into account:

• • Power lines should avoid SPA and IBA areas, especially if in such areas major groups of wintering birds concentrate, or if the areas they are in migratory corridors or flight corridors of large birds. If the area can not be avoided, cabling should be undertaken.

- • It is recommended that the planned corridor of power lines is placed outside protected areas, Natura sites and sites with natural values, as well as outside dense forest.
- • Power lines should be cocncentrated along the same corridor, or at least along existing infrastructure corridors.
- • The use of 'bird-friendly' pylons should be planned.
- • In the case of interventions in protected areas, a comprehensive assessment of the impacts on nature should be carried out.

8.6.2 Description of impacts of the sub-programmes "electricity transmission" and "electricity distribution network" on cultural heritage

The impact of the construction of power lines on the cultural heritage is reflected in the destruction of, or damage to buildings of cultural heritage or individual elements that require protection. Along the cable conduits and at the pylon sites of long-distance cables, archaeological remains could be destroyed or damaged.

A significant permanent impact is the impact on the integrity of buildings and sites of cultural heritage caused by the location of a power line, but generally it increases with the increase in nominal voltage of the power line with a more prominent intrusion into in the space.

In planning sites in more detail, objects and cultural heritage areas should be taken into account, usually in such a way that interventions in buildings and areas do not occur. In areas of pylon sites or along cable conduit routes, ex ante archaeological research should usually be carried out, and, if necessary, an optimisation of the intervention, so as to avoid unnecessary interventions in archaeological remains.

Cultural Heritage:
key strategic emphasis of the sub-programmes "electricity transmission" and "electricity distribution network"
The impact of the construction of power lines on cultural heritage is reflected in the destruction degradation of, or damage to the integrity of buildings and areas of cultural heritage or individual elements that require protection.

In planning sites in more detail, objects and cultural heritage areas should be taken into account, usually in such a way that interventions in buildings and areas do not occur.

It is estimated that it will be possible to optimise the planned power lines in such a way that the impacts on cultural heritage are acceptable.

8.6.3 Description of impacts of the sub-programmes "electricity transmission" and "electricity distribution network" on nature

In accordance with Recommendation 1999/519/EC on the limitation of public exposure to electromagnetic radiation (EMR), activities concerning the protection of population from the consequences of electromagnetic field impacts shall be balanced against other benefits that EMR resources have on people's health, safety and security, especially when areas such as telecommunications, the energy industry and public safety are concerned. Within Recommendation 1999/519/EC, the recommended values of population exposure to EMR in the frequency range from 0 to 300 GHz were defined, which, based on new findings concerning EMR impacts on health (report ICNIRP - International Commission of protection of people against EMR) were subject to minor changes, and also defined by Directive 2004/40/EC on the minimum health and safety requirements for workers exposed to EMR.

In accordance with the Agreement, EU Member States may define more stringent limit values for the protection of the population from exposure to EMR, but they must be reasonable and proportionate to the current level of knowledge regarding EMR impacts on health, and in doing this, possible or alleged long-term impacts of EMR shall not be included because there is no verifiable data on these impacts on health.

Health:
key strategic emphasis of the sub-programmes "electricity transmission" and "electricity distribution network"
The location of power lines or conduits underground is a measure to protect the population from exposure to EMR, which in populated areas should be taken into account in new constructions or the reconstruction of existing power lines and conduits.

8.6.4 Description of impacts of the sub-programmes "electricity transmission" and "electricity distribution network" on nature

During construction, the removal of, or damage to individual landscape elements can occur. The special feature of this consists in the fact that works in the case of air conduits are limited to relatively small surfaces of pylons areas that are locally distributed in space. In the case of cable conduit, impacts occur along the entire route during construction.

One of the most important permanent impacts of power lines in general is the incidence of pylons and conduits in the landscape image. The degree of impact depends on the presence of power lines in landscape image and visual landscape quality in which the power line is placed.

The impact of a power line corridor on landscape quality is noted where the corridor in the space becomes more noticeable. This is especially characteristic of power lines traversing exposed ridges and landforms, particularly in cases where these areas are covered with a continuous cover of higher vegetation. The construction of power lines requires the removal of higher vegetation on the route, so as the power line traverses the forest, some felled areas occur that are visually more exposed. A condition of low growth on the route is required even during the period of power line operation. Strong impacts also occur in broader flat areas without higher vegetation and in watercourse areas. The degree of impact largely depends on the overlapping of power line routes with important views, significant landscape elements, interesting designs and landscapes of expressed recognised or symbolic value (adapted from: Marušič I., Jaki F., Planning and Landscape Architecture of Power Line and Pipeline Conduit Corridors: Handbook, MESP, 1998).

The permanent impact of power line corridors on the quality of landscape is significantly reduced in the case of cable installation.

Landscape:

key strategic emphasis of the sub-programmes "electricity transmission" and "electricity distribution network"

The incidence of pylons and conduits in the landscape image is one of the most significant permanent impacts of power lines in general. The degree of impact depends on the presence of power lines in the landscape image and the quality of the visual landscape in which the power line is located.

The location of power lines shall be given special attention in the next stages of planning. Mitigation measures include optimisation the levels of lines, and the level of measures used to correct the consequences of interventions affecting the environment, including landscape regulatory measures, which mitigate the negative effects of the incidence of power lines in space.

It is estimated that it will be possible to optimise the planned power lines in such a way that the impacts on landscape are acceptable.

8.7 Sub-programme "natural gas supply"

The"natural gas supply" sub-programme includes the following measures for the supply of natural gas:

- - construction of compressor stations,
- - construction of transmission lines by 2020:

- M1/1 Kidričevo – Rogatec, 2010
- M1/1 Ceršak - Kidričevo, 2011
- M2/1 Rogaška Slatina – Trojane, 2013
- M2/1 Trojane – Vodice, 2013
- M5 in R51 Vodice – Jarše – TE-TOL, 2014
- M3/1 Kalce – Ajdovščina, until 2020*
- M3/1 Ajdovščina – Miren, until 2020*
- M3/1 Kalce – Vodice, until 2020*
- M6 Ajdovščina – Lucija, until 2020*
- M8 Kalce – Jelšane, until 2020*
- M9a Kidričevo – Lendava, until 2020*
- M9b Kidirčevo – Vodice, until 2020
- M10 Vodice – Žirovnica – Rateče, until 2020*
- Interconnector SLO - Hungary: Pince - Kidričevo, until 2020,

- new distribution networks and expansion of existing distribution networks.

Most transmission lines are already in the construction phase, or the CEIA has already begun.

For the transmission line M9b Kidirčevo - Vodice, the CEIA has not yet been implemented.

The measures of the "natural gas supply" sub-programme in terms of impacts on natural resources, air, waters, climatic factors, health and material assets are considered to be irrelevant.

The significant effects on the environment of the "natural gas supply" sub-programme are impacts in terms of nature, cultural heritage and landscape.

In assessing the environmental impact of the "natural gas supply" sub-programme, no significant cumulative impacts on the environment have been detected.

8.7.1 Description of impacts of the "natural gas supply" sub-programme "natural gas supply" on nature

During pipeline construction, land and water habitat types and species habitats are affected by destruction, fragmentation and reduction of areas (the working corridor during construction is approx. 20 m). During construction, the loss of breeding and feeding habitats in the wider area is short-term, while in the pipeline corridor this loss may also be permanent. Above the pipeline, there is a buffer corridor 10 m wide, which represents a limitation of wood vegetation, and regular maintenance work (mowing, cleaning). During period when vegetation is degraded at construction sites, there is a danger that invasive species that threaten the native flora may become established. Areas along watercourses and wetland habitat types are especially vulnerable.

The most extensive permanent impact on nature may be caused by the construction of pipelines along watercourses and in wetland areas. In the course of construction, species living in aquatic and riparian environments (amphibians, birds, bugs, humidity seeking flora, etc.) are especially vulnerable. Impacts on aquatic habitats may also be remote; the laying of pipes across the watercourse affects the quality of the watercourse downstream. By under-drilling, this impact can be avoided. The execution of the route across a wetland has an indirect impact on the habitat in the vicinity (drainage of wetlands); the restoration of the original habitat in the maintenance corridor area is not possible. The impact is reflected in the loss of wetland habitat for humidity seeking species, and in the reduction of the HT volume related to the higher moisture in the soil. Given the extent of interventions, it is necessary to examine the percentage of reduction in habitat of species and to adopt the appropriate measures.

Nature:
key strategic emphasis related to the sub-programme "natural gas supply"
The siting of a pipeline constitutes a direct fragmentation and reduction of a habitat; particularly in the case of route across wetland, the impact may also be remote. Therefore, in the siting of pipelines, important nature conservation areas, especially wetlands should be avoided.

8.7.2 Description of impacts of the "natural gas supply" sub-programme on cultural heritage

The pipeline impacts are concentrated on archaeological heritage. Destruction of, or damage to archaeological remains can occur along a pipeline. The basic rule in planning is that pipeline routes should be located outside known archaeological sites. As a rule, ex ante archaeological research should be carried out along the route and, if necessary, optimisation of the route or rescue excavations should also be carried.

Other impacts on cultural heritage can usually be avoided (for example, interventions in heritage buildings), or due to the characteristics of the intervention (carried out under the surface) are irrelevant, as they do not change the image of the heritage area or the impact area of the building. The effects may be more pronounced in areas of heritage landscapes, where damage to, or the destruction of protected landscape elements can occur, and this is why routes should avoid such areas.

Cultural Heritage:
key strategic emphasis related to the sub-programme "natural gas supply"

Along pipelines, destruction to, or damage of archaeological remains can occur. Routes should avoid known archaeological sites; in the detailed planning and during the construction stages, the findings of ex ante archaeological research should be taken into account.

It is estimated that it will be possible to optimise the planned power lines in such a way that the impacts on cultural heritage are acceptable.

8.7.1 Description of impacts of the "natural gas supply" sub-programme on nature

Compared with other line infrastructure facilities, the impacts of pipelines on the landscape quality are relatively small.

The impact of the power line corridor on landscape quality is ssen where the corridor becomes more noticeable. This is typical of pipelines traversing areas that are covered with continuous higher vegetation, primarily visibly exposed slopes. The construction and operation of the pipeline requires the removal of higher vegetation in the operational band, so it becomes visible when passing through woods, thickets, riparian vegetation, crowns and hedges, parks and gardens. During the operation period, forest felling and complementary fellings of forest crowns are required. In areas where high vegetation is removed due to construction requirements, the area is generally restored to its original state (adapted from: Marušič I., Jaki F., Planning and Landscape Architecture of Power Line and Pipeline Conduit Corridors: Handbook, MESP, 1998).

Landscape:
key strategic emphasis related to the sub-programme "natural gas supply"
Compared with other line infrastructure facilities, pipeline impacts on the landscape quality are relatively small. Permanent impacts are generally limited to the visibility of fellings in areas with dense vegetation.
It is estimated that it will be possible to optimise the planned pipelines in such a way that the impacts on landscape are acceptable.

8.8 Sub-programme "liquid fuels"

The sub-programme "liquid fuels" includes the construction of new storage capacities at existing industrial sites to ensure the minimum stock in the RS and the development of biofuel production in Slovenia. Within these sites, interventions in possible building or technical heritage may occur. Particular attention should be paid to evaluating the potential heritage on industrial sites where new storage facilities will be created, and to the appropriate management of heritage (documentation, restoration, depositing). Because this is a potential impact manageable within the detailed planning phase is it not addressed further in the NEP.
The development of first generation biofuel production (the production of biofuels from vegetable oils) in Slovenia is limited due to the relatively small areas used for the production of industrial crops (from 7,000 to 10,000 ha, mainly oilseed rape), so that the potential production of biofuels from vegetable oils in Slovenia is mainly linked to the importation of raw materials.

Due to the limited natural resources (availability of agricultural land) and relatively poor impact of this renewable source production (the carbon footprint of first generation biofuels production is equal to at least 60% of GHG emissions from fossil fuels of the same energy value), the displacement of food production, which is reflected as a global problem, as well as due to the harmful impacts of monoculture production of industrial crops on soil and water, and impacts on landscape values (due to large areas of industrial crop production, the landscape pattern is subject to modifications), the production of biofuels from vegetable oils is not considered a contribution to the sustainable development of Slovenia.

The production of so-called green diesel with the Fischer-Tropsch process seems more acceptable; various types of biomass may be used as raw material input, including wood, grassland and residues from agriculture and forestry; and the carbon footprint of the process is less than 15% of the carbon footprint resulting from the produced fuel.

The measures for building new storage facilities at existing industrial sites, in terms of impacts on natural resources, air, waters, climatic factors, cultural heritage, health and landscape are considered irrelevant.

The significant environmental impacts of new storage facility construction at existing industrial sites are on material assets.

Measures for the biofuel production in terms of impacts on natural resources, air, waters, nature, health, cultural heritage and material assets are considered irrelevant.

The significant environmental impacts of biofuel production are on climatic factors and landscape.

In assessing the environmental impact of new storage facility construction at existing industrial sites, no significant cumulative impacts on the environment have been detected.

8.8.1 Description of impacts of the "liquid fuels" sub-programme on climatic factors

The production of biofuels in terms of the impact on climatic factors is acceptable if the carbon footprint of biofuel production is less than 30% of carbon footprint of the fuel produced.

Climatic factors:

key strategic emphasis related to the sub-programme "liquid fuels"

The chosen method for the production of biofuels from biomass should cover the conversion of total organic carbon of lignite-cellulose fibres into biofuel, which is guaranteed by techniques for the production of biofuels of second and third generation.

8.8.2 Description of impacts of the "liquid fuels" sub-programme on nature

The over-exploitation of forest biomass has a negative impact on the diversity of forest structure in various stages of growth, and on the preservation of porous trees and defoliation waste, resulting in a decline in biodiversity.

The introduction or promotion of biofuel use may have an indirect impact on the increased production of crops for biofuel production. In the case of the establishment of monocultures, a negative impact on the biodiversity of the area is likely, which may be especially pronounced in important nature conservation areas.

One of the waste products of biogas facilities is digestate. The use of liquid digestate (liquid manure) in the karst area can have many negative impacts on biodiversity.

Nature:
key strategic emphasis related to the sub-programme "liquid fuels"
It is possible to use exclusively biomass obtained by preventing overgrowth; mono-cultures should not be introduced in important conservation areas.

8.8.3 Description of impacts of the "liquid fuels" sub-programme on landscape

The possibility of using differentiated biomass for the production of so-called green diesel with the Fischer-Tropsch process could be one of the maintenance measures in cultural landscapes subject to overgrowth, as it offers a solution to the disposal of the removed residual plant material, and covers at least partially the costs of such maintenance.

Landscape:
key strategic emphasis related to the sub-programme "liquid fuels"
The possibility of using biomass derived from the maintenance of cultural landscapes subject to overgrowth may be considered as one of the comprehensive measures for the protection and development of landscape.

8.8.4 Description of impacts of the "liquid fuels" sub-programme on material assets

In assessing the impacts of the "liquid fuels" sub-programme on material assets, the following should be checked:
- - the possible negative effects of the siting of storage facilities for liquid fuels at existing industrial and energy-generating sites on the operation and efficiency of the transport infrastructure,
- - possible disturbances in the provision of services related to the use of other facilities situated in the vicinity of storage facilities for liquid fuels (such as communal infrastructure),
- - negative impacts on neighbouring property and land values, and
- - potential loss of recreational areas or other qualities of the area where the planned storage of liquid fuels has an impact.

The measures of the "liquid fuels" sub-programme in terms of impacts on material assets are considered acceptable if their impact on material assets can be mitigated. It will be possible to mitigate the impacts on material assets if the storage of liquid fuels is located in an existing industrial or energy-generating location, preferably in the vicinity of existing storage facilities for liquid fuels. In such a case, the existing infrastructure in the energy-generating or industrial site can be used to the maximum extent, while the area of the new storage facility for liquid fuels must be sufficiently distant from settlements, so that no significant negative impact on nearby settlements occurs.

Material assets:
key strategic emphasis related to the sub-programme "liquid fuels"
It is estimated that the environmental impacts in terms of material assets can be mitigated if the storage facilities for liquid fuels are placed in an existing industrial or energy-generating location and are adjacent to the existing storage facilities for liquid fuels.

8.9 Sub-programme "nuclear energy"

With a view to contributing to a reliable, long-term stable and low-carbon electricity supply in Slovenia, the "nuclear energy" sub-programme includes the implementation of the following measures during the period 2010-2020 which have medium- and long-term impacts on the environment:

- - ensuring a sustainable and safe disposal of low and intermediate level radioactive waste (LILW),
- - drafting a proposal for a decision on dismantling the existing NPP and on the management of highly radioactive waste (HLW),
- - extension of the designated lifetime of the existing NPP, and
- - further long-term exploitation of nuclear energy in Slovenia, with the construction of a new NPP at the existing location of nuclear energy exploitation.

The "nuclear energy" sub-programme in the framework of its targets lays down as a medium-term priority the construction of a permanent repository for LILW in Vrbina in the Municipality of Krško, and the provision of conditions for the long-term exploitation of nuclear energy in Slovenia at the existing location of nuclear energy exploitation by extending the lifetime of the existing NPP and by the construction of a new third-generation NPP which complies with internationally recognised state-of-the-art technology.

The measures of the "nuclear energy" sub-programme, irrespective of the significance of the impact, in this Environmental Report are dealt with in terms of all aspects of environmental impacts, although they are planned at the existing location for nuclear energy exploitation.

Information on the description of the impacts of the "nuclear energy" sub-programme in terms of natural resources, air and health are taken from the study "Environmental Report for the process of integrated environmental impact assessment for the new NPP2 on the planning level for the National Energy Program" (IOS Institute of Occupational Safety, 2010), which was provided by the initiator of the programme "nuclear energy" GEN energija d.o.o. for the purpose of creating this Environmental Report.

8.9.1 Description of the impacts of the "nuclear energy" sub-programme on natural resources

Impacts on soil

The planned location of the new nuclear power plant is east or west of the existing NPP. The areas measure approximately 57 and 51 ha, respectively. Both areas are larger than the area od the existing

NPP (25.3 ha). Regardless of the location, due to the construction of the new NPP, the surface of farmland areas will decrease by approximately 0.003% within a radius of 10 km.

The existing infrastructure necessary for the operation of the existing NPP will probably suffice for the new NPP, with the exception of the high-voltage network. Due to the increased traffic, the existing roads will need reconstruction or extension, but this should not have a major impact on the soil or land use. The high-voltage network will have to be extended to allow the transmission of newly generated electricity. It is likely that it will be possible to use the existing corridors, thus reducing the impacts on soil surfaces. It is expected that the infrastructure impacts will be small.

The construction of the new NPP will take several years (at least four). It will be necessary to provide housing for the workers, which means pressure on the settlements of this area. Overall, it is expected there will be an increased impact from work force immigration, compared with the option without construction, but the long-term impact on the area's settlements is small.

Radioactive waste management
Radioactive waste management in Slovenia is organised under the auspices of the state public utility services. Radioactive waste in Slovenia derives from the generation of electricity from the nuclear power plant, from medicine, industry, and research activities. Most radioactive waste is generated in the existing NPP, which produces annually around 100 m3 of radioactive waste annually. During the entire lifetime of the existing NPP (including waste, which will be incurred in decommissioning), around 18,000 m3 of radioactive waste will have been produced.

During the operation of the existing NPP, spent nuclear fuel and radioactive waste are produced. At the end of 2007, the pool for spent nuclear fuel contained 872 fuel elements. In the facilities for the storage of radioactive waste, 2,200 m3 of low and intermediate level waste were stored. The pool for spent nuclear fuel has enough storage space for fuel storage for the expected lifetime up to the year 2043. The Republic of Slovenia has no other facilities for the management of spent nuclear fuel. Radioactive waste and spent nuclear fuel will be stored at the location of the existing NPP until removal for final disposal

For the new NPP, the use of four types of light water reactors (LWR) is being considered; these use water-pressure technology (high-pressure reactors) and are also most commonly used to produce electricity.

During the operation of the new NPP, non-radioactive and radioactive waste will be produced. Low level and medium level radioactive waste (LILW) will be generated in the form of liquids, solids and gasses. Radioactive waste also includes spent nuclear fuel (SNF).
A typical power reactor with 1000 MW(e) during operations generates between 200 and 350 m3 of LILW and about 20 m3 of SNF annually. Thus a power reactor with 1700 MW(e) would generate between 240 and 595 m3 of LILW and about 34 m3 of SNF annually. During the decommissioning of NPP, non-radioactive and radioactive waste is generated. Without knowing the type of reactor, its design and construction plan, it is difficult to specify the amount of waste be generated during the decommissioning of the reactor. The estimated amount of waste from the decommissioning of a

WPR 1000 MW(e) is approximately 10,347 m3, and the volume of waste from the decommissioning of a WPR 1700 MW(e) is approximately 13,487 m3.

Natural resources

key strategic emphasis in relation to the sub-programme "nuclear energy"

In the medium term, the permanent and safe disposal of low and intermediate level radioactive waste (LILW) shall be guaranteed, and a proposal for the management of highly radioactive waste (HLW) shall also be prepared.

8.9.2 Description of the impacts of the "nuclear energy" sub-programme on air

Pollutants in waste gasses which are typical of emissions in other industries are also generated in NPPs. When using fuel oil, natural gas, propane or other flammable material, normal emissions of sulphur dioxide, nitrogen oxides, carbon dioxide, carbon monoxide and particulate matter occur. Emissions of these substances from NPPs are small compared with emissions from industry or transport, and have no measurable impacts on OPNEC objectives in relation to the national emission ceilings for ambient air pollutants, and they do not constitute a significant contribution to ambient air pollution at the local level.

In the exploitation of nuclear energy, radioactive releases from a WPR are generated in extremely small quantities - mainly noble gasses (helium, neon, argon, krypton, xenon and radon), gas activation products, halogens and aerosols. The mixture of noble gasses in the surrounding atmosphere quickly dilutes to levels that pose no risk. The half-lives of the majority of radionuclides in discharges are short, which reduces their impact on human health and the environment.

Discharges of radioactive substances into the air from the existing nuclear power plant in Krško are far the below legal limits, and much less than 1% of the allowable limits. For the new NPP at the current location of nuclear energy exploitation, it is expected that the requirements for protecting human health and the environment be met at least as well as at the existing nuclear power plant.

The measures of the "nuclear energy" sub-programme in terms of impacts on air are assessed with as grade A in terms of the significance of environmental impacts as the emissions of pollutants from NPPs do not have an impact on ambient air quality status.

8.9.3 Description of the impacts of the "nuclear energy" sub-programme on water

After more than 25 years of operation, the impacts of nuclear energy on surface water and ground water are well known. The thermal discharges from the existing NPP constitute one of the main impacts on the Sava River and other rivers. The thermal discharges from the existing NPP are within operational limits, which allow the warming of the Sava River by a maximum of 3°C. In addition, the maximum temperature of the Sava River is limited to 28°C.

Discharges from the existing NPP are controlled so that the impacts on the Sava River are kept to a minimum. Cooling waste water that is heated due to the cooling needs of the existing NPP is discharged into the Sava River on the left bank, because fish are expected to swim on the right bank.

In this way, the impact on fish species in rivers is minimised. Hot water does not travel far from the left bank, although it gradually mixes with the colder water in the river and extends across the whole river area. The result of such methods of discharging hot water into the Sava River is that on the right bank of the Sava River, no impacts of discharges are detected.

The existing nuclear power plant in Krško, in discharging cooling water waste, also disposes of small amounts of chemical wastes and biocides. This is a consequence of the normal operation of the power plant, when for the adjustment of water hardness, of dissolved oxygen and the pH of the supplied water, hydrazine and amines are used. Liquid waste containing measurable concentrations of chemical substances from the pre-preparation of cooling water, chemical and biological agents, water from laundry and sanitation, and waste water from chemical laboratories, prior to discharge into the Sava River, are treated and cleaned.

Also, all radioactive discharges from the existing NPP are within the required operating limits. It is expected that the new NPP at the Krško site will not cause any major impact due to radioactive discharges into water.

Within the plan of building a chain of hydroelectric power plants (HEP) on the Sava River, the construction of a hydroelectric power plant in Brežice is also planned. Because of this, in the section between the existing NPP and the HEP Brežice, changes in the hydrological status of the Sava River will occur - an accumulation reservoir or pool. Changes in the distribution of pollution in the Sava River are also expected - there will be more deposition of suspended particles and adsorbed substances over that; changes in infiltration underground; a rise in groundwater is likely; a rise in the temperature of the Sava River due to the slower water flow in the reservoir is possible; debris will accumulate in the reservoir.

These changes have been analysed in the study "Analysis of changes due to the radiological and thermal impacts of the existing NPP on the environment after the construction of the HEP Brežice[22] (hereinafter referred to as: the study). The purpose of the study was to estimate the impacts of thermal and other types of pollution on the Sava River resulting from the operation of the existing NPP, and propose measures to protect the Sava River and groundwater from pollution produced by the existing NPP; in particular, to answer questions related to providing the indispensable thirty-day cooling of the existing NPP.

[22] the study was ordered by the Ministry of the Economy (2006) and prepared by the "Jožef Stefan" Institute in cooperation with the ty of Civil and Geodetic Engineering (FGG) – Fluid Mechanics Chair, the Institute of Sanitary Engineering, and the Elektroprojekt engineering bureau (IBE).

Although the objectives of the study were to assess the impacts of a different water regime on the Sava River due to the construction of an HEP on the lower section of the Sava River on the operation of the existing NPP and its requirements for cooling, the results of modelling in the study show the need to take measures to prevent intense eutrophication (biomass discharge with cooling water from the cooling system of the existing NPP into the Sava River) and overheating of the Sava River. In the existing NPP, the operators should be prepared for occasional cleaning of the cooling system and more frequent operation with cooling cells in late summer, when the flow rate of the Sava River will be below 100 m3/s, and when the objective danger of overheating of the Sava River is greater than 3 K.

From the modelling carried out within the study of the transport and dispersion of heat and matter brought by the Sava River and emitted by the existing NPP during normal operations under the conditions of flow rates of 40 m3/s, 60 m3/s, 100 m3/s and 242 m3/s, in the pool of Brežice no specific changes in respect of the existing state are expected. The exception is heating of the Sava River, which in special hydrological and meteorological conditions - flow rates below 100 m3/s, temperature of the water upstream of the existing NPP above 22^0C - will exceed the limit on the maximum allowable temperature increase of 3 K. The calculated temperature rise amounts to 4.6 K, which, in accordance with Directive 2000/60/EC, is not permissible because of requirements to achieve the environmental objective related to a good ecological status of surface waters. It is estimated that due to overheating of the Sava River, during the low water levels of the Sava River and in summer time increased eutrophication can occur in the Brežice retention pool.

The measures of the "nuclear energy" sub-programme, in terms of the impacts on water, are assessed grade C in terms of the significance of the environmental impacts, provided that the measures of occasional cleaning of the cooling system and more frequent service to the cooling cells in late summer are guaranteed, so that when the flow rate of the Sava River is below 100 m3/s, there is no likelihood that the River will overheat by more than 3 K, or less if - due to the nutrient content of the Sava River - the water in the pool of the HEP Brežice will be more sensitive to the phenomenon of eutrophication.

The new NPP is not expected to use cooling water from the Sava River for the once-through system cooling. For the new NPP, a closed cooling system with wet cooling towers is planned.

Water:

key strategic emphasis in relation to the sub-programme "nuclear energy"

Due to the changed water regime in the area of the Brežice retention pool, the implementation of the measures for occasional cleaning of the cooling system of the existing NPP and more frequent operation of the existing NPP with cooling cells in late summer must be guaranteed, so that when the flow rate of the Sava River is below 100 m3/s, there is no likelihood of the River overheating by more than 3 K, or less if - due to the nutrient content in the Sava River - water in the pool of the HEP Brežice is more sensitive to eutrophication.

8.9.4 Description of the impacts of the "nuclear energy" sub-programme on nature

The existing NPP is not situated within a protected area; similarly, the potential locations of the new NPP, which lie east and west of the existing NPP, are not foreseen to be in a protected area or in some other important nature conservation areas. It is not envisaged that the new NPP would use cooling water from the Sava River. For the new NPP, a closed cooling system with wet cooling towers is planned.

The impact of the existing NPP on the Sava River is direct, due to the use of water from the Sava River for cooling purposes. Based on almost twenty-five years of operation of the existing NPP and the monitoring of abiotic and biotic changes in the Sava River during cooling water discharge, it has been noted that the thermal impacts on biological communities are not visible or statistically significant, from which it is possible to conclude that even after the recent increase in power of the electric power plant (by 6%) and with a simultaneous and increased cooling and providing a permitted temperature difference (3 K) no adverse effects on the river ecosystem have been detected. Impacts on the Sava River and the consequent impacts on biological communities due to the discharge of waste cooling water from the existing NPP may worsen conditions, because of planned changes in the water regime in the retention pool of the HEP Brežice (a cumulative effect). A slower flow rate of the Sava River at the point of discharge or in the impact area of discharge of waste cooling water from the existing NPP, in unfavourable hydrological conditions (the flow rate is less than 100 m3/s and the temperature of the Sava River is 18°C), may have a direct impact on the occurrence of eutrophication in the entire area of the retention pool of the HEP Brežice. The implementation of measures to achieve a good ecological status of the Sava River will also guarantee the acceptability of the sub-programme "nuclear energy" in terms of impacts on nature.

In the case of greater ionising radiation than is permitted one (an accident), a negative impact on the living world is expected to occur. Ionising radiation causes other than the immediate effects (at higher doses received), an increased frequency of cancers and an increased frequency of mutations, which is largely expressed in a higher mortality rate in the early stages of development.

Nature:
key strategic emphasis in relation to the sub-programme "nuclear energy"
Due to the changed water regime in the retention pool of the HEP Brežice, it is necessary to ensure the implementation of measures to prevent the occurrence of eutrophication in the retention pool of the HEP Brežice, so that thermal impacts from the existing NPP will have no significant effect on eco-systems. The new NPP shall not use the water from the Sava Rifer for cooling purposes.

8.9.5 Description of the impacts of the "nuclear energy" sub-programme on cultural heritage

The impacts of the sub-programme relate to the construction of buildings and the possible consequent impacts on areas and buildings of cultural heritage (destruction, damage, devaluation), including the impact areas and archaeological sites. The degree of impact depends on the area and nature of interventions and the importance of the affected cultural heritage.

8.9.6 Description of the impacts of the "nuclear energy" sub-programme on climatic factors

The impacts of nuclear energy exploitation for electricity generation on climatic factors are irrelevant. In the exploitation of nuclear energy, emissions of carbon dioxide are among the lowest per unit of generated electricity among all alternative sources, if emissions throughout the lifetime of the electric energy source are added to the discharge. As for renewable energy sources, also for nuclear energy no greenhouse gasses are emitted during electricity generation, although emissions occur in the construction of plants for the generation of electricity and their decommissioning, and in nuclear energy also during mining activities and the production of nuclear fuel, the disposal of spent fuel and by-products and from waste management.

The typical life cycle of nuclear energy consists of uranium mining (open cast mining or underground mine), fragmentation, conversion, enrichment (diffusion and/or centrifuge), fuel production, NPP, processing and treatment of spent nuclear fuel, radioactive waste interim storage, and final disposal.
Total GHG emissions from the NPP depend on power plant characteristics (type, availability factor, efficiency and lifetime period) and on the geographical location of the power plant, and are rated from 5 to 40 g CO2 eq / kWh of generated electricity. GHG emissions from NPPs are generally lower than emissions assessed for the entire lifetime of solar power plants or hydroelectric power plants.

Climatic factors:
key strategic emphasis in relation to the sub-programme "nuclear energy"
Electricity generation in nuclear power plants has a negligible impact on climatic factors and represents an opportunity to improve the environmental situation if it replaces electricity generation from fossil fuels.

8.9.7 Description of the impacts of the "nuclear energy" sub-programme on health

Requirements for radiation protection in the new NPP will reduce the doses of workers during the operation of the reactor, as well as during maintenance work during regular reconditioning. The design of the planned new types of reactors for the new NPP already take into account the principle of ALARA (optimisation), so that the time needed for maintenance and repairs would be as short as possible, and the radiation levels in the workplace as low as possible. Thus, in the new generation of nuclear reactors there are built-in requirements for equipment reliability and maintenance, as follows: implementation of work at distance or half-distance; protection of workers during maintenance and repair work; floor plan in a format that reduces the potential spread of contamination; reduction of the growth of radiation in materials and equipment; ventilation and air flow in a direction that reduces the formation of aerosols in areas where longer retention of employees in expected. Estimates of the annual total dose for workers during normal operations range from 0.5 to 0.69 man/Sv for the various types of reactor expected to be installed in the new NPP. The annual effective total dose in the existing NPP in 2007 was 0.89 man/Sv. Doses of workers, both the average and the maximum in the new NPP will be equal to or lower than those in the existing NPP at Krško.

In each NPP, liquid, gaseous and solid radioactive waste is generated. The radiation doses of people living in the surroundings of the NPP depend on liquid and gaseous effluents and potential transmission routes of radionuclides in the discharges. As the proposed new NPP will have a greater generating power - 1,000 or 1,700 MWe - compared to the existing NPP, with 700 MWe, we can expect somewhat greater annual discharges of radioactive substances. Thus, for example, the new EPR reactor at Krško would cause some major releases of tritium, carbon-14, activation and fission products, and noble gases into the atmosphere and the Sava River.

Although the doses of residents who live near the NPP depend on geographical location and the environmental conditions determining the transmission routes, the estimated dose is a sufficiently good approximation to assess the impacts on residents due to ionising radiation. An annual dose of an inhabitant living in the vicinity of the new NPP is estimated to be less than 10 μSv, which is much less than the authorised annual limit of 50 μSv, and is only a small proportion of the natural background radiation dose (less than 0.4%) received on average by an inhabitant of Slovenia.

8.9.8 Description of the impacts of the "nuclear energy" sub-programme on landscape

The impacts of the sub-programme relate to the construction of buildings and the consequent destruction of landscape elements and changes to the landscape image. The degree of impact depends on the nature of the intervention and the characteristics of the landscape in which this intervention occurs.

8.9.9 Description of the impacts of the "nuclear energy" sub-programme on material assets

In assessing the impacts of the "nuclear energy" sub-programme on material assets, the following should be checked:

- - potential negative impacts of NPP operation on the operation and efficiency of transport infrastructure,
- - possible disturbances in the provision of services related to the use of other infrastructure (such as communal infrastructure),
- - negative impacts on real estate and land values, and
- - potential loss of recreational areas or other qualities of the area where the NPP operation has an impact.

The measures of the "nuclear energy" sub-programme will be implemented at the existing location of electricity generation from nuclear power by making optimal use of the existing infrastructure, while the area of the new NPP is not so extensive as to have a significant negative impact on the existing settlement of the Municipality of Krško.

9 Cross-Border Impact

The cross-border impacts of implementing NEP measures have been established for all the neighbouring countries: Italy, Austria, Hungary and Croatia. In accordance with the Convention on Environmental Impact Assessment in a Transboundary Context (List of Activities), the NEP measures examined for cross-border impacts fall under:

- Point 2 "thermal power stations and other combustion installations with a heat output of 300 MW or more and nuclear power stations" of Annex 1 of the Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context
- Point 14 "installations for hydroelectric energy generation" of Annex 2 to the Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context.

Cross-border impacts were examined and evaluated in relation to all the environmental elements discussed, i.e. natural resources, air, waters, nature, cultural heritage, climatic factors and landscape and visible features.

Cross-border effects on Austria have been established as a result of:

- defining the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura and
- the planned new NPP.

Cross-border effects on Italy and Hungary have been established as a result of the planned new NPP.

Cross-border effects on Croatia have been established as a result of:

- defining the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura and
- the planned new NPP.

The planned NEP measures have a significant cross-border impact on the environment of neighbouring Austria as a result of defining the area of potential utilization – the border section with Austria to the highway bridge at Vučja vas on the inner Mura, as a result of the direct and long-distance impact on the waters of the Mura River water body and as a result of the direct and long-distance impact on nature.

The cross-border effects on neighbouring countries assessed as insignificant include the effects on Croatia resulting from building a new NPP and from defining the area of potential utilisation – the border section with Austria to the motorway bridge at Vučja vas on the inner Mura.

The cross-border impacts of implementing NEP measures have been established for all neighbouring countries: Italy, Austria, Hungary and Croatia.

10 Evaluation of NEP Sub-Programme Environmental Impacts and Mitigation Measures

10.1 Sub-Programme of Efficient Energy Use

10.1.1 Mitigation Measures and guidelines

Cultural heritage

The impact of the sub-programme of efficient energy use on cultural heritage has been rated C - insignificant – in view of the following general mitigation measures:
- when preparing spatial plans, which include measures for improving the energy efficiency of buildings, conservation principles need to be applied in implementing these measures;
- solutions for the illumination of cultural heritage structures need to be adapted to the further development of energy-saving bulbs;
- in the context of the energy efficiency measure, special attention needs to be paid to the evaluation of any technical heritage and appropriate heritage management (documentation, restoration, deposition).

Detailed mitigation measures are to be specified for individual cultural heritage structures.

The effects on cultural heritage are assessed under the assumption that the construction of low-energy, passive and near zero-energy buildings (4% of the housing fund annually) will apply the new generation of spatial legislation, which will comply with the principles of cultural heritage protection, so that the effects of construction on cultural heritage will be insignificant.

Climatic factors

The Action Plan for Efficient Use of Energy and the spatial plans incorporating measures of the sub-programme of efficient energy use need to be prepared in accordance with the following guidelines:

- for each type of measure, GHG emissions need to be calculated for the entire life of measure implementation, including the carbon footprint of the materials used to implement the measures,
- the calculation of the carbon footprint of implementing individual measures must apply verified and EU-recognised data on the carbon footprint of insulation and other materials and methods of GHD emission calculation for the entire life of the measure which are repeatable and applicable to Slovenian climatic conditions or samples of energy product use in Slovenia,
- the carbon footprint of implementing the measure of materials used should not exceed 25% of total GHG emissions in the entire life of the measure. Measures where the carbon footprint of materials used contributes a significant share of GHG emission in the entire life of the measure (over 50%) are not acceptable in terms of impacts on climatic factors, because their synergic impact on renewable resources is too great.

As regards climatic factors, the effects of the sub-programme of efficient energy use are rated A in terms of environmental impact due to their important contribution in reducing environmental stress from GHG emissions.

10.1.2 Overall assessment of the significant environmental impacts of the sub-programme of efficient energy use

Table 14: Assessment of the significant environmental impacts of the sub-programme of efficient energy use

Type of measure / significant impacts	Cultural heritage	Climatic factors
Construction of low-energy, passive and near zero-energy buildings (4% of the housing fund annually)	B	A
Measures for improving the efficiency of buildings	C	A
Energy-efficient household appliances	A	A
EUE measures in the service industry	A	A
Energy efficiency measures in energy-intensive branches of the processing industry	C	A
Horizontal energy efficiency measures in industry	A	A
Energy efficient public lighting	C	A

10.2 Sub-Programme of Energy Use in Transport

10.2.1 Guidelines and mitigation measures

Air

In the preparation of operational programmes in the field of road transport that incorporate measures for energy use in transport, the following guidelines need to be followed:

- in preparing the measures, it has to be taken into account that biofuel-powered vehicles with conventional internal combustion engines significantly pollute the air, particularly through the emission of particles and carbon oxides. Introducing electric vehicles or compressed or liquefied hydrogen powered vehicles significantly reduces air pollution caused by vehicle usage (leaving only dust resuspension, which currently accounts for 15% to 30% of total emissions from road transport in urban environments).

As regards effects on air, the impact of individual measures of the sub-programme of energy use in transport is assessed as follows:

- the impact of biofuel usage in conventional internal combustion engines is assessed rated C - insignificant, provided that mitigation measures due to ambient air pollution are implemented by restricting road transport to biofuels and liquid fossil fuels,
- since the introduction of energy efficient vehicles helps achieve environmental targets in the field of air quality over the medium term, this measure of the sub-programme of energy use in transport is assessed as rated A in terms of environmental impact because of its noticeable share in improving the status of ambient air quality.
- the use of electric battery vehicles, plug-in hybrid vehicles and compressed or liquefied hydrogen powered vehicles (with internal combustion engines or fuels cells) are rated A, since they significantly contribute to improving ambient air quality in urban environments,

- the environmental impact significance of introducing LPG and CNG powered vehicles is rated A, as it means an opportunity for air improvement, particularly in urban environments.

The mitigation measures that need to be implemented in urban environments, along with the promotion of biofuel usage in conventional internal combustion engines are the same as the measures for reducing the atmospheric emission of substances for fossil fuel powered vehicles: banned or limited transportation in vehicles without particle filters.

<u>Climatic factors</u>

In preparing operational programmes in the field of road transport that incorporate measures for energy use in transport, these measures need to be planned in view of the carbon footprint of alternative fuel usage in road transport (Figure 19 of this Environmental Report).

As regards the effects on climatic factors, the impact of individual measures of the sub-programme of energy use in transport is assessed as follows:

- the effects of using 1st generation biofuels (vegetable oils processed into biodiesel) in conventional internal combustion engines are rated C - insignificant, provided that mitigation measures are implemented in producing biofuels to ensure that:
    - the use of 1st generation biofuels contributes to reducing GHG emissions by more than 40% in comparison with emissions from fossil fuels, and that the production of biofuels does not have a harmful synergic effect on the use of available farming land for food production,
- the introduction of energy efficient vehicles and tyres helps achieve environmental targets in the field of GHG emission reduction over the medium term, which is why the environmental impact significance of this measure of the sub-programme of energy use in transport is rated A.
- the use of electric battery vehicles, hybrid vehicles and compressed or liquefied hydrogen powered vehicles (with internal combustion engines or fuels cells) is rated A, as they vitally contribute to achieving environmental targets in the field of GHG emissions,
- the environmental impact significance of using electric battery vehicles, plug-in hybrid vehicles and LPG and CNG powered vehicles is rated A, since it has no effect on achieving environmental targets in the field of climatic factors.

10.2.2 Overall assessment of the significant environmental impacts of the sub-programme of energy use in transport

Table 15: Assessment of the significant environmental impacts of the sub-programme of energy use in transport

Type of measure / significant impacts	Air	Climatic factors
Introducing biofuels – adding biodiesel to diesel fuel and bioethanol to petrol	**C**	**C**
Promoting the use of biofuels in specific areas: agriculture, public transport	**C**	**C**
Improving the energy efficiency of vehicles and introducing energy-efficient tyres	**A**	**A**
Hybrid vehicles and plug-in hybrid vehicles	**A**	**A**
Hydrogen-powered vehicles	**A**	**A**

LPG and CNG powered vehicles	**A**	**A**
Charging infrastructure for electric vehicles, hydrogen-powered vehicles, LPG and CNG powered vehicles.	**A**	**A**

10.3 Sub-Programme of Renewable Energy Sources

10.3.1 Micro, small and medium-sized power plants

10.3.1.1 The generation of electricity by wind farms

10.3.1.1.1 Guidelines and mitigation measures

Natural resources

The generation of electricity by wind farms as a measure of the sub-programme of renewable energy sources is rated A in terms of environmental impact, since it has no significant impact on natural resources.

Nature

Wind farms have a potential impact on biodiversity, flora and fauna, and areas important for nature protection.

General mitigation measures:

1. Unsuitable locations for the siting of wind farms are: protected areas, SPA areas, the heart of area of ecological importance (AEI) – Core Habitat Area of Large Carnivores.

2. For the purposes of siting, the following must be ensured in potential WF areas:
    - surveying of the flight corridors of birds in WF areas with appropriate monitoring
    - surveying of important nesting areas of endangered species in the vicinity
    - surveying of the foraging corridors of bats in the area
    - research on the impact of WF on large carnivores
    - mapping of habitat types in the affected area.

3. Based on the results of the above listed research, the impact of individual sites on flora, fauna and HT needs to be assessed as part of the comprehensive environmental impact assessment. The sites need to be planned outside important areas for qualifying species and outside uninterrupted areas of qualifying HT.

4. When planning, interference with the habitats of protected and endangered species and priority habitat types must be avoided to the greatest extent possible to prevent any negative effects on them.

5. The wind farms need to be sited, designed and maintained so as not to diminish the birds' prospects of preservation. Recommendations based on international experience include:

- in principle, wind farms should not be set up in areas protected in the interest of birds (SPA, IBA areas, as well as national and landscape parks, natural reserves, designated primarily in the interest of birds),
- in principle, turbines should not be set up in areas regularly flown over by large numbers of birds (mass migration routes, especially bottle neck areas),
- in principle, turbines should not be set up near habitats of endangered bird species populations, even if the areas are not formally protected,

- before construction, all possible alternative locations should be studied to determine where the impact is the smallest,
- before setting up WF, it is favourable to prepare a national plan of requirements for energy from wind farms, which should consider the actual possibilities in order to avoid setting up wind farms without a noteworthy effect on electricity generation,
- it is favourable to make bird surveys in all the potential areas for the siting of wind farms in order to establish the actual differences between the areas in terms of nature protection. It is definitely necessary to make surveys at least in areas planned for siting wind farms, and in the event of projected high potential impact, to adjust the plans,
- the surveys must include the birds during nesting, wintering and flight, which is why they must span at least one year or, optimally, two,
- the impact assessment should also take into consideration the effect of the supporting infrastructure, as well as the long-distance effect on the areas mentioned in Points 1-3.
- the surveys need to be carried out by professionally qualified surveyors.

Planning guidelines:

- When planning, it is recommended to site wind farms outside protected areas and outside the range of long-distance impact.

Mitigation measures for potential WF areas

The following describes the effects and mitigation measures for potential WF areas. The range of direct and long-distance impact is defined in accordance with the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas (Official Gazette of the RS, Nos. 130/04, 53/06, 38/10) as 100 m and 1,000 m, respectively. The impacts on nature for all potential WF areas are rated C - insignificant, provided that mitigation measures are implemented. Also, at the planning stage, a comprehensive environmental assessment is required for each potential WF area.

The assessments of individual areas, potentially suitable as wind farm locations, are based on the data available. As the authors of this Environmental Report, we believe that it will be possible to site a wind farm in each of the areas assessed as conditionally acceptable by optimising the number, location and power of individual wind turbines. On the basis of new findings resulting from additional research, it is of course possible, although unlikely, that in the later stages of siting, some of the locations may prove unacceptable.

Table 12:

Description of activities affecting environmentally important areas within areas intended for wind farms in the sub-programme of renewable energy sources

Potential WF area	Protected areas (Natura 2000 areas and protected areas – PA)	Qualifying species/HT that will feel an impact*	Valuable natural features and expected valuable natural features (eVNF)	Areas of Ecological Importance (AEI) and IBA
Porezen	Direct impact: - SCI Podbrdo-Skalovje - PA Cerkno – soteska potoka Zapoška - PA Kuk: rastišče kr. popkoresa - SCI Porezen - SCI Cerkno – Zakriž Long-distance impact: - SCI Porezen - SCI Cerkno – Zakriž	Direct and long-distance impact: - the lesser horseshoe bat	- Selška SoraRuscov slap - Skočnik pod Poreznom - Podcajnovo okno - Zapoška – soteska s slapovi - Spodnji Sopot pod Poreznom - Milpoh in Vojspoh - Zajtel grapa - Driselpoh – soteska - Prodar – rastišče kr. popkorese - Lajtna grapa - Davča s Poreznom - eVNF Karbonati	- Julijske Alpe - Porezen – Cimprovka - SCI Cerkno – Zakriž - Podbrdo - Idrijca s pritoki - Driselpoh
Rogatec - Črnivec - Ojstri vrh	Direct impact: - PA Slap – Cuc Long-distance impact: - SPA Kamniško – Savinjske Alpe in V Karavanke	Long-distance impact: - the golden eagle - the peregrine falcon	- Cuc - Kališe – tisa - Riharska Draga – jelka 1 - Riharska Draga – jelka 2 - Slapišče v Tumfih - Dreta s pritoki - Lučnica s pritoki - Kranjska reber - Jazbina 1 - Jazbina 2 - Mlačko-Mlačnikovo brezno - Rogatec 1 - eVNF Plešivec - eVNF Karbonati	- Menina planina
Špitalič - Trojane – Motnik	/	/	- Bela – lipi - Log pri Blagovici – lipa - Prilesje – kostanj - Špitalič – nahajališče fosilov - Tabor pri Špitaliču – nahajališče fosilov - Vrh – lipe nad zaselkom - Tabor pri Špitaliču – nahajališče fosilov - Špitalič – nahajališče fosilov - Brezno na Kekcu - Veternica - eVNF Karbonati	- Menina planina
Knezdol – Mrzlica	Direct impact: - PA KP Mrzlica - ZO lipe pri cerkvi sv. Lenarta - ZO Bukev blizu cerkve sv. Lenarta - PA Hribarjeva tisa (II) v Mariji Reki - PA Hribarjeva tisa (I) v Mariji Reki - PA Otavnikov	Long-distance impact: - the golden eagle - the peregrine falcon	- Durnikova bodika - Hribarjeva tisa 1 - Hribarjeva tisa 2 - Kodrov kostanj - Kregarjeva peč - Otavnikov kostanj - Plavčeva lipa - Vrhe – cerkvena bukev - Vrhe – lipe - Mrzlica - Kregarjeva peč - eVNF Karbonati	- Posavsko hribovje – severno ostenje – Mrzlica

	kostanj v Veliki Reki Long-distance impact: - SPA Posavsko hribovje – ostenje			
Golte	Direct impact: - PA Visočnikov javor Long-distance impact: - SPA Kamniško – Savinjske Alpe in V Karavanke	Long-distance impact: - the golden eagle - the peregrine falcon	- Leskovškova lipa - Leskovškova pustora – leska - Leskovškova tisa - Libija – slapovi - Libija s pritoki - Mačkin kot – stena - Ravne – požiralnik - Sušnikov javor 1 - Sušnikov javor 2 - Visočnikov javor - Visočnikova lipa - Zaloka – ponorna jama - Brezno dveh lobanj - Partizansko skladišče - Ponor v Zaloki 2 - Rupa - eVNF Karbonati	- Kamniško – Savinske Alpe
Črni vrh - Zaloška planina	Direct impact: - SCI Pohorje Long-distance impact: - SPA Pohorje	Direct impact: - species-rich grasslands with dominant mat-grass (Nardus stricta) on silicious soil - silicious rocky slopes with chasmophytic vegetation Long-distance impact: - the European honey buzzard	- Javhovo – rdeči bor - Kotniško – jelka - Miklavževa bodika - Mislinja - Mislinjski greben – lipa - Srklovnik – jelka - Smagajeva lipa - Strmčnikovi lipi - Svečkova lipa - Mislinja - Paka - eVNF Pohorje	- Pohorje
Slivniško Pohorje	Direct impact: - PA Janžetova lipa v Kalšah št. 11	/	- Jenžetova lipa - eVNF Pohorje	- Fram - Devinja - Pohorje
Velika gora	Direct impact: - SCI Kočevsko Long-distance impact: - SPA Kočevsko – Kolpa - SCI Kočevsko	Direct impact: - large carnivores - bats (listed below) Long-distance impact: - the golden eagle - the peregrine falcon - the white-tailed eagle - the European honey buzzard - the Barbastelle - the Mediterranean	- Skedenca - Kravjerebersko brezno - eVNF Karbonati	- Core habitat area of large carnivores

		horseshoe bat - the great horseshoe bat - the lesser horseshoe bat		
Novokrajski vrhi	Direct impact: - SCI Sušački, Smrdejski in Fabski potok - PA Drevje pri cerkvi v Sušaku - Influence area of the Škocjan Caves Regional Park Long-distance impact: - SPA Reka – dolina - SCI Reka	Long-distance impact: - the common bent-wing bat - the long-fingered bat - the great horseshoe bat	- Sušak – drevje pri cerkvi sv. Ivana	- Sušački, Smrdejski in Fabski potok
Hrpelje – Slope	Long-distance impact: - SCI Kras - SPA Kras - Influence area of the Škocjan Caves Regional Park	Long-distance impact: - the great horseshoe bat - the common bent-wing bat - the long-fingered bat - the lesser horseshoe bat - the greater mouse-eared bat - the lesser mouse-eared bat - Geoffroy's bat - the short-toed eagle - the European honey buzzard	- Jelihovec - Jama pod Zajčevo dolino - Jama pod Krasom - Jama nad Sovnikom - Jama v Gaberju - Kabalenščica - Pečina nad Palkovo ograd o - Pečina Sovnik - SI 1 (Slope) - eVNF Matarsko podolje – meja K-Tc - eVNF Karbonati	/
Senožeška Brda - Vremščica - Čebulovica – Selivec	Direct impact: - SCI Vrhe nad Rašo - SCI Dolina Vipave - SPA Kras - PA Brestovica pri Povirju – Petnjak - Influence area of the Škocjan Caves Regional Park Long-distance impact: - SCI Kras - SPA Kras - SPA Trnovski gozd – južni rob in Nanos - SCI Trnovski gozd - Nanos - SCI Nanoščica Long-distance impact for PA: - Brestovica pri Povirju – Petnjak	Direct impact: - the Mediterranean horseshoe bat - the great horseshoe bat - the European honey buzzard - the short-toed eagle Long-distance impact: - the European honey buzzard - the short-toed eagle - the great horseshoe bat - the common bent-wing bat - the long-fingered bat	- Dolenja vas pri Senožečah – stratigrafska meja - Laže – lipa pred asfaltno bazo - Volče – lipa na Jezerih - Volče – vaški kal - Nanoščica - Sajevško polje - Raša - Brezno v Kukčevi Lozi - Brezno na Lovcah - Brezno v kamnolomu v Lažah - Luknja v skali - Petnjak - Tončkov spodmol - Stanovica - Spodmol ob Raši pod Renicami - Zalovka - eVNF Vremski Britof – Podgraje – flišni rob - eVNF Kras - eVNF Karbonati	- Karst - Vipava – reka in osrednji del Vipavske doline - Slavinski Ravnik - Vrhe na Vipavskem IBA Karst

	- Vremščica - vrh in pobočja - Brestovica pri Povirju – Globočaj pond - Nanos - južna in zahodna pobočja z vrhovi Pleše, Grmade in Ture - Speleološki sistem podzemeljske Rakuljščice - Južni in zahodni obronki Nanosa	- the lesser horseshoe bat - the greater mouse-eared bat - the lesser mouse-eared bat - Geoffroy's bat - Bechstein's bat - the Mediterranean horseshoe bat - the great horseshoe bat		
Grgar – Trnovo	Long-distance impact: - SPA Banjšice - SPA Trnovski gozd – južni rob in Nanos - SCI Trnovski gozd - Nanos - SPA Trnovski gozd	Long-distance impact: - the European honey buzzard - the golden eagle - the short-toed eagle - the peregrine falcon - the griffon vulture - the lesser horseshoe bat - the great horseshoe bat - the Mediterranean horseshoe bat - the common bent-wing bat - the long-fingered bat - Bechstein's bat	- Ravnica – stratigrafski stik - Voglarji – nahajališča fosilov - Brezen 1 pri Batičih - Brezen 1pri Voglarjih - Brezen 3 pri Batičih - Brezen 3 pri Cvetrežu - Brezen 4 pri Voglarjih - Jama 2 pri Trnovem - Jama v Bukovih dolinah - eVNF Visoki kras - eVNF Karbonati	- Trnovski gozd in Nanos
Banjščice – Lokovec	Direct impact: - PA Banjšice, Brezno na Vodicah Long-distance impact: - SPA Banjšice	Long-distance impact: - the European honey buzzard	- Brezen 1 pri Podleščah - Brezen 1 pri Zgorelnicah - Brezen 2 pri Podleščah - Brezen 2 pri Zgorelnicah - Brezen 3 pri Bregu - Brezen 4 pri Mokrinih - Brezen na Vodicah - Brezen pri Bricu - Brezen pri Frnažih - Brezen pri Volniku - Brezno Veternik - Brezno za Kniževim bregom - Gorjupovo pokrito brezno - Jama pri Podlaki - Rupa na Smrdikovcu - Smrdikovec - Srednikovo brezno - eVNF Visoki kras	/
Avče	/	/	eVNF Visoki kras	/

<u>In addition to general mitigation measures, specific mitigation measures for individual locations should be taken into account when planning:</u>

1. Mitigation measures for the siting of wind farms in the Porezen area:
- The activities should be planned outside VNF.
- The activities should be planned outside SCI Podbrdo-Skalovje, PA Cerkno – soteska potoka Zapoška and PA Kuk.
- The planning of activities that affect protected areas should comply with the Ordinance designating cultural and historical monuments and natural sites of special interest in the area of Idrija Municipality (Official Gazette of the SRS, Nos. 16/86, 56/93) and the Ordinance designating cultural and historical monuments and natural sites of special interest in the area of Tolmin Municipality (Gazette of the Ajdovščina, Nova Gorica and Tolmin Municipalities, No. 5/90).
- No activity affecting the site of short-haired sandwort is allowed.
- It is necessary to survey the roosts, foraging habitats and flight routes of bats in the area and determine the impact on them. For this purpose, observation of the species for at least one year is recommended. The research findings should be taken into account when planning activities (especially turbine sites).
- The impact on the golden eagle and griffon vulture should be researched. Any flight and migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

2. Mitigation measures for the siting of wind farms in the Rogatec - Črnivec - Ojstri vrh area:
- The activities should be planned outside VNF.
- PA Slap – Cuc must be preserved.
- The activities affecting PA Slap - Cuc should comply with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Mozirje Municipality (Official Gazette of the SRS, No. 27/87).
- The impact on the golden eagle and the peregrine falcon should be researched. For this purpose, at least two years of field observation of the species is recommended. The research findings should be taken into account when planning activities (especially turbine sites).
- Any flight and migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

3. Mitigation measures for the siting of wind farms in the Špitalič - Trojane – Motnik area:
- The activities should be planned outside VNF.
- Any flight and migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

4. Mitigation measures for the siting of wind farms in the Knezdol –Mrzlica area:
- The activities should be planned outside VNF and outside protected areas.

- Dendrological monuments need to be preserved.
- Activities which affect PA should comply with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, No. 4/96) and the Ordinance designating dendrological monuments and man-made natural monuments in Žalec Municipality (Official Gazette of the RS, Nos. 40/97,78/98).
- The impact on the golden eagle and the peregrine falcon needs to be researched. For this purpose, at least two years of field observation of the species is recommended. The research findings should be taken into account when planning activities (especially turbine sites).

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

5. Mitigation measures for the siting of wind farms in the Golte area:
- The activities should be planned outside VNF and outside PA Visočnikov javor.
- Activities which affect PA should comply with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Mozirje Municipality (Official Gazette of the SRS, No. 27/87).
- The impact on the golden eagle and the peregrine falcon needs to be researched. For this purpose, at least two years of field observation of the species is recommended. The research findings should be taken into account when planning activities (especially turbine sites).
- Any flight and migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

6. Mitigation measures for the siting of wind farms in the Črni vrh - Zaloška planina area:
- HT mapping should be carried out in the part extending into SCI Pohorje. The activities should be planned outside qualifying HT and species habitats.
- The activities should be planned outside VNF areas.
- The impact on the European honey buzzard, eagle and black grouse needs to be researched. For this purpose, at least two years of field observation of the species is recommended. The research findings should be taken into account when planning activities (especially turbine sites).
- Any flight and migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

7. Mitigation measures for the siting of wind farms in the Slivniško Pohorje area:
- There should be no interference with the PA site and VNF Janžetova lipa. Planning should comply with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Mozirje Municipality (Official Gazette of the SRS, No. 27/87).
- Any flight and migration corridors of birds of prey should be identified and considered when planning the activity.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

8. Mitigation measures for the siting of wind farms in the Velika gora area:
- The activities should be planned outside VNF.
- Research is required on the impact on the following species: the golden eagle, peregrine falcon, white-tailed eagle and European honey buzzard. For this purpose, at least two years of field observation of the species is recommended.
- It is necessary to survey the roosts, foraging habitats and flight routes of bats in the area and to determine the impact on them. For this purpose, at least one year of observation of the species is recommended.
- Collect data on large carnivores – i.e. carry out research in the entire area and assess the impact on them.
- The findings of the above listed research need to be considered when planning activities (especially turbine sites).

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

9. Mitigation measures for the siting of wind farms in the Novokrajski vrhi area:
- Activities should be planned outside SCI Sušački, Smrdejski in Fabski potok and VNF.
- PA Drevje pri cerkvi v Sušaku should not be interfered with. The planning should comply with the Ordinance regulating natural monuments protection in Ilirska Bistrica Municipality (Primorske novice – official announcements, No. 6/69).
- The roosts, foraging habitats and flight routes of bats need to be surveyed. For this purpose, at least one year of observation of the species is recommended. The research findings should be taken into account when planning activities (especially turbine sites).
- Any flight and migration corridors of birds of prey should be identified and considered when planning the activity.
- Pollution of subterranean cave systems is to be prevented.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

10. Mitigation measures for the siting of wind farms in the Hrpelje-Slope area:
- The activities should be planned outside VNF.
- The roosts, foraging habitats and flight routes of bats need to be surveyed in the area. For this purpose, at least one year of observation of the species is recommended.
- The impact on the short-toed eagle and the European honey buzzard needs to be researched. For this purpose, it is recommended observing the species in the field for at least two years and the research findings must be taken into account when planning activities (especially turbine sites).
- Pollution of subterranean cave systems should be prevented.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

11. Mitigation measures for the siting of wind farms in the area of Senožeška Brda - Vremščica - Čebulovica - Selivec:
- Activities affecting SCI Vrhe nad Rašo and SCI Dolina Vipave should be planned so as to maintain the integrity and network of the habitats of qualifying species.
- The wintering and resting areas of qualifying bat species should not be interfered with; WF sites should not be planned within a radius of min. 1000 m.
- The roosts, foraging habitats and flight routes of bats need to be surveyed in the area. For this purpose, at least one year of observation of the species is recommended.
- The impact on the short-toed eagle and European honey buzzard, as well as on the eagle owl and white stork, should be researched. For this purpose, it is recommended observing the species in the field for at least two years, and the research findings must be taken into account when planning activities (especially turbine sites).
- The activities should be planned outside VNF.

The activities affecting PA Brestovica pri Povirju – Petnjak should comply with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Sežana Municipality (Primorske novice – official announcements, No. 13/92, 68/95) and the Ordinance designating cultural and historical monuments and natural sites of special interest in the area of Ajdovščina Municipality (Gazette of the Ajdovščina, Nova Gorica and Tolmin Municipalities, No. 4/87) and the Ordinance designating cultural and historical monuments and natural sites of special interest in the area of Postojna Municipality (Primorske novice – official announcements, Nos. 29/84, 30/91).
- Pollution of subterranean cave systems should be prevented.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

12. Mitigation measures for the siting of wind farms in the Grgar – Trnovo area:
- The roosts, foraging habitats and flight routes of bats need to be surveyed in the area. For this purpose, at least one year of observation of the species is recommended.
- It is necessary to research the impact on the following birds: the European honey buzzard, golden eagle, short-toed eagle, peregrine falcon and griffon vulture. For this purpose, at least two years of field observation of the species is recommended.
- The findings of the above stated research need to be considered when planning activities (especially turbine sites).

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

13. Mitigation measures for the siting of wind farms in the Banjščice – Lokovec area:
- The activities should be planned outside VNF and PA Banjšice, Brezno na Vodicah.
- The activities affecting PA should comply with the Ordinance designating cultural and historical monuments and natural sites of special interest in the area of Nova Gorica Municipality (Gazette of the Nova Gorica Municipality, No. 8/85).
- The impact on the European honey buzzard, golden eagle, short-toed eagle, peregrine falcon and griffon vulture needs to be researched. For this purpose, it is recommended to observe the species

in the field for at least two years and the research findings must be taken into account when planning activities (especially turbine sites).

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

14. Mitigation measures for the siting of WF Avče:
- Any flight or migration corridors of birds of prey should be identified and considered when planning activities.

The comprehensive assessment of acceptability for the potential wind farm area needs to be carried out at the level of a detailed plan or activity in accordance with Article 25a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

Cultural heritage

The potential areas for the installation of wind farms are hilly areas, generally with a small volume of heritage. Since areas with a high density of heritage, areas of heritage and historic landscapes and Alpine areas with architectural heritage have already been excluded from these potential areas, no impact on them may be expected. More conflicts with heritage are possible in locations in the Primorska region and in the area between Špitalič and Mrzlica, where areas with favourable wind conditions extend into areas with a greater density of heritage to a greater extent.

Table 17: Description of registered heritage areas within areas intended for wind farms in the sub-programme of renewable energy sources that need to be considered in the next planning stages.

Potential WF area	Heritage areas*
Porezen	-
Rogatec - Črnivec - Ojstri vrh	-
Špitalič - Trojane – Motnik	- Spodnji Okrog pri Motniku – zaselek (EŠD (heritage register number) 15280) - Špitalič – cerkev sv. Antona Puščavnika (EŠD 2563) - Bela – Pidov mlin (EŠD 12864) - Motnik – Trško naselje (EŠD 12028) - Motnik – naselbina Za zidom (EŠD 11346) - Motnik – poznoantična utrdba (EŠD 11347) - Zgornji Motnik – zaselek Brezovica (EŠD 4342) - Zgornji Motnik – zaselek Vrh (EŠD 490576) - Zgornji Motnik – zaselek Srobotno (EŠD 490575)
Knezdol – Mrzlica	- Knezdol – zaselek Zgornje Svine (EŠD 8417) - Čeče – zaselek Jesenova Ravan (EŠD 10136)
Golte	- Ter – domačija Ter 55 (EŠD 25410) - Bele Vode – Domačija Bele Vode 45 (EŠD 26625)
Črni vrh - Zaloška planina	- Mislinja – domačija Mislinja 289 (EŠD 463)
Slivniško Pohorje	- Kočno pri Polskavi – grad Gromberk (EŠD 6911)
Velika gora	/

Novokrajski vrhi	- Zabiče – Grad Gotnik (EŠD 8466) - Fabci – vas (EŠD 27673) - Sušak – vas (EŠD 27742) - Sušak – cerkev sv. Janeza Krstnika (EŠD 3726)
Hrpelje – Slope	-
Senožeška Brda - Vremščica - Čebulovica – Selivec	- Volče pri Košani – vas (EŠD 16097) - Volče pri Košani – arheološko območje Žuškovka (EŠD 9592) - Laže – gradišče Ajdovc (EŠD 7292) - Senožeče – drevored ob cesti Razdrto – Senožeče (EŠD 7938) - Potoče pri Senožečah – gradišče Bandera (EŠD 105) - Dolenja vas pri Senožečah – gradišče Hribi (EŠD 7267) - Dolenja vas pri Senožečah – gradišče Šmarnik (EŠD 7269) - Razdrto – arheološko najdišče Goli vrh (EŠD 13047)
Grgar – Trnovo	-
Banjščice – Lokovec	-
Avče	- Kanalski Vrh - Cerkev sv. Antona Padovanskega (EŠD 3739)**

Legend:
*Listed are more extensive or important heritage areas which need to be given special attention. Individual smaller structures (of architectural and memorial heritage) are not listed. It is estimated that at the detailed planning stage, a full adjustment to these structures will be possible without putting them at risk.
**Outside the potential WF area but in visual contact with the activity.

The impact on the archaeological heritage cannot be assessed at the stage of strategic environmental impact assessment. We foresee that it will be possible to avoid all known archaeological sites in the course of detailed siting. In the areas of individual turbines and the associated infrastructure, prior archaeological research will be required.

It is estimated that at the stage of individual turbine siting, adjustments to (avoiding) individual heritage structures and areas will be possible, since there is relatively plenty of potential for coordination and optimisation. Impacts on the visual image of heritage in the broader locality are to be mitigated by observing the mitigation measures for landscape protection (see below).

The impacts of the measure on cultural heritage are assessed as grade C – insignificant, provided that mitigation measures are implemented. These measures relate to the optimal siting of individual wind energy harnessing structures and facilities and the associated infrastructure within the individual potential areas for wind farm installation in the next phases of planning in a way that will not affect individual units of heritage - as a rule by avoiding heritage areas, including their impact areas. When defining the impact area, it should be taken into consideration that it may be larger that in other spatial arrangements due to the large size of wind turbines.

<u>**Climatic factors**</u>

The generation of electricity on wind farms is a measure of the sub-programme of renewable energy sources, which is assessed as having an environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

<u>**Landscape**</u>

The potential areas for wind farms do not encroach on exceptional landscapes. Where relevant, landscape areas with distinctive features at the national level are likewise excluded from these areas. In smaller parts, where border sections of these areas are included by virtue of making use of land with favourable wind conditions, special attention should be given to the details of turbine siting.

There will be changes to the visual image of landscapes with distinctive features at the local level, particularly to:

- wooded hilly landscapes on visually prominent crests and slopes, particularly in these locations: Porezen, Rogatec - Črnivec - Ojstri vrh, Knezdol - Mrzlica, Črni vrh - Zaloška planina, Grgar - Trnovo;
- the karst landscapes of the Primorska region in the area of Divača Karst, a farming country of dry valleys typified by karstic relief phenomena, dry-stone walls, stone piles and dominant grassland with isolated trees, and karstic woods, with largely pioneering species on poor, rocky beds, with black pine dominant – in the locations of Hrpelje - Slope, Senožeška Brda - Vremščica - Čebulovica - Selivec.

In these areas, typical karstic elements will be lost, particularly micro-relief phenomena, hedges and dry-stone walls.

The impacts of the measure are assessed as grade C – insignificant, provided that mitigation measures are implemented. These measures relate to optimising the siting of individual structures and facilities for the harnessing of wind energy, or the associated infrastructure, within individual potential areas for the installation of wind farms in the next planning phases in such a way that distinctive landscape features within individual areas can be preserved to the greatest extent possible and that the changes to the landscape composition are as small as possible, or such that the landscape composition of wind farm areas remains harmonious.

General mitigation measures for the siting of wind farms

1. Landscape quality:

- Wind farms should not be sited in landscape areas with distinctive features at the national level, or in exceptional landscape areas. When siting wind farms in the vicinity of such areas, an analysis of visual changes to the locality should be carried out and appropriate adjustments made. All typical views of, or from these areas should be preserved.
- As landscapes with a higher degree of biodiversity and natural preservation are more vulnerable to the incorporation of wind farms, siting in these areas should be avoided.

2. Scale:

- The extent, number, size and distribution of wind farms should be in keeping with the scale of the space. The space of large-scale landscapes is less vulnerable to the installation of wind farms than the space of small-scale landscapes where wind farms can become distinctive and conspicuous spatial dominants and are in contrast with finely structured landscape features.
- The functional areas and scale of smaller towns, villages and hamlets should be preserved and respected where the scale of wind farms could destroy the existing spatial proportions.
- Such locations should be sought as will allow the setting up of a group of wind turbines as a single unit. Setting up individual turbines distributed over larger distances should be avoided.

2. Relief:

- The choice of location should take into account the broader relief and topographical features of the area. An open landscape with rounded, gentle transitions of relief or a landscape of flatlands with little variety of scenery and no distinct character is less vulnerable to the incorporation of wind farms than a varied landscape with finely fragmented structures and a less open aspect.

- A consideration in the siting the wind farms should be the openness/passability or the confinement/impassability of the space which primarily results from the form of the terrain and the degree of vegetation, especially in large-scale spaces where relief and vegetation masses find greater expression. Such landscapes provide more opportunities for creating a screen and counterbalance to wind farms and better integration of the associated infrastructure and access ways into the space.

3. Structural features and landscape elements:

- The structural features of the space should be taken into account.
- New spatial relationships due to the inclusion of new structures – wind farms should be established in view of the existing spatial structures (fields, hedge vegetation and similar), directions (the lines of waterways, roads, woodland margins and similar) and the ground cover (wood mass and similar) so that the new structures complement and/or augment the existing ones. Landscapes of no particular complexity and a simple landscape structure with clear spatial directions are more suitable for wind farm siting than complex landscapes with irregular and fragmented structures.

4. Urbanized areas:

- As a rule, urbanised areas with a higher degree of degradation of typical spatial structures are more suitable for the incorporation of wind farms. In siting the wind farms, advantage should be taken of the existing commercial zones, industrial plants, degraded areas of pits and tips and areas along the transport infrastructure and similar.
- Balanced proportions should be ensured between wind farms and urban areas.
- The placement of new structures in already saturated areas should be avoided.

5. Visibility:

- Inclinations and relief structures (slopes, crests, mountain spines and similar) should be made use of to guide views or hide them, e.g.: a wind farm on a ridge above a concave slope is visually more prominent than a wind farm on a ridge above a convex terrain etc. Wind farms should not be set up on higher-lying and prominent areas which present major spatial dominants in the wider locality (a prominent hill, ridge, relief edge, centre of a valley, etc.) The visual prominence of areas should be taken into consideration. Views that are typical of the locality should be preserved, particularly from points which are frequently occupied by people (lookout points, roads, towns and villages etc.)

6. Design:

- The size of a wind turbine (the height of the tower and size of rotor) is to be determined with respect to the scale of the space (roughly/finely fragmented landscape) in which it is being incorporated and the relief characteristics of the area (valley, hill, slope, relief edge, ridge, etc.)
- Modern design options and solutions should be applied; the latter should be adjusted to the space in which they are placed (e.g. cylindrical turbines above roads).
- Structures at the base of wind turbines and other associated infrastructure (substations etc.) should be inobtrusive in the space and as small as possible, simply constructed, and designed with quality and in keeping with the architectural features of the area or in line with modern trends in design.
- The composition and proportion of wind turbines should be considered in relation to each other, individually, as groups and in relation to the selected area, with regard to: the view from near by/a

distance, clustered/dispersed, regular/irregular distribution, large/small, coloured/uncoloured, the effect of viewing from the horizon considering the type of distribution.
- The distribution of wind farms should follow the following principles, depending on the relief characteristics:
  - regular and/or linear distribution of wind turbines is more suitable in spaces typified by large dimensions, openness, transparency and regular structure;
  - irregular and/or clustered distribution of wind turbines is more suitable for fragmented, undulating landscapes;
  - graded distribution is favourable when the wind tubines are sited on prominent spatial lines (a crest tailing off across a slope to flatland).
- The clarity of the view of wind farms is to be taken into account.

Mitigation measures for potential areas for siting wind farms

1. Porezen area:

- due to the slopes - which are in places very steep - visually prominent, have no traffic access and where challenging construction conditions may be expected, special attention should be paid to detailed siting; use should be made of areas with access from the existing road network;
- areas of isolated farms should be preserved and the visual prominence of individual crests and slopes should be taken into consideration.

2. Rogatec - Črnivec - Ojstri vrh area:

- the south-eastern part of this area partly extends into a landscape area with distinctive features at the national level – Zadrečka dolina, which is why special attention should be paid to detailed siting. In a similar way, this also applies to the visually very prominent (from the Ljubljana basin) south-eastern slope of Kranjska reber.

3. Špitalič - Trojane – Motnik area:

- in the course of detailed siting, special attention should be devoted to the finely fragmented farming landscape and to views of the locality from plateaus, slopes and ridges.

4. Knezdol –Mrzlica area:

- as the area is visually fairly prominent, activities should be planned so as to make their visual prominence as small as possible;
- areas of hamlets on slopes and ridges should be preserved.

5. Golte area:

- detailed siting should take into consideration the views from the surrounding peaks.

6. Črni vrh - Zaloška planina area:

- in the course of detailed siting, special attention should be paid to the preservation of waterways and to the localities of individual farms on slopes.

7. Slivniško Pohorje area:

- in the course of detailed turbine siting, special attention should be paid to the preservation of clustered hamlets on clearings and to the views from the locality.

8. Velika gora area:

- the finely fragmented cultural landscape should be considered;
- in the course of detailed siting, special attention should be paid to the preservation of the features of the settlement development zones and cultural heritage areas and to the change in the visual perception of space in the area of Loški potok and Cerkniško polje, distinctive at the national level.

9. Novokrajski vrhi area:

- the functional areas of settlements should be preserved.

10. Hrpelje – Slope area:

- when planning the wind farms, special attention should be devoted to preserving the openness of the locality in relation to settlement development zones.

11. Senožeška Brda - Vremščica - Čebulovica – Selivec area:

- in the siting, special attention should be paid to the preservation of bare higher-lying areas with views, areas of clustered villages and to the openness of the locality in relation to settlement development zones.

12. Grgar – Trnovo area:

- when planning the wind farms, special attention should be devoted to the preservation of the openness of the locality in relation to settlement development zones.

13. Banjščice – Lokovec area:

- when siting the wind farms, special attention should be paid to preserving the features of the dispersed settlement area of Lokovec area.

14. Avče:

- when planning the wind farms, the visual features of the wider area should be taken into account, particularly from the direction of Kanalski vrh.

Material assets

Electricity generation on wind farms is a measure of the sub-programme of renewable energy sources, the impact significance of which is assessed as A due to its lack of significant impact on material assets except in the areas of ski slopes and other recreational facilities, where the wind turbines must be spaced at a distance of 3 rotor diameters from areas occupied by users for longer periods of time in the winter (areas of ski runs and lifts).

10.3.1.1.2 Overall assessment of significant impacts on the environment caused by electricity generation on wind farms

Table 18: Assessment of significant impacts on the environment caused by electricity generation on wind farms

Area of measure / significant impacts	Natural resources	Nature	Cultural heritage	Climatic factors	Landscap e	Material assets
Porezen	A	C	C	A	C	A
Rogatec Črnivec-Ojstri Vrh	A	C	C	A	C	A
Špitalič Trojane Motnik	A	C	C	A	C	A
Knezdol Mrzlica	A	C	C	A	C	A
Golte	A	C	C	A	C	B
Črni vrh Zaloška planina	A	C	C	A	C	A
Slivniško Pohorje	A	C	C	A	C	A
Velika Gora	A	C	C	A	C	A
Novokrajski vrhi	A	C	C	A	C	A
Hrpelje – Slope	A	C	C	A	C	A
Senožeška Brda - Vremščica - Čebulovica – Selivec	A	C	C	A	C	A
Grgar Trnovo	A	C	C	A	C	A
Banjščice Lokovec	A	C	C	A	C	A
Avče	A	C	C	A	C	A

10.3.1.2 Electricity generation in small hydroelectric power plants

10.3.1.2.1 Guidelines and mitigation measures

<u>Water</u>

The construction of new sHPPs is carried out on water bodies in accordance with the limitations and conditions for the use of water for hydroelectricity in sHPPs, whereby the modification of the hydro-morphological status of a surface water body needs to be justified for each sHPP in the course of its siting, in accordance with the procedures that must be observed for exceptions stipulated in Article 4(7) of Directive 2000/60/EC.

The impacts of the measure on waters are assessed as grade C – insignificant, provided that mitigation measures are implemented.

The mitigation measures primarily relate to the acceptable scope of changes to the hydro-morphological status of water bodies and to the observation of the procedures for the planning of these changes in accordance with the instructions for applying exceptions in accordance with Article 4(7) of Directive 2000/60/EC.

General mitigation measures which relate to the selection of the method of surface water use for the generation of electricity at sHPPs include:

- The selection should give priority to so-called derivational methods of water use for the generation of electricity in sHPPs.
- Run-of-the-river methods of water use in sHPPs are permissible if sHPPs are situated on existing dams, which are water infrastructure structures designed to retain or guide the flow of water.
- The overhaul of existing sHPPs with the intention of reducing hydro-morphological impacts and increasing the efficiency of electricity generation in existing sHPPs have priority over the construction of new sHPPs.

Nature

The impact of HPP construction may result in the direct destruction of aquatic and riparian habitats and an interruption in the passability of the waterway for aquatic organisms.

Strategic guidelines for the siting of sHPPs:

- As a priority, small HPPs should be sited outside areas with a protected status. The siting of activities in protected areas is acceptable on condition that such activity is permitted by legislation; and in the course of its planning, the objectives and regimes for the protected area need to be observed.
- We suggest carrying out an analysis of the situation and using it to establish a record of implemented and planned sHPPs.
- We recommend an examination of the option of upgrading existing technologies at existing locations before new sHPPs are planned, and giving priority to utilizing existing, abandoned structures such as watermills and sawmills in the course of planning.

General mitigation measures for small hydroelectric power plants:

1. The dynamic of the waterway and the bed-load discharge or sedimentation should be preserved to the greatest degree possible.
2. Individual sections of the waterway should remain connected (sHPP should provide suitable passages for aquatic organisms)
3. The bottom sills and dams should enable the passage of fish even at low water levels.
4. The operation of sHPPs needs to be consistent with the current flows of waterways and the regulations for ecologically acceptable flow. The dam, intake channel, gates and other structures need to be planned and implemented in a way that will ensure Q_{esp} even in the event of failures, or to prevent excessive water intake.
5. The outfall from the plant must be planned so that the water will rejoin the waterway by the shortest route.
6. Bank reinforcements in the area of an sHPP should be limited to the smallest extent necessary and in a sustainable way by using indigenous material.
7. The diversion of water should not cause significant changes in the water regime of the waterway.
8. In addition to adequacy, the location of the sHPP facility should take into account the vulnerability of the riverside land.
9. Any activities affecting gravel bars and other arrangements (including those outside the riparian zone) should not be detrimental to the status of qualifying habitat types and qualifying species in the area of the activity or detrimental to the habitats of protected and endangered species.
10. According to Article 12 of the Decree on criteria for the determination and mode of monitoring and reporting ecologically acceptable flow (Official Gazette of the RS, No. 97/2009), the holder of water rights must ensure daily or continuous monitoring of parameters based on which it is possible to establish whether the requirements regarding ecologically acceptable flow have been met at all times.

Provided that the mitigation measures are implemented, the construction is acceptable (grade C).

<u>Cultural heritage</u>

In the event that cultural heritage areas and structures are considered in the siting (primarily by avoiding them) and planning (by preserving protected features) of small hydroelectric power plants, the impacts of the measure may be assessed as grade C - insignificant by virtue of implementing mitigation measures.

Mitigation measures that apply to hydroelectric power plant siting and planning are observed where relevant. The overhaul of existing sHPPs has priority over the construction of new sHPPs.

<u>Climatic factors</u>

The generation of electricity in sHPPs is a measure of the sub-programme of renewable energy sources which is assessed as having an environmental impact significance grade A, which means an opportunity for improving the environmental status in terms of climatic factors.

<u>Landscape</u>

In the event that landscape features are taken into account in the siting and planning of small hydroelectric power plants, the impacts of the measure can be assessed as grade C - insignificant by virtue of implementing mitigation measures.

Where relevant, mitigation measures which apply to hydroelectric power plant siting and planning are observed. The renovation of existing sHPPs has priority over the construction of new sHPPs.

<u>Material assets</u>

The siting of sHPPs should adhere to the following guideline: the use of water in sHPPs should not encroach on water rights conferred in the impact area of water harnessing in sHPPs.

Electricity generation in sHPPs is a measure of the sub-programme of renewable energy sources which, in terms of the impacts on material assets, is assessed as having environmental impact significance grade A.

10.3.1.2.2 Overall assessment of significant impacts on the environment caused by electricity generation in sHPPs

Table 19: Assessment of significant impacts on the environment caused by electricity generation in sHPPs

Measure/significant impacts	Water	Nature	Cultural heritage	Climatic factors	Landscap e	Material assets
Overhaul of existing sHPPs	**A**	**C**	**C**	**A**	**C**	**A**
New sHPPs	**C**	**C**	**C**	**A**	**C**	**A**

10.3.1.3 Electricity generation in solar power stations

10.3.1.3.1 Mitigation measures and guidelines

Cultural heritage

The impacts of the measure on cultural heritage may be defined as insignificant, provided that mitigation measures are implemented or that the conditions - appropriately defined provisions of spatial planning documents - are met (grade C).

The spatial planning documents should lay down the conditions of spatial implementation in a way that will make the installation of solar power stations on cultural heritage structures or in cultural heritage areas and their impact areas impermissible, or stipulate the acceptability assessment for each respective case and the provision of a technological solution that will ensure that the protected heritage features are not affected in any way.

Climatic factors

Although the effect of impacts on climatic factors is reduced when taking into account greenhouse gas emissions during the entire life-cycle of solar power stations by around 100g CO_2 eq/kWh$_e$ (from the generation, operation and maintenance to the decommissioning of a solar power station), the generation of electricity in solar power plants as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

Landscape

The impacts of the measure on the landscape may be assessed as insignificant provided that mitigation measures are implemented or by virtue of meeting the conditions (grade C) – appropriately defined spatial implementation conditions in spatial planning documents, both with regard to the relevant (im)permissibility of solar power stations and with regard to their design.

The spatial planning documents should define the (im)permissibility of siting solar power stations by individual spatial planning units or categories of dedicated use of land. As a rule, it should only be permissible to install solar power stations on structures or in a manner that does not present an independent spatial arrangement in the landscape, but rather as part of a comprehensive spatial arrangement (e.g. for an infrastructural or industrial facility, rehabilitation).

10.3.1.3.2 Overall assessment of significant impacts on the environment caused by electricity generation in solar power stations

Table 20: Assessment of significant impacts on the environment caused by electricity generation in solar power stations

Measure / significant impacts	Cultural heritage	Climatic factors	Landscape
Solar power stations	**C**	**A**	**C**

10.3.1.4 Electricity generation in geothermal power plants

10.3.1.4.1 Guidelines and mitigation measures

Water

From the point of view of impacts on waters, the generation of electricity in geothermal power plants as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade C, provided that mitigation measures which ensure the reinjection of the geothermal heat conduction medium are implemented.

Climatic factors

Although the effect of impacts on climatic factors is reduced when taking into account greenhouse gas emissions during the entire life-cycle of a geothermal power plant and when taking into account the use of energy for the reinjection of the geothermal heat conduction medium by approx. 150 g CO_2 eq/kWh$_e$ (from the generation, operation and maintenance to the decommissioning of a geothermal power plant), the generation of electricity in geothermal power plants as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

Material assets

The siting of geothermal power plants should follow the following guideline: the use of groundwater in geothermal power plants should not encroach on water rights conferred in the impact area of groundwater harnessing.

Electricity generation in geothermal power plants is a measure of the sub-programme of renewable energy sources, which is assessed as having environmental impact significance grade A as regards its impact on material assets.

10.3.1.4.2 Overall assessment of significant impacts on the environment caused by electricity generation in geothermal power plants

Table 21: Assessment of significant impacts on the environment caused by electricity generation in geothermal power plants

Measure / significant impacts	Water	Climatic factors	Material assets
Electricity generation in geothermal power plants	**C**	**A**	**A**

10.3.1.5 Electricity generation in wood biomass CHP plants

10.3.1.5.1 Guidelines and mitigation measures

Air

When siting facilities for the generation of electricity in CHP plants fuelled by wood biomass, the following mitigation measure must be applied: it is necessary to use a method whereby the concentration of total dust in flue gases does not exceed 20 mg/m^3.

As a measure of the sub-programme of renewable energy sources, the generation of electricity in CHP plants using wood biomass is assessed as having environmental impact significance grade C with regard to its impacts on air.

Climatic factors

When planning or siting facilities for the generation of electricity in CHP plants using wood biomass, the following guideline must be followed: the carbon footprint of heat and electricity generation should not exceed 100 g CO_2 eq/kWh_e or 100 g CO_2 eq/kWh_t. GHG emissions caused by the preparation of WB fuel must also be factored into the carbon footprint.

As a measure of the sub-programme of renewable energy sources, the generation of electricity in CHP plants using wood biomass is assessed as having environmental impact significance grade A with regard to its impacts on climatic factors.

Landscape

When planning the generation of electricity in CHP plants fuelled by wood biomass-fuelled it must be ensured that the use of forest biomass is consistent with the condition of growing stock and the increment of growing stock in forests, and that the utilisation of forest biomass has no harmful effects on the condition of forests and their ecological functions and, consequently, on forest landscape features. In this case, the impact on the landscape is assessed as insignificant, provided that mitigation measures are implemented or the conditions fulfilled (grade C),

Material assets

The planning and siting of wood biomass-fuelled CHP plants for electricity generation should follow the guideline that the use of WB for energy generation purposes is subordinate to the use of forest biomass in the wood processing industry and is oriented towards the utilisation of waste forest biomass or lower-grade forest biomass and the use of solid fuels produced from waste wood products.

As a measure of the sub-programme of renewable energy sources, the generation of electricity in CHP plants using wood biomass is assessed as having environmental impact significance grade A with regard to its impacts on material assets.

10.3.1.5.2 Overall assessment of significant impacts on the environment caused electricity generation in wood biomass CHP plants

Table 3: Assessment of significant environmental impacts caused by electricity generation in wood biomass CHP plants

Measure / significant impacts	Air	Climatic factors	Landscap e	Material assets
Electricity generation in wood biomass CHP plants	**C**	**A**	**C**	**A**

10.3.1.6 Electricity generation from landfill gas, other biogases and biogas from biological treatment plants

10.3.1.6.1 Guidelines and mitigation measures

<u>Air</u>

When planning and siting facilities for the generation of electricity from landfill gas, other biogases and biogas from biological treatment plants, the following guideline must be followed: it is necessary to ensure a large enough distance (more than 350 m) from residential buildings and other buildings occupied by people for longer periods of time, so that any atmospheric emissions of substances which cause unpleasant odours may not affect the well-being of people.
As a mitigation measure for the generation of electricity from landfill gas, other biogases and biogas from biological treatment plants, it is necessary to ensure the reduction of atmospheric emission of substances which cause unpleasant odours by treating the waste air with active biological filters.

The generation of electricity from landfill gas, other biogases and biogas from biological treatment plants as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade C as regards its impact on air, provided that the implementation of mitigation measures for reducing the emission of unpleasant odours is ensured.

<u>Climatic factors</u>

When planning or siting facilities for the generation of electricity from landfill gas, other biogases and biogas from biological treatment plants, the following guideline must be followed:

- the carbon footprint of heat and electricity generation should not exceed 150 g CO_2 eq/kWh$_e$ or 150 g CO_2 eq/kWh$_t$,
- the heat generated should be used in the greatest extent possible for technological purposes or for the heating of interiors in the locality of biogas production.

As a measure of the sub-programme of renewable energy sources, the generation of electricity from landfill gas, other biogases and biogas from biological treatment plants is assessed as having environmental impact significance grade A with regard to its impact on climatic factors.

10.3.1.6.2 Overall assessment of environmental impacts caused by the generation of electricity from landfill gas, other biogases and biogas from biological treatment plants

Table 23: Assessment of significant environmental impacts caused by electricity generation from landfill gas, other biogases and biogas from biological treatment plants

Measure / significant impacts	Air	Climatic factors
Landfill gas	**C**	**A**
Other biogases (waste processing, the processing of waste of plant and animal origin in agriculture)	**C**	**A**
Biogas from biological treatment plants	**C**	**A**

10.3.2 Heating systems using RES:

10.3.2.1 Geothermal heating systems

10.3.2.1.1 Guidelines and mitigation measures

Water

From the point of view of impact on water, the generation of heat in geothermal heating systems as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade C, provided that the mitigation measure ensuring the reinjection of the geothermal heat conduction medium is implemented.

Climatic factors

The generation of heat in geothermal heating systems as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

Material assets

In the planning and siting of geothermal heating systems, the following guideline should be followed: the use of groundwater in geothermal heating systems should not encroach on the water rights conferred in the impact area of groundwater harnessing.

The generation of heat in geothermal heating systems is a measure of the sub-programme of renewable energy sources, which is assessed as having environmental impact significance grade A as regards its impact on material assets.

10.3.2.1.2 Overall assessment of significant impacts on the environment caused by the generation of heat in geothermal heating systems

Table 44: Assessment of significant impacts on the environment caused by the generation of heat in geothermal heating systems

Measure / significant impacts	Water	Climatic factors	Material assets
Generation of heat in geothermal heating systems	**C**	**A**	**A**

10.3.2.2 Solar thermal collectors

10.3.2.2.1 Mitigation measures and guidelines

<u>Cultural heritage</u>

The impacts of the measure on cultural heritage may be defined as insignificant, provided that mitigation measures are implemented or that the conditions - appropriately defined provisions of spatial planning documents - are met (grade C).

The spatial planning documents should lay down the conditions for spatial implementation in such a way that will make the installation of solar thermal collectors on cultural heritage structures or in cultural heritage areas and their impact areas impermissible, or stipulate the assessment of the acceptability of respective cases and the provision of a technological solution that will ensure the protected heritage features is not affected in any way.

<u>Climatic factors</u>

The generation of heat with solar thermal collectors as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

<u>Landscape</u>

The impacts of the measure on the landscape may be assessed as insignificant as a result of the implementation of mitigation measures or by virtue of meeting the conditions (grade C) – appropriately defined spatial implementation conditions in spatial planning documents, both with regard to the adequate (im)permissibility of solar thermal collectors and with regard to their design.

The spatial planning documents should define the (im)permissibility of siting solar thermal collectors by individual spatial planning units or categories of dedicated use of land. As a rule, it should be permissible to install solar thermal collectors only on structures or in a manner that does not present an independent spatial arrangement in the landscape, but part of a comprehensive spatial arrangement (e.g. of an infrastructural or industrial facility, rehabilitation).

10.3.2.2.2 Overall assessment of significant impacts on the environment caused by the generation of heat with solar thermal collectors

Table 25: Assessment of significant environmental impacts caused by the generation of heat with

Measure / significant impacts	**Cultural heritage**	**Climatic factors**	**Landscap e**
Solar thermal collectors	C	A	C

10.3.2.3 Heating systems using wood biomass

10.3.2.3.1 Mitigation measures and guidelines

<u>Air</u>

For the heating of buildings or settlements, it is necessary to ensure the implementation of the mitigation measure of flue gas purification or the use of a wood biomass burning method in which the concentration of total dust in flue gases does not exceed 20 mg/m^3 for small combustion plants, and 30 mg/m^3 for medium-sized combustion plants.

As a measure of the sub-programme of renewable energy sources, the generation of heat in heating systems using wood biomass is assessed as having environmental impact significance grade C as regards its impact on air.

<u>Climatic factors</u>

The generation of heat in heating systems using wood biomass as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

<u>Landscape</u>

The impact on the landscape is assessed as insignificant, provided that mitigation measures relating to the sustainable use of forests and agricultural development (introduction of new crops, agrarian operations for more efficient production) are observed (grade C) and the principles of comprehensive planning of the cultural landscape applied.

Specific mitigation measures adapted to individual landscape areas must be defined by spatial planning documents (by way of spatial implementation conditions for individual units of spatial planning) and by documents prepared on the basis of sectoral regulations for agriculture (rural development programmes or active agricultural land policy programmes) and for forestry (silvicultural plans).

<u>Material assets</u>

When planning the fuel supply of heating systems using wood biomass, the following guideline must be followed: the use of WB for energy generation must be secondary to the use of forest biomass in wood-processing industries and must be oriented towards the use of waste forest biomass or forest biomass of lower quality, as well as towards the use of solid fuels manufactured from waste wood products.

As a measure of the sub-programme of renewable energy sources, the use of wood biomass-fuelled heating systems is assessed as having environmental impact significance grade A as regards its impacts on material assets.

10.3.2.3.2 Overall assessment of significant environmental impacts caused by heating systems using wood biomass

Table 25: Assessment of significant environmental impacts caused by heating systems using wood biomass

Measure / significant impacts	Air	Climatic factors	Landscap e	Material assets
Boilers powered by wood biomass (WB) in households, 67,800 units	**C**	**A**	**C**	**A**
WB-powered boilers in the service industries, 7,700 units	**C**	**A**	**C**	**A**
WB-powered boilers in industry, 130 units	**C**	**A**	**C**	**A**
WBDH systems (> 1MW), 42 systems	**C**	**A**	**C**	**A**
Local WBDH systems (< 1MW), 280 systems	**C**	**A**	**C**	**A**

10.3.2.4 Heat pumps for heating interiors

10.3.2.4.1 Mitigation measures and guidelines

Water

Guidelines: the projected use of heat pumps to the extent projected by the sub-programme of renewable energy sources requires the issue of special regulations for the protection of groundwater that would stipulate the technical conditions for the exploitation of heat from aquifers. These regulations should primarily stipulate the properties of the pipelines and medium for conducting heat from an aquifer, as well as the obligation to remove the pipelines from aquifers once heat pumps are no longer in use.

In the use of heat pumps, the following mitigation measures need to be implemented:

- groundwater or surface water should not be used directly for the conduction of heat from a groundwater aquifer or surface water body,
- it is necessary to apply technical solutions that will prevent the heat conduction medium from spilling into the aquifer,
- a heat conduction medium must be used that will have no harmful effects on the water status in the event of leaking,
- after the heat pumps are no longer in use, all the equipment fitted into the aquifer must be removed,
- heat pumps should not be installed in important nature protection areas.

From the point of view of impact on water, the use of heat pumps for interior heating as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade C, provided that the mitigation measures are implemented.

Climatic factors

Guideline: the use of heat pumps for the heating of interiors should be aimed at those settlement areas where the use of biomass for interior heating is limited or made impossible by the pollution of ambient air.

The use of heat pumps for the heating of interiors as a measure of the sub-programme of renewable energy sources is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

10.3.2.4.2 Overall assessment of significant impacts on the environment caused by the use of heat pumps for heating interiors

Table 27: Assessment of significant impacts on the environment caused by the use of heat pumps for heating interiors

Measure / significant impacts	Water	Climatic factors
Heat pumps, 53,000 units, with a total heat output of 10 TJ	C	A

10.4 Local energy supply sub-programme

10.4.1 Mitigation measures and guidelines

<u>Air</u>

District heating is a measure of the local energy supply sub-programme, which is assessed as having environmental impact significance grade A as regards its impact on air, since it improves the quality of ambient air and contributes to a reduction in national emissions of pollutants.

<u>Climatic factors</u>

District heating is a measure of the local energy supply sub-programme which is assessed as having environmental impact significance grade A, which means an opportunity to improve the environmental status in terms of climatic factors.

10.4.2 Overall assessment of the environmental impacts of the local energy supply sub-programme

Table 28: Assessment of the environmental impacts of the local energy supply sub-programme

Measure / significant impacts	Air	Climatic factors
Connecting users to the network	A	A
Expanding district heating networks	A	A
Efficient use of energy in district heating and cooling systems	A	A
Construction of district cooling systems	A	A
Construction of DH systems:	A	A

- small district heating systems with an average thermal power for the generation of 500 kW, - larger systems with an average size of 4 MWt		
Utilising waste for energy purposes (the measures are included in operational programmes for waste management)	**C**	**A**

10.5 Sub-programme of combined heat and power generation using NG

10.5.1 Mitigation measures and guidelines

Air

The measures of the sub-programme of combined heat and power generation using NG are, from the point of view of impacts on air, assessed as having environmental impact significance grade A, since they mean an improvement of ambient air quality and a reduction in national emissions of certain pollutants (NO_x, PM, SO_2).

Climatic factors

As regards the impacts on climatic factors, the measures of the sub-programme of combined heat and power generation using NG are assessed as having environmental impact significance grade A, since the resulting GHG emissions are lower than when using liquid and solid fossil fuels, which means they provide an opportunity to improve the environmental status in terms of climatic factors.

10.5.2 Overall assessment of the environmental impacts of the sub-programme of combined heat and power generation using NG

Table 29: Assessment of the environmental impacts of the sub-programme of combined heat and power generation using NG

Measure / significant impacts (replacement or modernisation of old facilities and heat supply systems and new systems):	Air	Climatic factors
CHP using NG in industry: 165 MW by 2020 and 95 MW by 2030	**A**	**A**
CHP using NG in district heating systems - 20 MW by 2020 and 17 MW by 2030 (excluding TE-TOL)	**A**	**A**
CHP using NG in the service industries: 28 MW by 2020 and 27 MW by 2030	**A**	**A**
CHP using NG in households: 11 MW by 2020 and 27 MW by 2030	**A**	**A**

10.6 Electricity generation sub-programme

10.6.1 The generation of electricity from fossil fuels

10.6.1.1 Mitigation measures and guidelines

<u>Natural resources</u>

When planning the generation of electricity from solid fossil fuels, the following guideline should be followed: the ash, including residues from waste gas purification, must be managed in a way that will prevent further soil degradation and ensure the rehabilitation of already degraded soil in the area where the residues of used solid fossil fuels are disposed of.

As a mitigation measure relating to ash generation, its recycling should be ensured to the greatest extent possible (production of building materials or construction fills to remedy the consequences of mining.)

From the point of view of impacts on natural resources, ash management (fly ash, gypsum and slag) is acceptable and assessed as having environmental impact significance grade C, provided that mitigation measures are implemented.

<u>Air</u>

When planning and siting facilities for the generation of electricity from fossil fuels, it must be ensured that the emissions of SO_2, NO_x and $PM_{2.5}$ in the 2000 - 2020 period indicate approximately the same trend of reduction as projected for the energy generation sector in EU25 in accordance with the Thematic Strategy on Air Pollution in the EU. Provided that this condition is met, the generation of electricity from fossil fuels in respect of its impacts on air is assessed as being acceptable for the environment and graded C for its significance of environmental impact, which means an improvement of the environmental status in terms of ambient air pollution.

<u>Water</u>

When planning and siting facilities for the generation of electricity from fossil fuels, it is necessary to ensure that the cooling of energy facilities for the generation of electricity is effected with cooling systems using water as a secondary cooling medium which mostly recirculates. Provided that this mitigation measure is implemented, the generation of electricity from fossil fuels is assessed in respect of its impacts on water as being acceptable for the environment and graded C for its significance of environmental impact, which means an improvement of the environmental status of water.

Climatic factors

In the planning, siting and operation of facilities for the generation of electricity from fossil fuels, the implementation of the following mitigation measures must be ensured: the generation of electricity must contribute to the mitigation of climate changes to an extent that does not deviate much from the target set out in the EU climate and energy package of legislation on greenhouse gas emissions from industrial and energy facilities which are included in the European trading scheme for greenhouse gas emissions rights (at least a 21% reduction in greenhouse gas emissions by 2020)

Provided that these mitigation measures are implemented, the generation of electricity from fossil fuels is assessed in respect of its impacts on climatic factors as being acceptable for the environment and graded C for its significance of environmental impact, which means an improvement of the environmental status in terms of climatic factors.

10.6.1.2 Overall assessment of significant environmental impacts caused by the generation of electricity from fossil fuels

Table 30: Assessment of significant environmental impacts caused by the generation of electricity from fossil fuels

Measure / significant impacts	natural resources - waste	Air	Water	Climatic factors
TEŠ6, 549 MW, in 2014	**C**	**C**	**C**	**C**
TET: further exploitation of the location for energy purposes: (290 MW option, combined cycle power plant, in 2015, 130-190 MW option, tertiary reserves etc.)	**C**	**C**	**C**	**C**
TE-TOL, up to 134 MW in 2015 and up to 134 MW by 2018	**C**	**C**	**C**	**C**
TEB, replacement of existing units (e.g. 153 MW, gas turbine, 2015)	**C**	**C**	**C**	**C**
New sources of tertiary reserves (existing energy-generating and industrial locations), 170 MW by 2020	**C**	**C**	**C**	**C**
CCPP, two combined cycle plants, 2 x 396 MW, from 2020 to 2030 (existing industrial and energy generation locations)	**C**	**C**	**C**	**C**

10.6.2 Electricity generation from hydroelectric power plants

10.6.2.1 Mitigation measures and guidelines

Natural resources

When siting hydroelectric power plants, water retention structures must be sited outside areas of the best farmland, and substitute habitats must be planned outside farmland areas in which agricultural policy measures are being implemented and which are used to produce food.

As a measure of the electricity generation sub-programme, electricity generation in HPPs is assessed as having environmental significance impact grade B as regards its impacts on natural resources.

<u>Water</u>

The siting of a hydroelectric power plant in an aquatic environment must pass the assessment of impacts on waters based on the criteria for applying exceptions for new (planned) changes in the physical properties of a surface water body by virtue of implementing sustainable development activities, as set out in Article 4(7) of Directive 2000/60/EC, where it is necessary to observe the environmental objectives for water bodies, or less strict objectives for existing heavily modified water bodies.

According to the provisions of the Framework Water Directive and the Decree on the detailed content and method of drawing up a water management plan (Official Gazette of the RS, Nos. 26/06, 5/09), deviation from environmental objectives for water bodies is permitted in the following two cases:

- the failure to achieve a good status of groundwater bodies (GB), a good environmental status or good ecological potential of surface water bodies (SWB) or the deterioration of a body of surface water or groundwater is permitted in cases when these are caused by new changes in the physical properties of SWB or a change in the water table of GB, and when the conditions laid down by the Decree on the detailed content and method of drawing up a water management plan are met.
- the deterioration of SWB status from very good to good is permitted in cases when this is caused by new sustainable development activities and when the conditions laid down by the Decree on the detailed content and method of drawing up a water management plan are met.

In accordance with the Framework Water Directive, deviations from environmental objectives may be tolerated for two reasons, namely:

- the consequences of new activities of sustainable development or
- the consequences of new modifications of the physical properties of SWB.

While the construction of hydroelectric power plants defined in NEP constitute an activity of sustainable development, it involves water bodies which, in accordance with the Rules on the designation and classification of surface water bodies (Official Gazette of the RS, Nos. 63/05, 26/06), do not have a very good status. However, since the construction of hydroelectric power plants planned in NEP will cause new modifications to the physical properties of surface water bodies, deviation from environmental objectives for water bodies is permitted as a consequence of new modifications of the physical properties of water bodies if the conditions laid down by the Decree on the detailed content and method of drawing up a water management plan are met.

Less strict objectives

On the border section of the Mura River with Austria and on its inner section from Radenci to the motorway bridge at Vučja vas, no less strict objectives are specified for the water bodies in the basin in accordance with the Rules on the designation and classification of surface water bodies (Official Gazette of the RS, Nos. 63/05, 26/06).

Apart from that, the study "The regulation of the water regime on the Mura River in connection with the possibility of using the river for energy generation"[17] indicates that the border section of the Mura River with Austria and its inner section from Radenci to the motorway overpass at Vučja vas might exhibit some characteristics of a heavily modified water body.

Early activities affecting the water regime of the Mura go back to the 16th century. More extensive regulation of the water regime of the border Mura took place between 1875 to 1891, when larger regulation measures were carried out. The once branched channel was straightened and narrowed into the main channel. The channel's meanders were dug through and the banks of the channel were protected (fascine stone mesh, fascines, guiding structures, etc.).

Regulation work continued with the greatest intensity after the floods of 1965, 1966 and 1970 with the construction of flood levees in order to reduce the extent of flooding, which during extremely high water levels amounted to approx. 20,000 ha.

The existing condition of water regulation structures is related to the following issues:

- Except in restored sections, the technical condition of flood levees does not ensure stability during floods. The levees are non-homogenous and too permeable; seepage through the levees could cause their collapse. The levees are too low; water levels at a flow of Q100 are higher than those taken into account in the planning and construction of levees. The left embankment at Radenci is leaking at the bottom; its stability is threatened.
- Due to the regulation carried out (increasing the lengthwise fall of the stream by cutting off meanders, the concentration of a once multi-branched, braided stream in a basic channel) is subject to a strong trend of deepening. Due to increased speeds and depths during sediment transporting flows, the deepening is greatest in the section of the border Mura, with an average depth increase of 0.5m, and locally up to 1.5m (Trate – Cmurek bridge).

An additional cause of deepening is the construction of hydroelectric power plants on the Austrian Mura (17 plants between Leoben and Šentilj), which practically cut off the transport of bed sediment (gravel) into the downstream section, resulting in a negative ratio between the inflow and outflow of gravel (the deficit from 1970 to 2000 is estimated at 0.9 million m^3).

The water management issues may be summarised in the following problems:

- insufficient flood safety due to levees being too low and porous
- the deepening of the Mura's bed, the consequences of which are:
    - reduced water levels during low flow,
    - the disconnection of old river branches and mill races at low water levels,
    - reduced groundwater table.

Eligibility for exceptions under Article 4(7) of Directive 2000/06/EC

In the planning and siting of new HPPs, the following guideline should be followed: for each individual HPP, a change in the hydromorphological status of a surface water body must be justified in accordance with the procedures required for exceptions under Article 4(7) of Directive 2000/06/EC, which includes answering the following questions:

[17] *Urejanje vodnega režima reke Mure v povezavi z možnostjo energetske izrabe reke* (The regulation of the water regime on the Mura River in connection with the possibility of using the river for energy generation) No. 3148/09, October 2009; VGB Maribor)

1. will all the technically feasible and proportionate measures be taken to mitigate the harmful effects of the projected activity on the water status? (the exception is eligible if the answer is YES),
2. can the environmental objectives of sustainable development, on account of which the water body is hydromorphologically changed, be achieved with other technically feasible projects at insignificantly higher costs and in a more environment-friendly way? (the exception is eligible if the answer is NO),
3. is the project in the public interest, which means that the advantages of environmental and social benefits for the achievement of a good ecological status of the water body are smaller than the benefits presented by the changed hydro-morphological properties for human health, safety and property or sustainable development? (the exception is eligible if the answer is YES),
4. does the project prevent the achievement of a good ecological status of water in other water bodies in the same basin? (the exception is eligible if the answer is NO),
5. is the project in compliance with other EC legislation? (the exception is eligible if the answer is YES),
6. does the project ensure at least such water status as stipulated by current EU legislation? (the exception is eligible if the answer is YES).

Grounds for answers to questions related to the admission of exceptions under Article 4(7) of Directive 2000/60/EC

Grounds for the answer to Question 1: when siting HPPs in aquatic environments, the national spatial plan and a comprehensive assessment of the plan's impacts will ensure that all technically feasible and proportionate measures are implemented to mitigate harmful effects on the status of waters.

Grounds for the answer to Question 2: the answers to the questions posed in relation to the eligibility for exception under Article 4(7) of Directive 2000/60/EC are given in the RES AP for the period 2010-2020[18].

Examination of the available potential of renewable energy sources

RES AP provides a detailed analysis of the potential of exploiting renewable resources in Slovenia, the technical and natural limitations for their exploitation, the costs of their exploitation, and the feasibility of exploiting the available potential until 2020. The analysis conclusions are:

1. exploitation of forest biomass: forest biomass is one of the larger renewable natural sources for the generation of energy. The potential of this natural resource is defined by the annual wood increment in Slovenian forests and there are two technical limitations to the exploitation of this natural resource for energy purposes:

- in light of the sustainable use of natural resources, priority must be given to the use of wood for product manufacture; it is only prudent to exploit the residues of industrial wood processing for energy.
- as the technologies for energy recovery from wood residue until 2020 that are available on the market do not allow the use of this natural resource without heat consumption, the generation

[18] Renewable Energy Sources Action Plan for the 2010 – 2020 Period; July 2010

of electricity from forest biomass in combined heat and power plants is also limited by the option of using heat primarily for the heating of interiors.

Since a wider application of methods, including the gasification or liquefaction of carbon from forest biomass, may not be expected before 2020, the RES AP includes projects exploiting forest biomass for energy which have a capacity limited by the demand for heat combined with energy-efficient heating of interiors or the efficient use of heat in industry;

2. exploitation of crop biomass: in the RES AP, the production of crops for the production of first-generation biofuels (the use of vegetable oils for biofuel production) is assessed as unsustainable exploitation of renewable natural sources. Farmland used to grow crops for the production of biofuels significantly reduces the availability of the already limited amount of farming land for the production of crops intended for human nutrition.

3. exploitation of geothermal energy: there has been insufficient research into the potential of exploiting geothermal energy, but it is anticipated that access to this renewable natural resource is technically challenging. RES AP foresees a smaller use of geothermal energy by generating heat for the heating of interiors, which has no visible share in the total balance of renewable sources by 2020;

4. exploitation of wind energy: due to lower wind speeds, access to wind energy potential in Slovenia is only economically viable in locations where the annual average wind speed exceeds 4.5 m/s and the operating time of a wind farm is more than 1800 hours per year. In the RES AP, the projected scale of wind farm construction until 2020 is defined on the basis of examined available locations for the siting of wind farms, where the factors considered included nature protection limitations, as well as the fact that Slovenia has no tradition in this kind of renewable natural resource exploitation.

5. exploitation of solar energy: RES AP foresees the exploitation of solar energy for the generation of both heat and electricity. The energy potential of exploiting solar energy is limited particularly due to:

- the short operating time of solar thermal collectors (the average for solar power stations is around 1,000 hours a year);
- suitable locations for the installation of solar thermal collectors (primarily on built-up land and roofs of buildings) and
- the currently still high costs per unit of electricity output.

6. exploitation of the gravitational potential of water: since the generation of electricity in hydroelectric power plants has a long tradition in Slovenia, and in view of the restrictions imposed by nature protection, there is relatively little potential still available, but the operating time of hydroelectric power plants (between 3,500 and 4,500 hours a year) makes the potential of this renewable energy source for the generation of electricity the greatest. In the RES AP, the generation of electricity in hydroelectric power plants has a prominent place among renewable energy sources by 2020 due to:

- the lowest costs (of all renewable sources, hydroelectric power plants have the longest annual operating times and the lowest investment costs, calculated on the installed power of the electricity generator) and
- the high level of documentation preparation for the siting and construction of HPP facilities.

Targets for the use of renewable energy sources

The targeted 25 per cent share of RES in gross final energy consumption by 2020 is a binding and challenging goal for Slovenia in the Climate and Energy Package enforced by Directive 2009/28/EC. Over the long term, the target is expected to tighten by 2050, with an interim target in 2030 due to the adopted decisions of the EU to change to a low-carbon society by 2050. Slovenia's target RES share and starting point are among the highest in the EU.

In 2008, the share of RES in final energy consumption amounted to 14.9%. In 2005, it was higher by 1.0 percentage point, but the index declined because the growth of final energy consumption exceeded the growth of final RES consumption[19]. In 2008, Slovenia was 10.1 percentage points short of the target (25% in 2020), which means that the share will have to be annually increased by a good 0.8 of a percentage point in 12 years to reach the target. The share of RES in the generation of heat and cold was 20%, in the generation of electricity 29.7%, and in transport 1.3% relative to gross final energy consumption in these segments of use.

Measures for the efficient final consumption of energy will ensure a reduction in gross final energy consumption of 6 per cent from 2008 to 2030.

The transport share of RES will increase to the mandatory 10 per cent by 2020, but will not increase subsequently. A share above 10% is not feasible due to food safety objectives. With the extremely high share of transport in final consumption (37% in 2020), the low share of RES in this sector means that the targets in the other two segments of consumption need to be set even higher.

The share of heat generation from RES will increase considerably in the 2008 – 2030 period, specifically from 20.1% to 37.4%. Wood biomass will continue to predominate in the future, and the use of geothermal and solar energy will gain ground increasingly. By 2030, the overall consumption of heat will fall by 16% compared to 2008. While the reduction in heat consumption makes a positive contribution to improving the share of RES by virtue of reducing final energy consumption; this also lowers the upper limit for absolute RES quantities in this sector.

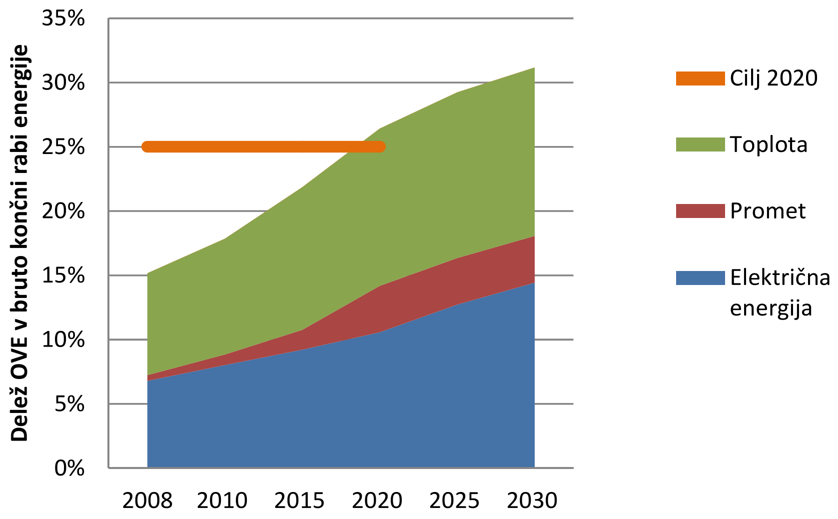


Figure 26: Share of RES in gross final energy consumption; the role of electricity, heat and transport in the overall share of RES for the NEP scenario

In 2008, most heat was used by industry (44%). After a reduction in 2010 due to the economic crisis, its share increases further to 54% by 2030. The increasing share is a consequence of the growth of heat consumption in industry after 2010, whereas overall consumption is falling. The share of RES at

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[19] The production of electricity in HPPs is normalized

the beginning of the observed period amounts to 8%; rises to 16% by 2020; and to 19% in 2030. For low-temperature heat consumption, the share of RES in industry increases to around 50% by 2030 (particularly through the exploitation of biomass, geothermal and solar energy and RES from waste).

In other segments of heat consumption in industry, a greater expansion of RES will be feasible indirectly in the long term with the greater use of electricity or second-generation biofuels. In 2020, industry contributes 11% to the overall share of RES in gross final energy consumption.

The second most important consumers of heat are households, whose share in heat consumption reduces from 40% to 33% from 2008 to 2030. In this period, energy consumption falls by 31%. Despite the reduction in energy consumption, the use of RES grows until 2020, but falls after this year. The share of RES increases from 39% to 56% in 2020 and to 61% in 2030. Households contribute 29% of the overall RES share in 2020.

The remaining consumption (the service sector and agriculture) accounts for only 16% of heat consumption in 2008. By 2030, the share falls to 14%. The consumption of energy falls by 29%. The share of RES grows from 6% to 36% by 2020 and to 53% by 2030.

An important contribution to the increase in RES use is made by the use of biofuels in agriculture to power tractors.

The remaining consumption contributes 7% to the overall RES share in 2020.

Table 31: Use of RES for the NEP scenario by source and designated use

[PJ]	INT						indeks	%/a	indeks	%/a	indeks	%/a
	2008	2010	2015	2020	2025	2030	2030/08	2030/08	2020/10	2020/10	2030/20	2030/20
Bruto končna raba energije	**230,44**	**206,84**	**214,08**	**217,39**	**215,61**	**217,48**	**94**	**-0,3%**	**105**	**0,5%**	**100**	**0,0%**
Električna energija	53,48	49,35	55,26	57,56	58,08	59,31	111	0,5%	117	1,6%	103	0,3%
Promet	86,00	72,80	76,69	80,52	80,45	81,95	95	-0,2%	111	1,0%	102	0,2%
Toplota	90,96	84,69	82,13	79,30	77,07	76,22	84	-0,8%	94	-0,7%	96	-0,4%
Raba OVE	**34,95**	**36,92**	**46,80**	**57,43**	**63,06**	**67,79**	**194**	**3,1%**	**156**	**4,5%**	**118**	**1,7%**
Električna energija	**15,64**	**16,61**	**19,74**	**22,98**	**27,45**	**31,39**	**201**	**3,2%**	**138**	**3,3%**	**137**	**3,2%**
Hidro energija	14,46	15,34	16,67	18,75	20,67	22,70	157	2,1%	122	2,0%	121	1,9%
Geotermalna energija	0,00	0,00	0,00	0,00	0,65	0,65	/	/	/	/	/	/
Sončna energija	0,01	0,04	0,34	1,26	2,20	3,30	48.919	32,5%	2.820	39,6%	262	10,1%
Vetrna energija	0,00	0,01	0,54	0,79	1,67	2,71	/	/	12.050	61,5%	344	13,2%
Les in druga trdna bioma:	0,85	0,69	1,12	1,14	1,31	1,14	134	1,3%	164	5,1%	100	0,0%
Bioplin	0,32	0,52	1,29	1,34	1,32	1,30	403	6,5%	258	9,9%	97	-0,4%
Promet	**1,03**	**1,69**	**3,28**	**7,85**	**7,79**	**7,89**	**765**	**9,7%**	**465**	**16,6%**	**101**	**0,1%**
Biodizel in bioetanol	1,03	1,69	3,28	7,85	7,79	7,89	765	9,7%	465	16,6%	101	0,1%
Toplota	**18,27**	**18,63**	**23,78**	**26,60**	**27,82**	**28,50**	**156**	**2,0%**	**143**	**3,6%**	**107**	**0,7%**
Neposredna raba	**17,84**	**17,92**	**22,16**	**24,21**	**24,87**	**25,32**	**142**	**1,6%**	**135**	**3,1%**	**105**	**0,4%**
Lesna biomasa	16,64	16,53	18,35	18,12	17,24	16,33	98	-0,1%	110	0,9%	90	-1,0%
Industrija	*2,99*	*3,03*	*3,95*	*4,73*	*5,18*	*5,51*	*184*	*2,8%*	*156*	*4,6%*	*116*	*1,5%*
Gospodinjstva	*13,57*	*13,35*	*13,61*	*12,38*	*10,70*	*9,31*	*69*	*-1,7%*	*93*	*-0,7%*	*75*	*-2,8%*
Storitve	*0,03*	*0,10*	*0,74*	*0,94*	*1,28*	*1,43*	*4.137*	*18,4%*	*898*	*24,6%*	*152*	*4,3%*
Kmetijstvo	*0,05*	*0,05*	*0,06*	*0,07*	*0,08*	*0,09*	*193*	*3,0%*	*139*	*3,4%*	*133*	*2,9%*
Ostali OVE	1,19	1,39	3,81	6,09	7,63	8,99	754	9,6%	438	15,9%	147	4,0%
Industrija	*0,12*	*0,10*	*0,33*	*0,56*	*0,80*	*1,07*	*870*	*10,3%*	*561*	*18,8%*	*190*	*6,6%*
Gospodinjstva	*0,33*	*0,51*	*1,77*	*2,84*	*3,74*	*4,52*	*1.355*	*12,6%*	*558*	*18,8%*	*159*	*4,7%*
Storitve	*0,71*	*0,75*	*1,20*	*1,47*	*1,81*	*2,06*	*291*	*5,0%*	*196*	*6,9%*	*140*	*3,4%*
Kmetijstvo	*0,03*	*0,03*	*0,51*	*1,21*	*1,27*	*1,34*	*4.531*	*18,9%*	*4.161*	*45,2%*	*110*	*1,0%*
Proizvodnja toplote v DO	**0,43**	**0,71**	**1,62**	**2,38**	**2,95**	**3,19**	**732**	**9,5%**	**338**	**12,9%**	**134**	**2,9%**

Table 32: Shares of RES for the NEP scenario by source and designated use

	2008	2010	2015	2020	2025	2030	2008	2010	2015	2020	2025	2030
Delež OVE	**15,2%**	**17,9%**	**21,9%**	**26,4%**	**29,2%**	**31,2%**						
Sektorski deleži OVE												
Električna energija	29,3%	33,6%	35,7%	39,9%	47,3%	52,9%						
Promet	1,2%	2,3%	4,3%	9,7%	9,7%	9,6%						
Toplota	20,1%	22,0%	29,0%	33,5%	36,1%	37,4%						
Delež posameznih virov							[PJ]					
Hidro energija	41,4%	41,6%	35,6%	32,6%	32,8%	33,5%	14,46	15,34	16,67	18,75	20,67	22,70
Geotermalna energija	2,6%	3,0%	5,3%	6,0%	7,5%	7,7%	0,92	1,11	2,48	3,42	4,74	5,21
Sončna energija	0,4%	0,7%	2,0%	4,1%	6,2%	8,3%	0,15	0,24	0,94	2,33	3,89	5,62
Vetrna energija	0,0%	0,0%	1,2%	1,4%	2,6%	4,0%	0,00	0,01	0,54	0,79	1,67	2,71
Les in druga trdna biomasa	51,3%	48,4%	44,6%	37,2%	33,5%	29,9%	17,93	17,89	20,88	21,35	21,15	20,25
Bioplin	0,9%	1,4%	2,8%	2,3%	2,1%	1,9%	0,32	0,52	1,29	1,34	1,32	1,30
Biogoriva	3,3%	4,9%	8,6%	16,5%	15,3%	14,7%	1,15	1,81	4,02	9,45	9,63	9,99
SKUPAJ	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**34,95**	**36,92**	**46,80**	**57,43**	**63,06**	**67,79**

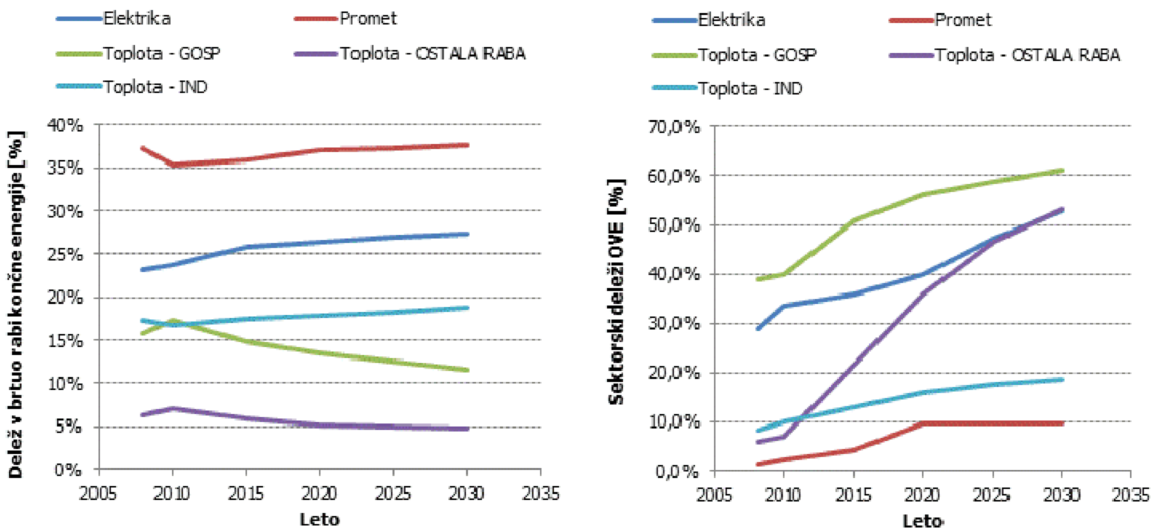


Figure 27: The sectors' share of energy consumption in gross final energy consumption (left) and sectoral shares of RES (right)

By 2020, the share of RES in gross final electricity consumption increases to almost 53% by building large HPPs; exploiting wood biomass by means of co-incineration with fossil fuels; building dispersed small generation units for the harnessing of solar, wind and water energy (small HPPs); wood biomass in CHP plants with a high utilisation rate (district heating and other sectors); biogases and geothermal energy. The structure of electricity generation from RES will change considerably from 2008 to 2030: the share of generation from hydroelectric power plants will fall from 92% to 71.4%, increase from less than one per cent to 10.4% for solar energy, and to 8.5% for wind energy, while the generation of electricity from biomass co-incinerated with fossil fuels will decrease due to the gradual reduction in the use of solid fossil fuels, while wood biomass CHP plants will increase in industry and district heating systems, with an overall share of approx. 10% in 2020 and 7.7% in 2030.

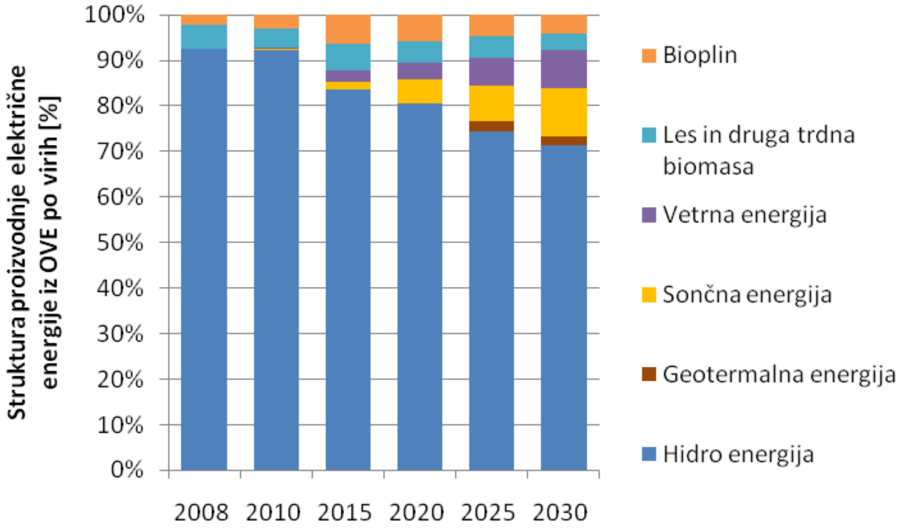
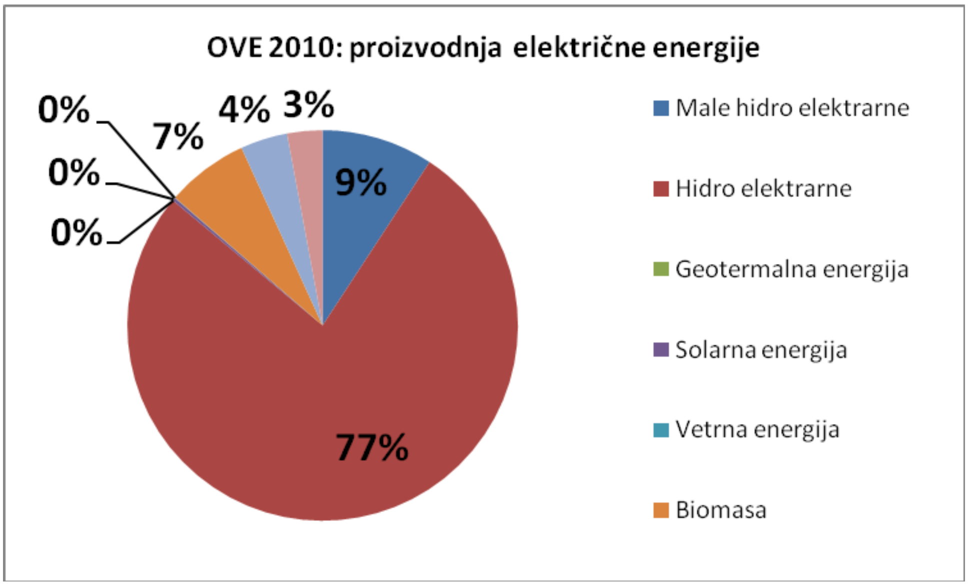
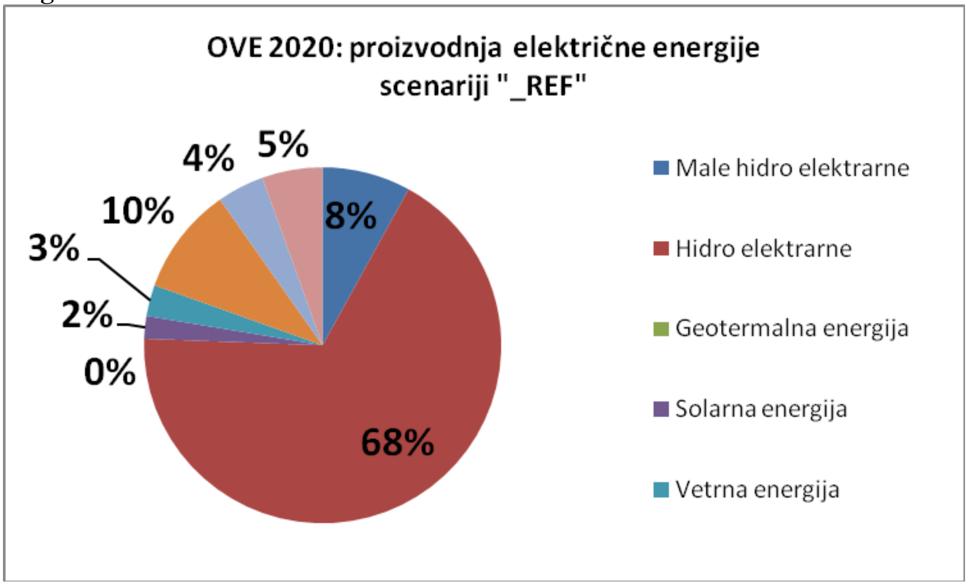


Figure 28: Share of RES in gross final energy consumption; the role of electricity, heat and transport in the overall share of RES for the NEP scenario

Despite the expected reduction in the consumption of gross final energy in Slovenia by 2020, new sources of renewable energy need to be ensured to achieve the targeted 25% share of renewable energy sources in final energy consumption. The figure below shows the current shares of RES in electricity generation by type of renewable energy source, and the same shares of RES in 2020, which are designated in NEP scenarios as "_REF" and "_INT".





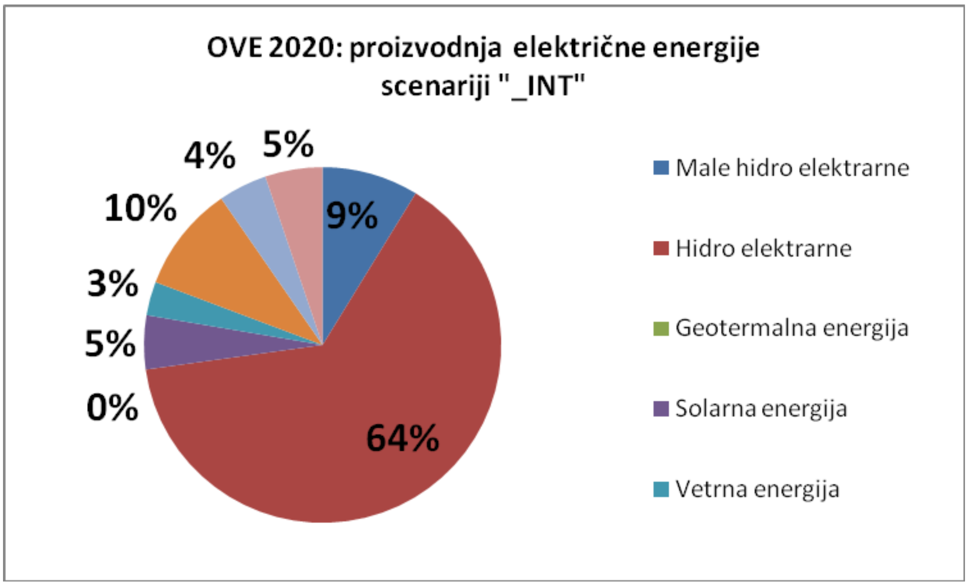


Figure 29: Shares of RES in electricity generation by type of renewable energy source

The charts showing the shares of RES in electricity generation by type of renewable source show that:

- the gravitational potential of surface waters is by far the largest source of renewable energy in Slovenia,
- the gravitational potential of surface waters in Slovenia cannot be replaced with other renewable energy sources despite the intensiveness of introducing RES measures,
- the share of electricity produced by sHPPs and HPPs is thus reduced with measures from the "_REF" and "_INT" scenarios by 10 percentage points ("_REF" scenarios) or 13 percentage points ("_INT" scenarios).

Grounds for the answer to Question 3: the public interest in energy generation from renewable energy sources is defined in detail for the entire EU in the provisions of Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. The enforcement of Directive 2009/28/EC confirmed the mandatory target of a 20% share from renewable energy sources (hereinafter: RES) in the EC's overall final gross consumption of energy by 2020 and the mandatory 10% minimum target which must be achieved by all Member States for the share of biofuels in transport diesel and petrol consumption by 2020. For Slovenia, the achievement of at least a 25% share of RES in final gross consumption of energy by 2020 is stipulated.

In the 2020-2030 period, projected economic growth gives reason to also anticipate a slight growth in gross final consumption of energy in Slovenia, which is why the NEP measures project a growing use of renewable sources in electricity generation, but in such a way that this growth is smallest in the generation of electricity from sHPPs and HPPs, as shown in the figure below.

The EU likewise predicts a continued reduction in GHG emissions in its long-term documents and, in this connection, also the "decarbonisation" of electricity generation. In this process, an increasing role will be played by renewable sources of energy, and also in order to further diversify the sources of energy and reduce import dependence as stressed by the EU in its documents.

The strategic impact assessment[20], which was carried out to assess the consequences of implementing Directive 2009/28/EC, evaluates the costs of implementing this Directive in 2020 for the EU territory and its benefits in terms of impacts on climatic factors, reliability of energy supply, biodiversity, air quality and international relations.

Evaluation of the costs of implementing Directive 2009/28/EC

In the absence of the complete internalisation of external costs and benefits, most forms of renewable energy sources are more expensive than the usual choice of energy of fossil origin or nuclear energy. According to expectations, the difference will decrease by 2020, but not disappear.

At the projected price of energy, which is based on the price of oil (48/barrel), the additional costs of renewable energy sources in the basic scenario of renewable source consumption (scenario with no additional promotion of renewable energy sources) in 2020 are estimated at €13,000,000,000 (billion euros) in comparison with the costs of the same energy. With a 20% share of renewable energy, the additional costs of energy from renewable sources would rise to €24 - €31 billion.

However, these additional energy costs from renewable sources would be almost fully compensated if the price of oil rose to $78/barrel and if GHG emissions were valued at €25/t CO2eq.

Benefits from the perspective of impacts on climatic factors

According to the basic scenario of renewable energy source consumption (scenario with no additional promotion of renewable energy sources), GHG emissions would decrease in 2020 by 430-600m tonnes. With a 20% share of renewable energy, the decrease in GHG emissions would increase to 600-900m tonnes.

Benefits for energy supply

A scenario-based analysis of the implementation of measures from Directive 2009/28/EC (Green-X, PRIMES) shows that the use of fossil fuels in 2020 could be reduced by around 234-300m tonnes/year, 200m tonnes/year of which would be imported.

Oil causes the worst difficulties in terms of supply reliability, especially in transport. A scenario with larger shares of biofuels would be of great help to the EU in improving the reliability of energy supply.

[20] COMMISSION STAFF WORKING DOCUMENT Renewable Energy Road Map SUMMARY OF THE IMPACT ASSESSMENT - SEC(2006) 1720

The reliability of energy supply is just as important in the heating sector, since the latter is also quite dependent on oil and gas.

Benefits for employment, gross national product and export opportunities

The results of a model calculation of the impacts of implementing the measures of Directive 2009/28/EC also factor in the changes in prices that will result from promoting the use of renewable energy sources. It has been shown that GNP would increase from 0.23% to 0.5% for a 20% share of renewable energy sources in 2020 in comparison with the basic scenario of renewable energy resource consumption (scenario with no additional promotion of renewable sources of energy) and that employment would rise from a little less than 0.1% to 0.3%, which means approximately 150,000 to 650,000 jobs.

The modelling of the impacts of implementing measures of Directive 2009/28/EC focuses on the effects of European demand for energy from renewable sources and on the basic working resources required for its generation. However, the active policy on renewable energy sources also creates opportunities for European producers to export this technology.

The export opportunities are the greatest for innovative technologies, but already exist for established technologies as well.

Benefits for biodiversity

Climate changes are the main threat to biodiversity. The positive impact of using energy from renewable sources on GHG emissions makes a positive contribution to biodiversity. However, the consequences of energy generation for local biodiversity should be considered at the same time.

As regards wind energy and biofuels, production processes with a very negative impact on biodiversity should be prevented: for example, the siting of wind turbines should be avoided in narrow passageways crossed by migrant bird routes and the clearing of rainforests should be avoided in the production of palm oil for biodiesel.

To avoid harmful effects on biodiversity, the Commission will formulate guidelines on how to take environmental impacts into consideration in the development of harnessing wind energy, and plan the development of a scheme for biofuel consumption and supply.

Provided that these measures are observed, it may be concluded that the impact of a greatly increased share of renewable energy sources on biodiversity would be above all positive, even if no negative impacts on biodiversity caused by the use of conventional sources of energy are taken into account. In fact, the conventional generation of energy from fossil fuels has considerable effects on biodiversity (oil spills are a case in point). The policy of promoting renewable sources of energy would reduce these effects, since a large share of renewable energy sources means lower consumption of conventional sources of energy.

Benefits for air quality

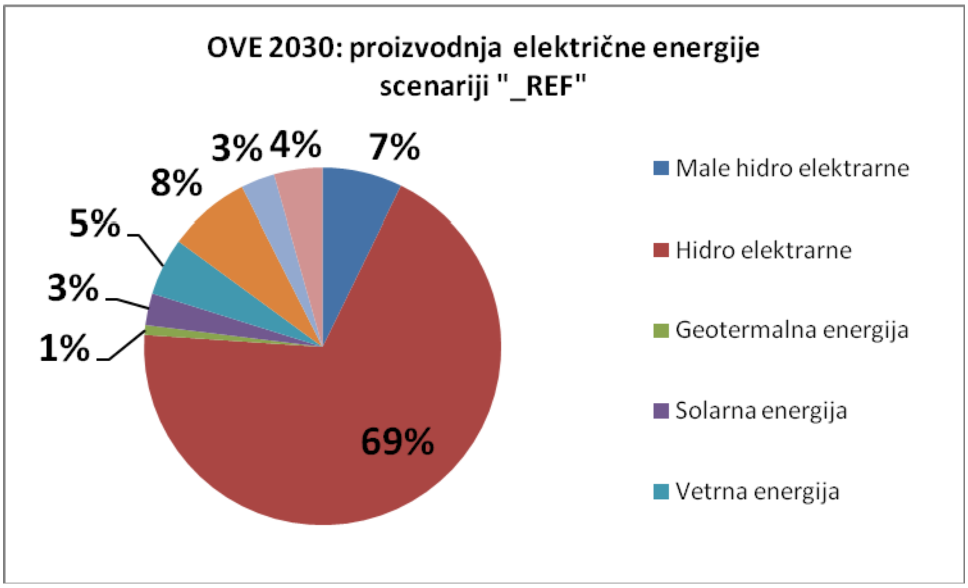
The replacement of fossil fuels and the generation of electricity from renewable sources has an overall positive impact on air quality, especially if coal is replaced. Replacing the usual transport fuels with biofuels has only a minimal effect on air quality, particularly due to strict controls of air pollution caused by road transport.

The replacement of traditional heating systems with biomass heating may have a negative impact on air quality if low-quality equipment is used. To avoid this, all efforts should be supported to ensure that financial incentives are available for high-quality equipment only.

Benefits for international considerations

European demand for biomass, and particularly for biofuels, may help improve trade relations with the trading partners of the European Union, especially those in developing countries, many of which have the means to produce and export biomass and biofuels at competititve prices.

Renewable energy sources could provide an important opportunity to create jobs and develop the countryside in developing countries. The EU's strong policy on renewable energy may thus be considered an important tool in its policies on developing countries.



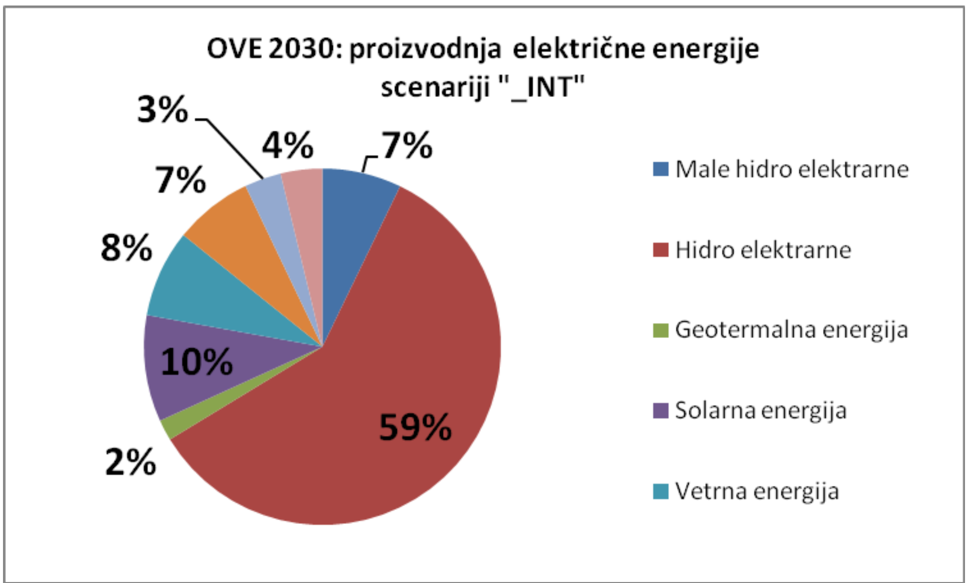


Figure 30: Shares of RES in electricity generation by type of renewable energy source in the 2020 – 2030 period

Directive 2009/28/EC enforced the instruments promoting the use of energy from renewable sources, the benefits of which primarily result from the mitigation of impacts on climate change. The use of energy from renewable sources also has purely economic benefits which result from the lower energy dependence of the EU on imported fossil fuels. The preparation of bases for the adoption of Directive 2009/28/EC included an evaluation of the potential use of renewable sources for each respective EU Member State, and these analyses served as a basis in setting Member State-specific National overall targets for the share of energy from renewable sources in final gross consumption of energy in 2020. The achievement of the share of energy from renewable sources in final gross consumption of energy is defined as one of the goals of sustainable development in the EU, which was announced in the EU Strategy for Sustainable Development

Grounds for the answer to Question 4: the construction of HPPs must be technically - and at reasonable cost - carried out in a way that does not prevent the achievement of a good ecological status of waters in other water bodies of the same river basin, or so that the HPPs have a positive impact on other water bodies if technically feasible. For example, the construction of hydroelectric power plants on the Mura on its border section with Austria to the motorway overpass at Vučja vas on the inner Mura could even contribute to the good volume status of the groundwater body in the impact area of projected HPPs.

The effect of measures preventing the achievement of a good ecological status of waters in other water bodies in the same river basin is assessed in greater detail as part of the process of adopting the national spatial plan and the comprehensive assessment of the plan's impacts.

Grounds for answers to Questions 5 and 6: the construction of new HPPs complies with EC legislation, where the focus should be on legislation relating to water conservation and also on nature conservation objectives. The impacts on water and nature are assessed in greater detail as part of the process of adopting the national spatial plan and the comprehensive assessment of the plan's impacts.

Potential for energy generation on the Mura

The exploitation of the Mura for energy is possible from its border section with Austria to the motorway bridge at Vučja vas on the inner Mura. Trends of river bed deepening and groundwater table lowering are perceptible on the Mura which, as a result, cause the reduction of aquatic and riparian habitats. There are also fewer high flow events, floods of shorter duration and longer droughts, which indicate considerable changes in the drainage regime of the Mura River (Comprehensive survey of the waters in the Mura river basin and their management, Globevnik, 2008). It has been found that, in addition to the reduced frequency of flooding, the main causes of the disappearance of aquatic and riparian habitats on the Mura (Globevnik in Kaligarič 2005) are the severed connections between the main river channel and its branches, the reduction of flood plains, the regulation of tributaries, the reduction in riverside vegetation and the drainage of agricultural land throughout the river basin.

Due to urbanisation, agricultural land reclamation and hydro-technical interventions in the river network in the past, the achievement of a good ecological status of waters depends to a considerable degree on intensive hydrodynamic processes in the river basin of the Mura and the rise in groundwater levels.

The reduced capacity for water retention in the area of the Mura River on the Slovenian-Austrian border led to the preparation of the Basic Water Management Concept for the Border Section of the Mura in 2001. The work centred on preparing a decision-making framework for the prevention of further deepening of the river bed and assurance of flood protection for populated areas, and infrastructural facilities until the next occurrence of 100-year floods and for the long-term dynamic natural development of the water system.

Provided that mitigation measures ensuring the achievement of a good ecological status are implemented, the generation of electricity on the border section with Austria to the motorway overpass at Vučja vas on the inner Mura is assessed as acceptable in terms of impacts on waters and is rated C for its environmental impact, since it could to a certain extent also mean a positive change in the hydromorphological status of the surface water body. The siting of energy facilities should be consistent with the agreements of the inter-governmental commission responsible for the Mura river basin (e.g. the branch of the Mura at Apaško polje).

Energy generation on the middle Sava

Although the ecological status of the water bodies in the basin of the middle Sava is not good, it does not have the characteristics of a heavily modified water body due to urbanisation, agricultural land reclamation and hydro-technical interventions in the area of the water body in the past.

Since activities affecting the basin of the middle Sava do not constitute activities affecting heavily modified water bodies, the following guideline should be followed in the planning and siting of new HPPs: as part of the process of adopting the national spatial plan and the comprehensive assessment of the impacts of this plan, the change in the hydromorphological status of a surface water body needs to be justified for each respective HPP based on the criteria to be applied for exceptions under Article 4(7) of Directive 2000/60/EC (grounds for answers to questions 1, 4, 5 and 6 related to the application of exceptions must be provided).

The mitigation measure relates to the selection of the method of using surface water to produce electricity in HPPs, where run-of-the-river HPPs have priority over HPPs using dams.
If mitigation measures are implemented, the generation of electricity in hydroelectric power plants is environmentally acceptable from the point of view of its impacts on waters and rated C for its environmental impact, which means a permissible modification of the hydromorphological status of a surface water body.

<u>Nature</u>

The impact of HPP construction may result in the direct destruction of aquatic and riparian habitats and constitute a barrier to the passage of aquatic organisms.

The comprehensive assessment of the acceptability of an individual hydroelectric power plant must be carried out at the level of a more detailed plan or project, in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

General mitigation measures for the siting and construction of hydroelectric power plants:

1. Hydroelectric power plants should be sited in a way that prevents their impact on distinctive features of important nature protection areas and their biodiversity (Natura areas, Ramsar sites, IBA, UNESCO Sites, AEI, valuable natural features, protected areas).
2. To achieve the targets of RES AP (at least a 25% share in the balance of final energy by 2020) any future hydroelectric power plants in the basins of the Sava, Drava, Mura and Soča must as a priority be sited outside areas with a protected status.
3. When siting HPPs, habitat types or species habitats should be conserved to a degree that still ensures the good status of qualifying and key HT/species, as well as the habitats of protected and endangered species and priority habitats.
4. Should the activity result in the loss of fish spawning grounds, substitute spawning grounds must be arranged.
5. Before building the dams and other infrastructure in the river's channel, it is necessary to provide a bypass that will enable free migration and genetic exchange, and prevent the isolation of individual populations of aquatic organisms, and also serve as a substitute habitat. The bypass must be designed in a way that imitates the natural waterway system.
6. To ensure the undisturbed reproduction of fish (migration into tributaries to spawn and vice versa) it is necessary to preserve their free passage through tributaries, especially in their outfall sections.
7. A temporary or permanent measure for preserving populations of indigenous fish species in the area of new impoundments is artificial breeding and release into affected waterways.
8. An adequate water table of groundwater needs to be ensured in areas where this is necessary to preserve the good status of important nature protection habitats and HT (e.g. in areas of dry grassland it is necessary to prevent a rise in the groundwater due to HPP construction to an extent that may change the moisture of dry grassland).
9. The existing riparian vegetation should be preserved to the greatest extent possible. Once the activities are completed, the riparian vegetation must be replanted. Indigenous species that originally covered the banks must be used (a continuous belt of trees and shrubs with a strong web of roots). The routes of levees should not follow strictly straight lines and should be designed on both sides at different gradients and dynamically, with intermediate terraces to allow the formation of smaller coves and pools.
10. The dynamic of the river and its bed-load discharge or sedimentation should be preserved to the greatest extent possible.
11. The tributaries should only be modified where this is absolutely necessary and even then in a sustainable way only. River tributaries should not be unnecessarily shifted or their channels changed. The hydrological characteristics of the tributaries and channel morphology must be preserved. Spawning grounds in tributaries should be preserved.
12. The negative consequences of planned HPPs due to the loss of habitats of other animal species and HT can most probably be mitigated if the lost areas are substituted. All important habitats of importance for nature protection which would be lost with construction need to be substituted. The habitats lost should be substituted at an approximate factor of 1.5. Functional substitute habitats need to be established before construction is launched. Substitute habitats should be planned outside farmland areas where agricultural policy measures are being implemented and which serve to produce food.
13. Where appropriate, an island should be planned in the reservoir, designed as a resting point for wild animals crossing the waterway. The shore should be gently canted and the island should not be fenced.

Provided that the mitigation measures are implemented, the construction is acceptable (grade C).

Note:
HPP Učja vas lies in the protected area of 'Soča s pritoki' (the Soča River and its tributaries). The area is defined in the Act Determining the Conservation Area for the River Soča with Tributaries (Official Gazette of the SRS, Nos. 7/76, 8/76, 29/86, 83/89, 5/90, 10/91, 17/91, 55/92, 13/93, 66/93, 31/00, 110/02), which does not permit the construction of power plants on the Soča or its tributaries.

Energy generation on the middle Sava

HPP chain on the middle Sava from Jevnica to Suhadole (phase 1)

In the area of the planned chain of HPPs or its immediate vicinity, there are:
- three Natura 2000 areas: SCI Kum, SCI Reber -borovja and SPA Posavsko hribovje – ostenje;
- three areas of ecological importance (AEI): Kum, Zasavsko hribovje and Sava od Mavčič do Save;
- eight protected areas (PA): krajinski park Park, Čebulova dolina, Završki Čeren, Izvir Mitovščice, Mitovški slap, Greben Krvava peč – Planina, Soteska Ribnika, Brzice na Savi pri Prusniku;
- one candidate protected site: krajinski park Ostrež;
- a considerable number of valuable natural features (many tributaries of the Sava are defined as a valuable hydrological, geological and/or ecosystemic natural feature).

There has been a proposal to extend SCI Sava - Medvode – Kresnice, specifically to Kresnice. The proposed SCI site also includes HPP Jevnica and HPP Kresnice. An amendment to SCI KUM has also been proposed (a proposal for additional qualifying species, IRSNC, February 2011)

River and riverside HT of nature protection significance are found along the middle Sava as well as endangered/protected animal and plant species. Due to the chain of HPPs, the impact will be cumulative and synergic. The large scale of activities and resulting loss of suitable habitats will cause a reduction in the density of individual species populations, or even the extinction of certain local populations, particularly aquatic organisms.

The implementation of activities in protected areas and valuable natural features may permanently degrade or destroy these areas or harm vital parts of valuable natural features. A particularly large impact will be felt by the tributaries of the Sava, which in their present condition are defined as valuable natural features. In cases where the valuable natural feature is the outfall river section, there is a chance of its being destroyed due to the change in the water regime. In the planning of activities, areas of valuable natural features should be avoided, but if this is not possible, the impacts on them should be limited to the smallest degree possible.

Special attention should be paid to the planning of activities in SCI Reber – Borovlja (between HPP Ponoviče and HPP Renke i.e. between the villages Sava and Močenik); the entire site is protected for the habitat type of Dinaric dolomite Scots pine forests.

The SPA Posavsko hribovje – ostenje is located at intervals along the Sava in the area between HPP Renke and HPP Trbovlje. Qualifying for this area are the golden eagle and the peregrine falcon. Activities may cause a disturbance in the nesting and foraging habitat of these species.

Should the HPP chain be built in the area of SCI Kum, impacts are possible on HT semi-natural dry grasslands and scrubland facies on calcerous substrates (Festuco-Brometalia) (*important sites of orchids), the site of lillyleaf ladybell and the habitat of *Carabus variolosus.* The inner zones of these species and HT are located on the right bank of the Sava, particularly in the section between HPP Trbovlje and HPP Suhadole.

The broader area of Kum is also the habitat of protected species such as the stone crayfish, the longhorn beetle, *Carabus variolosus* and the lillyleaf ladybell.

Mitigation measures for planning the HPP chain on the middle Sava from Jevnica to Suhadole

1. HPPs should be sited so as not to affect the distinctive features of important nature protection areas and their biodiversity.
2. Activities should be planned to the greatest extent possible outside habitat types of importance for nature protection and the habitats of protected and endangered species. Where necessary, substitute habitats should be planned.
3. When planning, impacts on PA Mitovški slap should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
4. When planning, impacts on PA Izvir Mitovščice should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
5. When planning, impacts on Krajinski park Kum should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
6. When planning, impacts on PA Greben Krvava Peč-Planina should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
7. When planning, impacts on PA Čebulova dolina should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
8. When planning, impacts on PA Soteska Ribnika should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
9. When planning, impacts on PA Završki čeren should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
10. When planning, impacts on PA Brzice na Savi pri Prusniku should be prevented by complying with the Ordinance designating natural sites of special interest and cultural and historical monuments in the area of Trbovlje Municipality (Official Newsletter of Zasavje, 4/96).
11. In the event of widening the channel to the right bank between HPP Trbovlje and HPP Suhadole extensive areas of HT semi-natural dry grasslands and scrubland facies on calcerous substrates (Festuco-Brometalia) (*important sites of orchids), the lillyleaf ladybell site and the habitat of *Carabus variolosus* may be destroyed. The widening should be carried out primarily on the left bank of the Sava, outside SCI Kum.
12. Activities affecting SPA Posavsko hribovje – ostenje should be planned in a way that causes no disturbance to the nesting habitat of the peregrine falcon and the golden eagle. It is likewise important to pay special attention to the planning of long-distance power lines, as these may pose a deadly obstacle to birds if sited incorrectly.
13. No activities should be planned between the villages of Sava and Močnik on the left bank of the Sava. The area of SCI Reber - borovlja is protected for the HT Dinaric dolomite Scots pine forests.
14. Activities should be planned outside areas of valuable natural features. In the event of any interference with them, the vital part of the valuable natural feature should not be affected.

Provided that the mitigation measures are implemented, the construction is acceptable (grade C).

HPP chain on the Sava in the section from Medvode to Jevnica (phase 2)

The area includes a special area of conservation (Natura 2000) - SCI Sava – Medvode – Kresnice, and the wider area (up to 500 m) includes SCI Šmarna gora. The wider area also embraces the protected area of Krajinski park Polhograjski Dolomiti and a larger number of valuable natural features, two of which are in range of indirect impacts:

- Sava – od sotočja Save Bohinjke in Save Dolinke do Črnuč
- Podgrad – sotočje Ljubljanice, Kamniške Bistrice in Save

The following text focuses on the Natura site of SCI Sava – Medvode – Kresnice, which despite its name ends at Črnuče (downstream), although the section between Črnuče and Kresnice is in no way inferior in terms of significance for nature protection. There has been a proposal to extend SCI Sava - Medvode – Kresnice, specifically to Kresnice.

According to the SDF form, the area of SCI Sava – Medvode – Kresnice covers 382.99 ha and falls under the Central Slovenian region. The Natura site comprises the section of the Sava between Medvode and Kresnice. This part of the river is still relatively well-conserved. It represents an important habitat for fish species such as: the gudgeon, *Leuciscus souffia agassizi*, *Rutilus pigus virgo*, the huchen and the Ukrainian brook lamprey. Also found in this area is the narrow-mouthed whorl-snail, while the banks are covered with riparian vegetation. SCI Sava – Medvode – Kresnice could be threatened by inappropriate water regulation techniques, pollution of the waters and drastic changes in the water regime (damming). The riparian vegetation, on the other hand, is threatened by the spread of invasive plant species.

- The size of the Ukrainian brook lamprey population in this SCI site accounts for less than 2% of the total Slovenian population according to data on the SDF form; the degree of habitat conservation is assessed as good, and the population is not isolated from the wider geographical distribution area.
- <u>The population of huchens in this SCI site accounts for more than 15% of the total Slovenian population of this species. The conservation degree of this species' habitat is assessed as good and the population is not isolated.</u>
- According to data on the SDF form, the population of *Leuciscus souffia agassizi* in this area accounts for less than 2% of the total Slovenian population. The degree of habitat conservation is average or reduced, and the population is not isolated.
- According to data on the SDF form the population of *Rutilus pigus virgo* in SCI Sava – Medvode – Kresnice comprises less than 2% of the total Slovenian population. The degree of habitat conservation is average or reduced, and the population is not isolated.
- The population of the narrow-mouthed whorl-snail at this site accounts for less than 2% of the total Slovenian population; the degree of habitat conservation is good, according to SDF data, and the population is not isolated.
- The population of *Carabus variolosus* is not vital to this area according to SDF data, and its occurrence is atypical.
- The habitat types: alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)), Illyrian oak/hornbeam forests (*Erythronio-Carpinion*) and semi-natural dry grasslands and scrubland facies on calcerous substrates (*Festuco- Brometalia*) are marked by good representation and a good degree of structure conservation. The first two habitat types cover more than 20% of SCI site Sava – Medvode – Kresnice and the latter 5%.
- The habitat type of Alpine rivers and the ligneous vegetation with *Salix eleagnos* along their banks covers 2% of the Natura site. The degrees of representation and conservation are assessed as good.

- *Tilio-Acerion* forests of slopes, screes and ravines account for 1% of the surface area of the SCI site. The degree of representation of this habitat type is good, while the degree of structure conservation is average or reduced.

There are plans to build hydroelectric power plants on the section discussed. The huchen is a fish species which in Slovenia mostly lives in the Sava basin, while its populations in the Mura and Drava are extremely small. The section of river in question constitutes a small area of the huchen population in the Sava, where it lives from the confluence of the Sava Dolinka and the Sava Bohinjka to the confluence with the Mirna. Up to the section at Medvode, populations are small. The populations are most abundant from Medvode to Litija, while from Litija to the confluence with the Mirna, the huchen is again very rare. Downstream of the confluence with the Mirna, the huchen is no longer found in Slovenian territory (Zabric D.; 2008).

Due to the decline in huchen populations in Slovenian waterways, protective measures are carried out, the most important of which are measures to conserve the huchen's habitat. A habitat of good quality and adequate size, which provides living conditions for the huchen at all stages of its life, is a basis without which all other measures are ineffective. The measures include:

- ending the pollution of rivers and brooks,
- ending the unsustainable regulation of river channels,
- restoration and renaturation of destroyed habitats.

In the past, water pollution definitely caused the die-out of the huchen along certain stretches of rivers and streams in Slovenia. An example is the heavy decline in huchen populations in the middle and lower Sava caused by discharges from the coal industry. Since the 1990s, Slovenia has shown a marked trend of improvement in water quality, which provides a favourable basis for huchen conservation. Nevertheless, there are still some unrehabilitated sites of heavy point pollution (industry, sewage) and particularly problematic non-point pollution (agriculture).

Unsustainable water regulation of rivers and brooks is perhaps the major cause of the shrinking geographical distribution area and reduced population of the huchen. Unsustainable types of regulation include channel levelling, bed and bank reinforcement, concreting and laying stone coverings in a level design, the removal of riparian vegetation and the installation of water barriers impassable to fish. The use of so-called heavy regulation means a great change in the hydrological conditions in the channel, associated changes in the physical and chemical properties of water, and the absence of appropriate sediment, resting areas, hiding places and spawning grounds. Such types of regulation do not offer living conditions for the huchen, particularly in its most sensitive stages of life (egg, fry, fingerling and spawning adult).

The fragmentation of habitats with high water barriers caused by the construction of impassable water barriers is particularly problematic. In Slovenia, almost all high water barriers are impassable to fish. Based on an analysis of huchen distribution, we may claim that impassable water barriers and large reservoirs are probably the main reasons for the huchen's disappearance from its original geographical distribution area.

Due to the change in the habitat (Mavčiče and Medvode reservoirs), the huchen no longer lives in this section, and the huchen populations in the entire area from the confluence of the Sava Dolinka and Sava Bohinjka to Medvode are small. To conserve huchen populations above Kranj, passages for fish would have to be arranged at the dam at Majdičev jez, at HPP Mavčiče and HPP Medvode. This would re-establish contact between the population above Kranj and the vital population living downstream from HPP Medvode. To connect the entire huchen population in the Sava, passages need to be constructed on the existing barriers of HPP Vrhovo and HPP Boštanj. This connection would make it possible to preserve primarily the populations of common nase and, hence, also the huchen in the middle Sava.

In the Sava Bohinjka, the original geographical distribution area of the huchen has been reduced due to the dam at HPP Soteska and the entire population of the Sava Bohinjka is cut off from the population in the Sava with the Cajhnov jez dam. Upstream from the HPP Soteska dam, the huchen was artificially repopulated. To preserve the huchen population above HPP Soteska and reconnect the populations of the Sava Bohinjka and Sava, a passage for fish must be arranged at the HPP Soteska and Cajhnov jez dams.

In the Poljanska Sora, the huchen lives only to the point of the sHPP Jelovčane dam, but is absent upstream where it once lived. Huchen populations in the Poljanska Sora are separated from populations in the Sora by the Puštalski jez dam. The dam at Goričane, on the other hand, is barrier between the Sora and Sava populations. The hutchen probably never lived in the Selška Sora. To preserve huchen populations in the Poljanska Sora and the Sora, they must be reconnected with the Sava populations by arranging a functional passage for fish at the dam at Goričane. Fragmented populations must be reconnected, which is only possible either by removing non-functional dams or by arranging functional passages for fish at impassable dams: sHPP Jelovčan, Poljanškov jez (dam), HPP Fužine, Fužine dam, sHPPs Demšar and Koreninovec.

Huchen populations in the Ljubljanica river basin are also separated from huchen populations in the Sava. The former passage for fish at the sHPP Fužine dam must be reestablished; such a passage is yet to be constructed on the dam at sHPP Vevče.

The Sava from Medvode to Kresnice has one of the most abundant and vital huchen populations. Moreover, at this section, rivers and brooks that are just as important for the species flow into the Sava ((the Sora, Gameljščica, Kamniška Bistrica and Ljubljanica) Zabric D.; 2008).

HPP construction in this area is thus inconsistent with the conservation goals of preserving this rare, endangered, but charismatic fish species, found only in the upper and middle reaches of the Danube river basin.

<u>The guideline for further HPP planning in this area is not to plan any HPPs in the section between Medvode and the confluence of the Sava and the Ljubljanica, since there are no effective mitigation measures that could preserve the huchen's habitat in the Sava along with the connections between the Natura areas where it is a qualifying species (SCI Sava-Medvode-Kresnice and SCI Ljubljansko Barje) (grade D).</u>

Energy generation on the Mura River

The area of potential exploitation of the Mura River for energy purposes – its border section with Austria to the motorway overpass at Vučja vas on the inner Mura – is part of the Natura 2000 conservation area, SCI Mura (SI3000215) pursuant to the Decree on Special Protection Areas. On the Austrian side lies the Natura 2000 Grenzmur. The exploitation of the Mura for energy would cause a direct (in the area of activity) and long-distance impact (due to the change in living conditions downstream and along the Mura) on Natura 2000, and would have a detrimental effect on the connectedness of the area.

The expert bases of the IRSNC included a proposal for the expansion of the Natura area in view of the conclusions of a biogeographical seminar which served as a basis for the proposal to designate the border Mura a Natura 2000 area in accordance with the Habitats Directive (IRSNC, February 2011).

The area of **SPA Mura** (14,532 ha) is situated on the Slovenian part of the Mura from Cmurek to the Hungarian border. The qualifying species for SPA Mura include: the white stork (Ciconia ciconia), collared flycatcher (Ficedula albicollis), sedge warbler (Acrocephalus schoenobaenus), sand martin (Riparia riparia), little bittern (Ixobrychus minutus), European bee-eater (Merops apiaster), black stork (Ciconia nigra), stock dove (Columba oenas), spotted crake (Porzana porzana), grasshopper warbler (Locustella naevia), little crake (Porzana parva), little ringed plover (Charadrius dubius), common sandpiper (Actitis hypoleucos), water rail (Rallus aquaticus), barred warbler (Sylvia nisoria), grey-headed woodpecker (Picus canus), penduline tit (Remiz pendulinus), common redstart (Phoenicurus phoenicurus), common quail (Coturnix coturnix), great reed warbler (Acrocephalus arundinaceus), river warbler (Locustella fluviatilis), common whitethroat (Sylvia communis), red-backed shrike (Lanius collurio), nightingale (Luscinia megarhynchos), middle spotted woodpecker (Dendrocopos medius), reed warbler (Acrocephalus scirpaceus), European honey buzzard (Pernis apivorus), Savi's warbler (Locustella luscinioides), wryneck (Jynx torquilla) and the common kingfisher (Alcedo atthis). The species that breed in flooded forest and river channels would suffer most harm from the construction of hydroelectric power plants. Those that breed in extensive meadows and extensive agricultural landscape would also be harmed to a lesser degree.

Pursuant to the Decree on Special Protection Areas, **SCI Mura** (8,244 ha) is located on the Slovenian part of the Mura from Radenci to the Hungarian border.
The qualifying species for SCI Mura include: the ziege (Pelecus cultratus), Italian crested newt (Triturus carnifex), European pond terrapin (Emys orbicularis), asp (Aspius aspius), large copper (Lycaena dispar), scarce large blue (Maculinea teleius), dusky large blue (Maculinea nausithous), spined loach (Cobitis taenia), white-finned gudgeon (Gobio albipinnatus), fire-bellied toad (Bombina bombina), European weather loach (Misgurnus fossilis), otter (Lutra lutra), bitterling (Rhodeus sericeus amarus), European mud-minnow (Umbra krameri), Jersey tiger (Callimorpha quadripunctaria*), ramshorn snail (Anisus vorticulus), large white-faced darter (Leucorrhinia pectoralis), great capricorn beetle (Cerambyx cerdo), stag beetle (Lucanus cervus), green snaketail (Ophiogomphus cecilia) and the striped ruffe (Gymnocephalus schraetzer).
The qualifying HT for SCI Mura include: (6510) lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis*); (6430) hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; (6410) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); (3270) rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation; (3260) water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; (3150) natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; (91L0) Illyrian oak/hornbeam forests (*Erythronio-Carpinion*); and (91E0*) alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*,*Salicion albae*).

From the perspective of nature conservation, the flooded forests in the area of the Mura River are of very high value. Although considerably transformed in some places, these are the largest areas of this type of flooded forest in Slovenia. As regards the potential impacts in the event of exploiting the river for energy, the species or groups of animals that are essential to flooded forests are those which are associated with forest habitats or dependent on connections between forest and aquatic habitats in the broader area. This applies to birds, bats, the otter, beaver, amphibians, beetles, dragonflies, the group of moths, etc. What all these groups have in common is that the flooded forests along the Mura constitute their most important habitats in North-Eastern Slovenia, especially in association with suitable aquatic habitats, the most significant elements of which are the river branches, oxbows and tributaries of the Mura and the permanent and periodic standing water in them. Due to its long-distance impact, the exploitation of the Mura for energy would probably entail not only the direct destruction of flooded forests and, simultaneously, the habitats of species, but also changes in vegetation conditions in the broader area (indirect impact).

The harnessing of water requires large-scale interventions in the channel of the waterway, such as the construction of a reservoir and dams, and the regulation of tributaries and banks etc. All these activities can completely transform the original river habitat (not just directly, but over a wider area). A fast-running river may change into a slow-running one. The channel shape and composition, hydrological regime, physic-chemical properties and biotic properties of the water may change completely in the river upstream and downstream of a dam. This results in changes in the species composition of fish communities, the ratio of species, richness of populations, spatial distribution of the species, and fish spawning and migration. From the perspective of habitat destruction, the harnessing of the Mura could permanently harm fish biodiversity, particularly distinctly reophilic fish such as the white-finned gudgeon, striped ruffe and ziege. Species which require standing or slow-running water (such as the bitterling, European mud-minnow, asp, European weather loach and spined loach) may be expected to suffer less impact. Should the Mura be exploited for energy, a direct and long-range impact on biodiveristy on the Mura and its tributaries may be expected (especially on fish, lampreys and crustaceans).

The area of potential energy generation on the Mura includes an area of ecological importance (AEI) - Mura Radmožanci, i.e. an area of habitat types of significance for nature protection (priority HT), sections of the latter, or larger ecosystem units, which greatly contribute to the preservation of biodiversity. A considerable share of the species present here is classed as protected and endangered. In the event of harnessing the Mura for energy, the impact on aquatic organisms would be direct and long-range and the impact on species with habitats in the broader area would be indirect and long-distance. The impact on the functionality and connectedness of the AEI and biodiversity would be direct.

The following valuable natural features are located in the area of potential exploitation of the Mura for energy:

1. Valuable natural feature "Mura – loka 1" Category: hydrological and zoological. The surface area of the valuable natural feature is 4,398 ha. The VNF comprises the entire system of riparian habitats on the Mura River, including flooded forests, river channel, gravel bars and oxbows between Šentilj and Hotiza.
2. Valuable natural feature "Mura – reka 1" Category: botanical, hydrological and zoological. The surface area of the valuable natural feature is 494.6 ha and the channel length is 63.6 km. The VNF consists of the Mura channel between Šentilj and Hotiza.
3. Valuable natural feature "Mura – mrtvi rokav 1" Category: botanical, ecosystemic and zoological. The surface area of the valuable natural feature is 2.96 ha and the oxbow is 0.57 km long. The VNF consists of the oxbow near Ceršak.
4. Valuable natural feature "Mura – mrtvi rokav 3" Category: ecosystemic and hydrological. The surface area of the valuable natural feature is 25.86 ha and the oxbows are 11.33 km long. The VNF consists of a network of oxbows between Hrastje and Bunče.
5. Valuable natural feature "Mura – mrtvi rokav 4" Category: botanical, ecosystemic, hydrological and zoological. The surface area of the valuable natural feature is 40.13 ha and the oxbows are 20.38 km long. The VNF consists of a network of oxbows between Veržej and Mota.
6. Valuable natural feature Sladki vrh – gramoznica: Category: botanical, ecosystemic and zoological. The VNF is the habitat of endangered animal and plant species in an abandoned gravel pit along the Mura, east of Sladki vrh and north-east of Šentilj in Slovenske gorice.
7. Valuable natural feature Konjišče – gramoznica: Category: ecosystemic and zoological. The VNF is the habitat of endangered animal species in gravel pits along the Mura at Zgornje Konjišče, north-west of Gornja Radgona.
8. Valuable natural feature Podgrad - kolonija sivih čapelj: Category: ecosystemic and zoological. The VNF comprises a nesting ground of grey herons in Podgrad along the Mura, west of Gornja Radgona.

9. Valuable natural feature Petanjci – gramoznica 1 in 2: Category: botanical, ecosystemic and zoological. The VNF is the habitat of endangered plant and animal species in an abandoned gravel pit north-west of the Gornji Petanjci village and north-east of Radenci.

As a result of harnessing the Mura for energy, the impact on the valuable natural features numbered 1 – 5 would be direct, and the activities could, if inappropriate technical solutions were applied, have a permanent effect on the category and vital part of the VNF. As a result of harnessing the Mura for energy, the impact on the valuable natural features numbered 6 – 9 could be indirect and would be caused primarily by a change in the water table of groundwater.

The impacts on protected areas, species, habitat types, AEI and VNF cannot be set forth in greater detail without information on the project solutions and the precise location of the activity. The problem must be approached comprehensively and, for such a vulnerable ecosystem, the most suitable technological solutions must be envisaged and, if necessary, substitute habitats arranged at the very outset.

Guidelines and mitigation measures

1. The area of potential utilisation of the Mura River for energy is restricted to the border section with Austria to the motorway overpass at Vučja vas on the inner Mura River. The permissible potential of exploitation ranges from 1.5 MW to 55 MW or, with respect to the annual electricity output, from 7.25 GWh to 275 GWh.
2. Exclusively hydroelectric power plants of the run-of-the-water type may be constructed, provided that a high level of biodiversity and natural balance is preserved, a favourable status of endangered species and habitats is ensured, and the consequences of the existing environmental load remedied. The activities should be planned outside habitat types of importance for nature protection and habitats of protected and endangered species. To ensure that this measure is comprehensive, additional targeted research should be ensured and more detailed data on the occurrence of certain endangered and protected species obtained in the next phases.
3. Where necessary, substitute habitats should be planned. All habitats and habitat types of importance for nature protection must be substituted, specifically by establishing functional substitute habitats and habitat types before launching activities. The lost habitats must be substituted with a factor of 1.5.
4. Before building dams and other infrastructure in the channel of the Mura, it is necessary to provide a bypass that will enable free migration and genetic exchange and prevent the isolation of individual populations of aquatic organisms and also serve as a substitute habitat. The bypass must be affected in a sustainable way.
5. Further deepening of the channel must be prevented, and an adequate water table of groundwater must be ensured on the Mura in areas where this will be necessary to preserve the good status of habitats of importance for nature protection (particularly flooded forests, oxbows and river branches).
6. The bed-load discharge and the formation of gravel bars must be ensured.
7. The concessionaire must ensure a suitable manner of substitute habitat maintenance and management.
8. The siting of energy facilities should be consistent with the agreements of the intergovernmental commission responsible for the Mura river basin (e.g. the branch of the Mura at Apaško polje).
9. A comprehensive assessment of impacts on protected areas must be carried out in the next phases at the level of a more detailed plan in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

In the area of potential exploitation of the Mura River – the border section with Austria to the motorway overpass at Vučja vas on the inner Mura River (the permissible potential exploitation ranges from 1.5 MW to 55 MW), impacts in the event of harnessing the Mura for energy will be insignificant, provided that the above mitigation measures are implemented (grade C).

The investor should be warned that it is possible that any new findings arising from additional research in the next stages of siting may show that exploitation of the Mura is unacceptable.

Cultural heritage

Exploitation of the Sava River for energy

The density of areas and structures of cultural heritage in the planned area of impoundments on the middle Sava is relatively small. The impacts of HPP projects on areas and structures of cultural heritage will primarily result from activities affecting archaeological sites along the Sava. It is projected that only small, and as a rule, peripheral sections of archaeological sites would be flooded, while impacts on a larger area may occur due to the rise in groundwater and the construction site (levee construction etc. which may permanently damage or reduce the archaeological sites.) Archaeological relics discovered during construction may be destroyed or damaged. There is also a slight possibility of damage to archaeological relics in the event of any oil, petroleum derivatives or other, particularly corrosive, substances spilling into the soil at the construction site.

Cultural heritage structures in the impact area of the activities will be mainly affected indirectly (due to the proximity of the construction site, new arrangements in the immediate vicinity, the rise in groundwater, obstructed or blocked lines of sight of these structures during construction or after, etc.) It is necessary to highlight Ponoviče Castle (EŠD 8768) and its park (EŠD 8769), which should receive special attention during detailed planning.

It is considered that the impact on the two bridges that are designated as technical heritage - Jevnica - leseni most (EŠD 16200) and Sava - leseni most (EŠD 8114) - may not be defined precisely at this stage. However, the widths of the impoundment may exceed the span of the bridges. In the case of both bridges, it is reasonable to examine the possibility of preserving them in their existing form by narrowing the impoundment by means of technical measures (protective wall). Should this prove unfeasible and the impact on the structures certain, bridge adjustments must be planned (lengthening the structure and adjustment of the weight-bearing pillars) in accordance with detailed guidelines from the relevant cultural heritage protection service.

Exploitation of the Mura River for energy

The density of areas and structures of cultural heritage in the envisaged area is relatively small. Larger areas of cultural heritage are situated within or directly next to settlement development zones, which should not experience any direct impacts. The impact may be greater during construction due to access ways and construction sites.

Wider areas of protected cultural heritage which are in the probable impact area of the activities might be threatened to a minor extent, and will mainly be affected indirectly (due to the proximity of the construction site, new arrangements in the immediate vicinity, the rise in groundwater, obstructed or blocked lines of sight of these structures during or after construction);this includes areas and structures in the area of Gornja Radgona and the heritage structures of Trate – grad Cmurek (EŠD 69) and Petanjci – Bathyanijev dvorec (EŠD 16478).

The possible impacts of energy facilities on the areas and structures of cultural heritage could result primarily from flooding and hence the partial or permanent destruction of known and possible archaeological relics discovered directly alongside the Mura during construction, especially barrow cemeteries.

Overall assessment

Considering the scale of spatial arrangements connected with the construction of hydroelectric power plants on the Sava and the Mura, their expected impact on cultural heritage is relatively small. The impacts are assessed as insignificant, provided that mitigation measures are observed (grade C). The measures relate to the adherence to the principles of cultural heritage protection during both detailed planning and construction.

General mitigation measures for cultural heritage protection

The fundamental protection principle is that the locations of sHPPs and HPPs must avoid protected areas and structures of cultural heritage, while solutions must be guided by the preservation of protected heritage features. As a rule, preliminary archaeological studies must be performed in the entire planning area of hydroelectric power plant construction and, where necessary, solutions should be adapted accordingly and protective excavations carried out.

Structures and areas of cultural heritage must also be protected from damage or destruction during construction; no construction access ways or detours should run across structures and areas of cultural heritage; the latter must not be overlapped by any necessary rearrangements of waterways or irrigation systems, public utility, energy or telecommunications infrastructure, nor may they be used to dispose of surplus materials, etc.

Mitigation measures for individual HPPs on the middle Sava

1. HPP Jevnica:

- Possible activity in the area of Dolsko - Rimskodobno grobišče (KD 19588): The scope of activities is kept to minimum preliminary archaeological studies and, if necessary, protective excavations are carried out.

2. HPP Kresnice:

- Probable activity affecting the Jevnica - Most čez Savo (KD 16200) structure: Examine all preservation or reconstruction possibilities in accordance with detailed guidelines from the cultural heritage protection service.

3. HPP Ponoviče:

- Possible rise of groundwater in the area of Kresnice - arheološko najdišče (EŠD 22872): Preliminary archaeological studies are carried out, appropriate measures are determined in accordance with the guidelines of the relevant service and the least possible interference with the archaeological site is ensured.
- Probable flooding of a section of the area of Vernek - arheološko najdišče (EŠD 22879), possible rise of groundwater in the remaining area: Preliminary archaeological studies are carried out, appropriate measures are determined in accordance with the guidelines of the relevant service and the least possible interference with the archaeological site is ensured.
- Possible damage to the Ponoviče – Toplar (EŠD 511607) structure during construction; the structure is not expected to be directly affected: Impacts during construction should be prevented;

if necessary, the possibility of structure preservation or relocation should be examined if any solutions would affect the structure.
- Possible change to the setting of Ponoviče - grad Ponoviče (EŠD 8768) and the park of Ponoviče Castle (EŠD 8769): Options for optimising the routes of associated infrastructure are examined and the heritage qualities of the locality are respected in the architectural planning of the HPP facility.
- Possible impacts from activities on the right bank of the Sava upstream from the barrier in the area of Litija - Gradišče Sitarjevec (EŠD 22874): The smallest possible scope of activities affecting the area of the hill fort is ensured, and in the case of any damage, restoration or other measures are planned according to guidelines.

4. HPP Renke:

- The extreme southern edge of the area of Vernek - arheološko najdišče (EŠD 501378) will probably be flooded and a rise of groundwater is possible in the remaining area: Preliminary archaeological studies are carried out, appropriate measures are determined in accordance with the guidelines of the relevant service and the least possible interference with the archaeological site is ensured.
- The impoundment may affect the stability of the Sava - cestni most (EŠD 8114) structure; alternatively, the bridge will have to be moved, as the impacts during construction or after damming may be too great. The possibility of preservation or reconstruction is examined in accordance with conservation principles.

5. HPP Suhadol:

- The area of Podkraj pri Hrastniku - rimskodobna naselbina Ribnik (EŠD 8784) lies next to the area of probable impoundment: Protection against the eventuality of raised groundwater must be provided, preliminary archaeological studies carried out, provisions for appropriate measures must be made in accordance with the guidelines of relevant services and the least possible interference in the area ensured.
- The structure of Podkraj pri Hrastniku - cerkev sv. Nikolaja (EŠD 2198) lies in the area of probable impoundment: Protection against the eventuality of raised groundwater must be provided, appropriate measures must be determined in accordance with the guidelines of relevant services, and the least possible interference in the area must be ensured.
- The structure of Podkraj pri Hrastniku - gostilna Podkraj 67 (EŠD 536) lies next to the area of probable impoundment: Protection against the eventuality of raised groundwater must be provided, appropriate measures must be determined in accordance with the guidelines of relevant services, and the least possible interference in the area must be ensured.

Mitigation measures in the area of potential utilisation of the Mura River

- Possible change to the setting of Trate – grad Cmurek (EŠD 69): When planning the architecture of the barrier facility of the HPP which could be sited near the castle, the heritage qualities of the locality should be respected.
- Possible change to the setting of Gornja Radgona - grad Radgona (EŠD 150): When planning the architecture of the barrier facility of the HPP which could be sited near the castle, the heritage qualities of the locality should be respected.
- Possible change to the setting of Gornja Radgona - mestno jedro (EŠD 6681): Special attention is devoted to the routes of associated infrastructure, and in the event of planning any arrangements in the area of the town centre, the heritage qualities of the locality are respected.

- Possible damage to the structure of Gornja Radgona - smodniški stolp (EŠD 6712) during construction: Impacts during construction should be prevented; if necessary, if solutions would have an impact, the possibility of preservation should be examined.
- Possible change to the broader setting of Radenci – Zdraviliški park (EŠD 14066) and Radenci – Zdravilišče Radenci (EŠD 946): When planning the impoundment, the heritage qualities of the locality should be taken into account.
- Possible change to the setting of Petanjci – Bathyanijev dvorec (EŠD 16478): When planning the impoundment, the heritage qualities of the locality should be taken into account.
- Possible flooding of the area of Hrastje Mota – gomilno grobišče Gomilice (EŠD 14855): Preliminary archaeological studies are carried out; appropriate measures are determined in accordance with the guidelines of the relevant service and the least possible interference with the archaeological site is ensured.

Climatic factors

When planning devices and facilities for electricity generation in an HPP, the carbon footprint of the equipment and facilities used for electricity generation should also be taken into account among the other technical parameters; the carbon footprint should not exceed 75g of CO_2 equivalent/kWh, as calculated per the entire life span of the HPP.

Considering the impacts on climatic factors, the electricity generation in an HPP is assessed as being acceptable for the environment and is awarded grade A for its significance of environmental impact, because this constitutes an improvement in the environmental conditions of climatic factors.

Landscape

Energy use of the Sava River

The construction of hydroelectric power plants on the mid-section of the Sava River and the performance of all accompanying works will cause great changes to the landscape structure, spatial relations and elements of spatial identity. During construction, the effects on the landscape will be immense, mostly due to the removal of riparian vegetation and extensive earthworks, as well as due to the presence of a construction site and equipment. These impacts will be most prominent in areas of visible contact with existing settlements and, at the same time, in areas where changes made to the environment will be the most obvious – mostly in the areas of Senožeti, Litija, Renke, Sava, Hrastnik, Suhadol and along the traffic routes in the Sava River valley.

The permanent effects on the landscape will mostly be due to the placement of barriers and machine-rooms in predominantly natural and suburban areas. Accumulation pools will cause a significant widening of the current Sava riverbed in certain places, thus visibly changing the character of the river (the rocky riverbed will be flooded due to the rise in water levels, making rocks, rapids and the gravel bars invisible). The effects on the landscape will be greater on sections where energy embankments and water management embankments are to be constructed (mostly on the section from Dolsko to Ponoviče), but above all in areas where dams and connecting long-distance power lines are to be constructed. Due to the required reinforcements of the escarpments of the Sava River and the effluent sections of its tributaries, the permanent removal of riparian vegetation will be necessary on many escarpments along the Sava River, as well as the reconstruction of the current natural outlines of the riverbed. Oxbows and other river channels and river coves will be destroyed, along with the accompanying vegetation.

HPPs on the lower part of the section in question (downstream from Litija) will gradually become part of the landscape and, in spite of the change in the original conditions (the widening of the Sava riverbed, the reduction of the riparian space), they will not interrupt the views from the settlements and the nearby roads. On the other hand, the HPPs on the upper part of the section in question will require a greater measure of impounding and will thus cause greater changes to the characteristics of the landscape.

There are some spatial dominants in the impact area of the HPPs on the mid-section of the Sava River which will have to be taken into account in further planning as key spatial points requiring an appropriate spatial, landscape ambiance (such as the castles at Pogonik and Ponoviče) and appropriate functional connections (connections to the road network, walkways and bicycle lanes).

Energy use of the Mura River

The construction of hydroelectric power plants on the Mura River and the performance of all accompanying works could cause irreversible and fundamental changes to the landscape, spatial relations and elements of spatial identification, which are also of great social importance in this area.

According to the Spatial Planning Strategy of Slovenia (Official Gazette of the Republic of Slovenia, No. 76/2004), the Mura River area is defined as an area of natural qualities. It is an area of great biodiversity and preservation, which is reflected in the natural characteristics and structure of the landscape. The Mura River, area with its flood groves, oxbows, gravel bars, flood forests and cultural landscape preserved, is a unique area in Slovenia.

Energy use of the Mura River could lead to the permanent removal of the existing riparian vegetation and a reconstruction of the current natural outlines of the riverbeds due to the placement of barriers and machine-rooms in the natural environment, the construction of accumulation pools, energy embankments and water management embankments. The river dynamics are crucial for the preservation of the broader area, but after the construction of HPPs, this would not be as prominent as before. The character of the river would be visibly different and the essential structural features, the quality landscape elements and the unique landscape features of this well-known area would be permanently destroyed.

Due to the importance of the Mura River in Slovenia, such an intensive energy use of the river through the construction of multiple hydroelectric power plants is not acceptable. Interventions on the Mura River may only be carried out for the restoration or renaturalisation of the riparian space and the implementation of comprehensive measures to ensure the desired water regime, the conditions of groundwater in this area and the preservation of lowland forests. The hydro energy use of this area may only be permitted as an accompanying element of a comprehensive spatial arrangement with the intention of financing such an arrangement.

The effects on the landscape in the case of energy use of the Sava and Mura rivers are assessed as insignificant if mitigation measures are taken into account (grade C). The measures should primarily aim at the optimisation (reduction in the scope) of energy use in order to preserve the key spatial features and development possibilities along the river. The assessment shows that, when planning in more detail, there should be further optimisation of the expected solutions, in order to preserve individual, more vulnerable parts of the areas. Such optimisation refers to the comprehensive landscape (spatial) planning of the area along the river, which includes:

the implementation of other mitigation measures (construction of embankments, placing agricultural lands on higher ground, substitute habitats).
Not only optimisation, but programme guidelines must also be taken into account when planning, especially on the middle Sava River section. Such programme guidelines are based on the opinion that the construction of a string of HPPs on the Sava River may not be viewed only in the narrow energy context, but in the broadest spatial and social context. In addition to the optimisation and mitigation measures contained herein, a programme for spatial upgrading (especially with recreational content) is of key importance in order to reduce the effects on the landscape and thus increase the acceptability of the intervention.

<u>Due to the importance of the Mura River, intensive energy use of the river through the construction of multiple hydroelectric power plants is not acceptable.</u> The key mitigation measures are to limit the number of HPPs and the construction of a run-of-the-river type of HPP. Only such use is permitted, which would cause an increase in the water levels of the river to a point which enables the regulation of the desired levels of groundwater and which also preserves the current characteristics of the escarpments.

General mitigation measure for the protection and development of the landscape

In general, in order to reduce the effects on the landscape and its development, the following should be planned:

design of escarpments on the Sava and Mura rivers by taking into account the surrounding landscape (the design of the relief and vegetation) and enabling the use of the space along the impoundments for recreation;
sustainable design of riverbeds and the riparian space of the Sava and Mura tributaries;
planning for recreational purposes;
expert architectural design of hydroelectric facilities and their placement in the surrounding landscape and settlements;
diligent planning of the alignment of accompanying long-distance power lines and the implementation of measures for the restoration of bared escarpments as rapidly as possible, by the use of biological and engineering measures if feasible;
the planning of gravel pits along the Sava River as substitute habitats (wetlands and ponds with escarpments for bird nesting) and partly as water areas intended for recreational purposes (fishing, recreation beside the river);
on the Sava River, to preserve the basic features of the structure of plots and the image of the landscape when placing agricultural land on higher ground (separation of plots by a network of paths,

streams separating bigger plots, etc.), which is of special importance in areas of cultural heritage and areas of impact on heritage structures (for instance, the castles at Pogonik and Ponoviče);
only such increase in the water levels of the Mura River is permitted as would enable the regulation of the desired levels of groundwater and which also preserves the current features of the escarpments.

Mitigation measures according to individual HPPs on the Sava River

1. HPP Jevnica

Substantial impoundment areas can be expected due to additional quantities of water from the influents of Ljubljanica River and Kamniška Bistrica River. The impoundment extends from the barrier in the area of Senožeti or Jevnica to the confluence of the Sava River with the Ljubljanica and Kamniška Bistrica. Such impoundment signifies a potential modification of the area of confluence of the Kamniška Bistrica, Sava and Ljubljanica rivers, which is of great symbolic importance. The optimisation must lead to a decrease in the surface of the impoundment as much as possible, while carefully studying the high water level conditions of all three rivers, harmonising them accordingly. As little impact as possible must be ensured, the extent and the level of impoundment reduced – the possibility of preserving the natural riverbed in the area of the confluence must be studied. The effluent sections of the Kamniška Bistrica and the Ljubljanica rivers must be rearranged. The possibility and the reasonableness of renaturalisation of the Kamniška Bistrica riverbed must be studied. Special attention should be paid to the Mlinščica stream: to preservation in the upper section while ensuring flood safety, as well as the placement and design of the new alignment in the lower section.

2. HPP Kresnice

The impoundment of the HPP Kresnice mostly intrudes on areas of agricultural landscape. It would be reasonable to ensure as little flooding as possible by way of reducing the accumulation surface.

3. HPP Ponoviče

There will be modifications to spatial relations and the psychological aspect of the image of the Litija settlement. Sustainable park areas should be planned on the left and right banks of the Sava River, with accesses to the water and a sustainable arrangement of escarpments on the right bank. Bridging of the Sava River should be arranged at its narrow section, which should be functionally integrated into the settlement space (connections to the existing road network, including walkways and bicycle lanes) and carefully designed as part of the settlement's ambiance.

4. PSPP Požarje

The spatial image of the area in the direct vicinity of the Kal settlement will be modified. A high quality design for the accumulation area will have to be ensured, with careful design of its escarpments, appropriate technical solutions with regard to the expected changes in water levels, the planting of vegetation, measures for leading the view across the area, etc.

5. HPP Renke

There will be modifications to the use of the space and in the spatial image of the area with the barrier and pool, mostly upstream from the Sava settlement. Planning should ensure that the extent of these modifications is as contained as possible.

6. HPP Trbovlje

Modifications to the use of the space will be small, while the spatial image will be modified mostly in the area of the barrier and on the rocky section of the riverbed, where the increase in the water level will flood and partially remove the rocks. The picturesque aspect of the area is to be preserved at least in part.

HPP Suhadol: There will be slight modifications to the use of the space and the spatial image of the area upstream from the barrier; general mitigation measures are to be implemented.

Mitigation measures in the area of potential use of the Mura River

1. The area between the Ceršak and Gornja Radgona settlements

The broader area of this section of the river is covered mostly in riparian vegetation and lowland forests, gradually shifting to agricultural land. The changes in groundwater levels could damage or destroy this forest, which is a distinctive spatial feature and an important element of the landscape structure. There would be modifications in spatial relations and in the psychological aspect of the image of the broader space. An appropriate level of groundwater must be ensured in order to preserve the lowland forests and riparian vegetation; lowland forests must be preserved in their entirety.

In the upper section, the broader Mura River area on the Slovenian side is characterised by hills, while the lower section is characterised by a vast riparian plain. When impounding this section of the river, the construction of embankments and raised escarpments should be avoided, and the surface of the riverbed kept within its current dimensions as much as possible. The impoundment of the upper section of the Mura River could also affect the modification of the character of the river downstream. The change in the intensity and speed of the current could indirectly cause changes in its meanders, which should be prevented by the assurance of an appropriate water regime.

There could be modifications in the immediate area and in the psychological aspects of the image of the Sladki Vrh and Gornja Radgona settlements, as well as the Bad Radkersburg settlement on the Austrian side of the river. Sustainable park areas should be planned along the banks, with accesses to the water and a sustainable rearrangement of the escarpments. The HPPs should be planned with consideration of the broader area and with a comprehensive landscape architecture design of the area along the impoundment.

2. The area between Gornja Radgona and the motorway bridge at Vučja vas

The meandering riverbed is characteristic of this section of the Mura River. The broader area of the river is covered in lowland forests and agricultural land, with settlement areas on its edges. The level of intertwinement of the riparian area with the agricultural area is greatest in this section of the river.

An improper impounding in this section could have fundamental impacts on the modification of distinctive landscape features. Broader spatial relations would change.

The following should be taken into account:
the facility should be planned as a run-of-the river type of the HPP; an appropriate level of groundwater must be ensured in order to preserve the lowland forests and riparian vegetation; lowland forests must be preserved in their entirety;
it should be ensured that the impact be as small as possible, that the scope, surface and level of the impoundment be reduced as much as possible – i.e. that the majority of the impoundment remain the same as the riverbed is today.
a high quality design for the accumulation area should be ensured, with a careful design of its escarpments;
all structures connected with the river, such as the water mills, rafts, etc., should be preserved or transferred and returned to their previous use on the river;
the existing picturesque qualities of the area should be preserved: the escarpments, riparian vegetation, alluvial deposits, rapids and individual rocks, etc.;
the characteristic small agricultural plots, which sometimes extend to the water's edge, should be preserved and redefined.

<u>Material assets</u>

When planning the electricity generation by way of HPPs, the following guidelines should be taken into account:
in order to mitigate the impacts of HPPs on other uses of water, the use of the water for the electricity generation in HPPs should be secondary to the use of water for supplying drinking water and the use of water for irrigation in agriculture for the production of food,
the planning of HPP facilities must ensure synergy effects with regard to the protection of material assets from floods - the HPPs should also function as means of flood protection and as barriers for waves of high water levels, if the bodies of water in the area of impact of the HPPs are to be used for multiple purposes, the procedures laid down in Directive 2000/60/EC should be respected regarding the different types of activities for the use of the body of water: protection from flooding, maintaining of ecosystems, general use, use in agriculture and industry, including potential deviations from the aim of good ecological status, in accordance with paragraph 7 of Article 4 of the above-mentioned Directive, the navigability of the Mura River must be ensured, the multifunctional use of bodies of water should be enabled in the area of impact of the HPP.

As a measure taken as part of the sub-programme for electricity generation, such generation in HPPs, from the point of view of impacts on material assets, is rated grade B with regard to the significance of its impacts on the environment.

10.6.2.2 Overall assessment of significant impacts on the environment caused by the electricity generation in HPPs

Table 33: Assessment of significant impacts on the environment caused by the electricity generation in HPPs

Measure / significant impacts	Natural resources	Water	Nature	Cultural heritage	Climatic factors	Landscape	Material assets
the chain of HPPs on the mid-section of the Sava River, phase I: - 78 MW by 2020 (HPP Suhadol, HPP Trbovlje) - 162 MW by 2030 (HPP Renke, HPP Ponoviče, HPP Kresnice, HPP Jevnica)	**B**	**C**	**C**	**C**	**A**	**C**	**B**
other HPPs by 2030, 246 MW: - the area of potential energy use of the Mura River – the section between the border with Austria and the motorway bridge near Vučja vas (total power from 1.5 MW to 55 MW, depending on the environmental acceptability) - the area of potential energy use of the mid-section of the Sava River, phase II, depending on the environmental acceptability in the section between Medvode and Jevnica - other not yet determined locations from 2020 to 2030	**B**	**C**	**C**	**C**	**A**	**C**	**B**

Note:

The construction of HPPs on the Sava River between Medvode and the confluence of Sava River with the Ljubljanica River is unacceptable (grade D) with regard to its impact on the natural environment. This section is to be removed from the NEP.

10.6.3 Use of WB in large CHP units with a high utilisation rate

10.6.3.1 Mitigation measures and guidelines

Air

When introducing facilities for electricity generation in large CHP units by use of WB, mitigation measures must be implemented for the prevention of pollution of ambient air with emissions of total dust by way of techniques which ensure that the concentration of total dust in flue gases does not exceed $20mg/m^3$.

As a measure of the sub-programme for the electricity generation, the generation of heat and electricity in large CHP units using WB with a high utilisation rate is rated grade C for its impact on the air as a significant impact on the environment, provided that the implementation of mitigation measures is ensured.

Climatic factors

When planning or introducing facilities for electricity generation in large CHP units using WB, the following guidelines should be respected: the energy efficiency of the CHP unit must be at least 65% and the carbon footprint of the generation of heat and electricity must not exceed 100g of CO_2 equivalent/kWh_e or 100 g CO_2 equivalent/kWh_t. The emissions of GHGs from the preparation of WB fuel must also be calculated in the carbon footprint.

Considering the impacts on climatic factors, the generation of electricity in large CHP units is assessed as being acceptable for the environment and is rated grade A for its significance of environmental impact, which signifies an improvement in the environmental conditions of climatic factors.

Landscape

The effect on the landscape is assessed as insignificant, provided that mitigation measures of sustainable use of forests and the development of agriculture (introduction of new agricultural crops, employment of agrarian operations for more efficient production) are respected (grade C), and the principles of comprehensive planning of the cultural landscape applied.

The more detailed mitigation measures adapted to individual landscape areas must be defined by spatial planning documents (by way of spatial implementation conditions for individual units of spatial planning) and by documents prepared on the basis of sectoral agriculture rules (rural development programmes or active agricultural land policy programmes) and sectoral forestry rules (silvicultural plans).

Material assets

When planning generation of electricity in large CHP units using WB, the following guidelines should be respected: the use of WB for energy must be secondary to the use of forest biomass in wood-processing industries and must be oriented to the use of waste forest biomass or forest biomass of lower quality, as well as the use of hard fuels made of waste wood products.

As a measure taken as part of the sub-programme for the generation of electricity, such generation in large CHP units using WB, from the point of view of impacts on material assets, is rated grade B with regard to the significance of its impacts on the environment.

10.6.3.2 Total assessment of significant impacts on the environment caused by the use of WB in large CHP units with a high utilisation rate

Table 36: Assessment of significant impacts on the environment caused by the use of WB in large CHP units with a high utilisation rate

Measure / significant impacts	Air	Climatic factors	Landscap e	Material assets
Use of WB in large CHP units with a high utilisation rate	C	A	C	B

10.6.4 The generation of electricity from nuclear energy

10.6.4.1 Mitigation measures and guidelines

Natural resources

In the medium-term period and before the construction of a new NPP begins, the permanent and safe disposal of low and intermediate level radioactive waste (LILW) must be ensured as a mitigation measure, and a proposal must be prepared for the treatment of high-level radioactive waste (HLW). Provided this mitigation measure is implemented, the generation of electricity from nuclear energy is assessed as acceptable for the environment and rated grade C in terms of its impact on natural resources.

Air

With regard to the impact on air, the measures implemented as part of the nuclear energy sub-programme are rated grade A (assessment of significance of impacts on the environment), due to the fact that emissions from the NPP do not affect the quality of ambient air.

Water

With regard to the impact on water, the measures implemented as part of the nuclear energy sub-programme are rated grade C (assessment of significance of impacts on the environment), provided that mitigation measures of periodic cleaning of the cooling system are ensured, as well as more frequent functioning with the use of cooling cells in late summer, which would ensure that when the flow rate of the Sava River falls below $100m^3/s$, there will be no possibility of the river heating by more than 3K, or less if the water in the pool of HPP Brežice is more vulnerable to eutrophication due to the nutrient content in the Sava River.

A new NPP must not be using cooling water from the Sava River for once-through cooling (OTC). A closed cooling system with wet cooling towers must be planned for a new NPP.

Nature

The following mitigation measures must be taken into account with planning and operation:

- Carefully abide by the prescribed security standards during the planning and operational phases of the existing and new NPP.
- Prevent overheating of the Sava River in the NPP's area of impact.

The impact of this sub-programme on the environment is assessed as insignificant (grade C), provided that the appropriate measures are implemented.

Cultural heritage

The assessment is based on the premise that any new facilities for the use of nuclear energy are planned in the area next to the existing NPP or near by. In this case, no direct impacts on areas and structures of cultural heritage are expected, because there are no cultural heritage units registered in the potential location. There will be visible changes to the broader area; however, the area has already been partly degraded due to the existing NPP, therefore no greater indirect negative impacts on the areas and structures of cultural heritage are expected.

The impact of this sub-programme on the cultural heritage is assessed as insignificant (grade B). The impacts on the archaeological heritage are impossible to assess in the phase of strategic environmental assessment. Preliminary archaeological investigations will be performed to this end, probably in the next phases of planning.

General guidelines for the protection of cultural heritage are to be followed. The fundamental protection platform is that new spatial arrangements must avoid areas and structures of cultural heritage, while solutions must encompass the preservation of protected heritage features.

Climatic factors

With regard to the impact on climatic factors, the measures implemented as part of the nuclear energy sub-programme are rated grade A (assessment of significance of impacts on the environment), because they offer the possibility of improving environmental conditions with regard to climatic factors.

Health

With regard to the impact on health, the measures implemented as part of the nuclear energy sub-programme are rated grade A (assessment of significance of impacts on the environment), because their impact on health is insignificant if the dosage of natural background radiation received due to the operation of the NPP by a person in its vicinity is taken as a measure of impact of the NPP on the health such a person.

Landscape

The assessment is based on the premise that any new facilities for the use of nuclear energy will be planned in the area next to the existing NPP Krško or near by. The area adjacent to the existing NPP has no special landscape value. There are many different activities and structures based in this broader area, which is used in many ways (commercial and industrial zones, long-distance power lines, railway and road infrastructure, intensive orchard production, land consolidation, etc.), and the area is already heavily degraded. Further changes are also expected (the new road connection between Krško and Brežice, the expansion of commercial zones).

The spatial enlargement of the existing NPP represents a completion of the existing activities in this area, which already shows a high level of degradation of characteristic spatial structures. From the landscape point of view, such completion would be reasonable, because it would allow the avoidance of a hypothetical intrusion in an area where landscape quality is still preserved. The effect of this sub-programme on landscape is assessed as insignificant (grade B).

General guidelines for the protection of landscape are to be followed. Appropriate architectural or landscape architectural concepts must form part of the project, which must ensure that the designs of spatial plans are harmonised, or integrated into the area as much as possible.

Material assets

With regard to the impact on material assets, the measures implemented as part of the nuclear energy sub-programme are rated grade C (assessment of significance of impacts on the environment), because their impact on material assets can be mitigated.

Mitigation measures with regard to material assets refer mostly to the maximum use of the existing infrastructure, so that a new NPP will not have significant impacts on the existing settlement of the Municipality of Krško. The measures connected with the nuclear energy sub-programme are to be implemented at the existing location of the generation of electricity from nuclear energy, with a maximum use of the existing infrastructure, while the area of a new NPP is not large enough to have a significant negative impact on the existing settlement of the Municipality of Krško.

10.6.4.2 Overall assessment of significant impacts on the environment caused by the generation of electricity from nuclear energy

Table 35: Assessment of significant impacts on the environment caused by the generation of electricity from nuclear energy

Measure / significant impacts	Natural resources	Air	Water	Nature	Cultural heritage	Climatic factors	Health	Landscape	Material assets
extending the lifespan of the existing NPP, operation until 2043	**C**	**A**	**C**	**C**	**B**	**A**	**A**	**B**	**C**
A new NPP, 1000MW or 1600MW, from 2020 to 2030 additional 12MW, 2013	**C**	**A**	**C**	**C**	**B**	**A**	**A**	**B**	**C**

10.7 Transmission of electricity sub-programme

10.7.1 Mitigation Measures and Guidelines

<u>**Nature**</u>

The placement of a DS, a long-distance power line or other power lines in an area that is significant in terms of protecting the natural environment would degrade such an area and could potentially have negative impact on birds.

General mitigation measures:

1. In the area of intrusion upon qualifying habitat types, surfaces must be renewed and returned to their previous condition if possible.
2. The impact of long-distance power lines can be reduced by the well-planned and implemented placement of structures. To this end, the following is recommended:

- Amendments should be made to national technical standards with regard to the types of poles and isolators, where these do not yet take into account the problem of the electrocution of birds. The number of casualties among birds due to electrocution may be significantly reduced by using "bird friendly" poles, which make it impossible for birds to cause a short circuit.
- All new poles should correspond to new standards, and the old ones replaced with new ones as soon as possible.
- Before the poles are erected, all alternative routes of the long-distance line should be studied. Usually, birds choose to fly on certain, relatively narrow routes, while they almost never fly on certain others.

- Wherever possible, power lines should be placed underground. Such placement is mandatory in areas where birds fly frequently.
- The height of the power lines should be in harmony with objects in the vicinity - such as buildings, trees, forests, hills, etc - as much as possible.
- Long-distance lines should follow existing barriers, such as railways and roads.
- Power lines should ideally be placed at only one vertical level, or as close to this recommendation as possible.
- Large, easily visible black-and-white markings, which make the power lines more visible, should be placed on the lines in areas, where the possibility of a collision of a bird with a line is greater. It is recommended that new long-distance power lines are not built in areas where the probability of a collision of birds with power lines is greater (for instance, near known greater wintering areas or migration routes).
- It is favourable that in the phase of variant studies, birds are surveyed on all routes in order to determine the real differences between routes with regard to the protection of nature. In any case, such a survey needs to be made in all areas where the construction of long-distance power lines is planned. If the survey shows that the impact could be great, the plans must be adjusted accordingly.
- The survey must include the nesting and wintering periods and, above, all the flight of birds, and must therefore last for at least one year. Surveys must be performed by expert personnel.

Guidelines:

- It is recommended that long-distance power line routes are planned outside of protected areas, Natura areas or valuable natural features.
- If long-distance power lines cross significant areas of nature protection (protected areas or SPA), cables should be placed underground if possible.

Upon considering mitigation measures, the impact will be insignificant (grade C).

Impact assessment for the long-distance power line Okroglo – Udine and the long-distance power line Cirkovce - Podlog

Long-distance power lines Okroglo – Udine: Route H crosses various protected areas and directly influences qualifying habitat types, which in a majority of cases are also priority habitat types, according to the Decree on Habitat Types; it also crosses various valuable natural features. The most critical sections are those crossing the protected area along the Soča River (Act Determining the Conservation Area for the Soča River with Tributaries, Official Gazette of the SRS, Nos. 7/76, 8/76, 29/86, 83/89, 5/90, 10/91, 17/91, 55/92, 13/93, 66/93, 31/00, 110/02), the area of SCI 'Soča z Volarjo' and the NV 'Spodnja in Zgornja jama' at Divje babe, where the route crosses the slopes above the caves. In a broader Blegoš area, there is a habitat of qualifying species, as well as habitats of *euphydryas aurinia* (marsh fritillary), *callimorpha quadripunctaria*, *austropotamobius torrentium* and *bombina variegata* (the yellow-bellied toad). The broader area of Grahovo ob Bači is a habitat of *rhinolophus hipposideros* (the lesser horseshoe bat) and *myotis myotis (the great* mouse-eared bat). The G route crosses two protected zones; the impact is expected mostly on riparian habitat types. The long-distance power line crosses the waterways through the air, and so negative impacts on aquatic organisms are not expected. There are *tetrao urogallus* habitats, mostly in the Blegoš, Črni vrh and Bevke areas, which should be carefully checked when planning the route. The corrections to the following SCI areas are suggested: Grahovo ob Bači area, Soča z Volarjo, Zakriž – Trebenče and Idrijca with tributaries. Corrections are also suggested with regard to the size of the areas and the new qualifying species (The Institute of the Republic of Slovenia for Nature Conservation, IRSNC, February 2011).

The long-distance power line Cirkovci – Podlog is planned to cross the SPA and IBA Dravinja valley and represents a fragmentation of the habitat for aquatic and riparian birds and the qualifying specie *ciconia ciconia* (the white stork). The long-distance power line crosses this area for approximately 900 metres. The route also crosses the SCI Ličenca pri Poljčanah for 1500 metres. The valuable natural features of Ličenca (the valley inside the above-mentioned SCI) are the flood meadows with ponds. The existing priority and qualifying aquatic and riparian habitat types especially could suffer from the placement of pylons and long-distance power line corridor. The long-distance power line corridor crosses the SCI Kočno ob Ložnici over a length of 1,300 metres. The area's qualifying species is *rhinolophus hipposideros* (the lesser horseshoe bat) and the long-distance power line could have a direct and an indirect impact on this species. The corridor also runs along the eastern edge of the IBA Čreta, which is one of the five most important areas in Slovenia for the three species of nesting birds: *ixobrychus minutus* (the little bittern), *aythya nyroca (*the ferruginous duck*)* and *porzana porzana (*the spotted crake*)*. There is information on the habitats of *unio crassus, lycaena dispar* (large copper), *lucanus cervus* and *carabus variolosus* north of Poljčane. A correction of the SCI Kočno ob Ložnici and the SCI Ličenca has been suggested (new qualifying species), as well as a new SPA area Medvedce (in the area of IBA Čreta) (The Institute of the Republic of Slovenia for Nature Conservation, IRSNC, February 2011).

Table 36: Tabular display of long-distance power lines crossing various important areas of nature protection

Long-distance power line	Protected areas (Natura 2000 areas and protected areas – ZO)[1] and IBA	Qualifying species/HT which will be affected[1]	Valuable natural features and expected valuable natural features (pNV)[2]	Environmentally important areas (EPO)[2]
2x400 kV Okroglo-Udine (route G)	Direct impact: - SCI Idrijca with tributaries - ZO Soča (river) Indirect impact: /	Direct impact: - *salmo trutta marmoratus* - *leuciscus souffia* - *barbus plebejus* - *barbus meridionalis* - *cottus gobio* - *lutra lutra* - *cypripedium calceolus* - caves closed to the public - Alpine rivers and ligneous vegetation with grey willow (*Salix eleagnos*) along their banks - Alpine rivers and herbaceous vegetation along their banks	- Soča – canyon near Podsele - Idrijca River with tributaries - Davča with Porezen - Selška Sora River - Sava River – downstream from the confluence of Sava Bohinjka River and Sava Dolinka River - Kopačnica - Kožuhova grapa - Jablenovica - Soča River, downstream from the confluence with Idrijca River - Soča River with tributaries, to the confluence with Idrijca River - pNV Idrija fracture zone - pNV Brezoviški vrh - pNV Visoki kras - pNV Karbonati	- Blegoš - Soča - Krasnica - Idrijca River with tributaries - Sava River from Radovljica to Kranj, with a confluence with Tržiška Bistrica River
2x400 kV Okroglo-Udine (route H)	Direct impact: - SCI Soča with Volarja - SCI Pod Bučnico – scree - SCI Gozd Kranj – Škofja Loka - SCI Cerkno – Zakriž - SCI Blegoš - ZO Soča (river) - IBA Čreta Indirect impact: /	Direct impact: - *salmo trutta marmoratus* - *leuciscus souffia* - *barbus plebejus* - *barbus meridionalis* - *cottus gobio* - *callimorpha quadripunctaria* - *austropotamobius pallipes* - *austropotamobius pallipes* - *lutra lutra* - Illyrian beech forests	- Tolmin – under the graveyard near the Church of St. Urh - Selška Sora River - Sava River – downstream from the confluence of Sava Bohinjka River and Sava Dolinka River - Kopačnica - Osiščnica - Poljanščica - Sevniščica - Soča River with tributaries, to the confluence with Idrijca River	- Blegoš - Soča - Cerkno - Zakriž - Idrijca River with tributaries - Škofja Loka Hills - Sava River from Radovljica to Kranj, with a confluence with Tržiška Bistrica River

		(*Fagus sylvatica* (*Aremonio-Fagion*)) - Lowland hay meadows *(Alopecurus pratensis, Sanguisorba officinalis)* - Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi - Alpine rivers and ligneous vegetation with grey willow (*Salix eleagnos*) along their banks - Alpine rivers and ligneous vegetation with German Tamarisk (*Myricaria germanica*) along their banks - Alpine rivers and herbaceous vegetation along their banks - Medio-European calcareous scree of hill and montane levels - *cordulegaster heros* - *eleocharis carniolica* - *callimorpha quadripunctaria* - *rhinolophus hipposideros* - Dinaric dolomite Scots pine forests (Genisto januensis-Pinetum) - Beech forests (*Luzulo-Fagetum*)	- pNV Crngrob - pNV Idrija fracture zone - pNV Hrastnik - pNV Karbonati	

220 kV Cirkovce-Podlog	Direct impact: - SCI Kočno ob Ložnici - SPA Dravinja valley - SCI Ličenca pri Poljčanah - IBA Dravinja valley Indirect impact: /	Direct impact: - *rhinolophus hipposideros* - *ciconia ciconia* - *pernis apivorus* - *alcedo atthis* - *picus canus* - *lanius collurio* - *leucorrhinia pectoralis* - *maculinea teleius* - *maculinea nausithous* - *euphydryas aurinia* - *callimorpha quadripunctaria* - Illyrian oak-hornbeam forests (*Erythronio-Carpinion)* - Alluvial forests with *Alnus glutinosa in Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) - Beech forests *(Luzulo-Fagetum*) - Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	- Vršac - Dravinja - Ličenca – valley - pNV Haloze - pNV Karbonati	- Dravinja valley - Ličenca - Medvedce - Kočno ob Ložnici

Legend:

Abbreviated names:

SPA	Special Protected Area
SCI	Sites of Community Interest
ZO	Protected area
NV	Valuable natural feature
pNV	Expected valuable natural feature
EPO	Ecologically important area
IBA	Important Bird Area
HT	Habitat type

[1] **Protected zones; Qualifying species/HT which will be affected:** Only those protected zones and qualifying species and HT are listed which are present in the area of influence and for which a direct or indirect impact has been determined according to the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas (Official Gazette of the Republic of Slovenia, Nos. 130/04, 53/06, 38/10), as follows:
DIRECT IMPACT (5 metres): all groups
INDIRECT IMPACT (250 metres): *ciconia ciconia*, *ciconia nigra,* aquatic birds, birds of prey, bats

[2] The table lists EPO and NV at 40 metres of protection corridor of the long-distance power line

Long-distance power line Okroglo – Udine (route G) and long-distance power line Cirkovce – Podlog are acceptable, provided that mitigation measures are implemented (grade C).

Mitigation measures for long-distance power line Okroglo – Udine

1. The route must be implemented with respect to the Act Determining the Conservation Area for the Soča River with Tributaries (Official Gazette of the SRS, Nos. 7/76, 8/76, 29/86, 83/89, 5/90,

10/91, 17/91, 55/92, 13/93, 66/93, 31/00, 110/02) and the relevant legislation with regard to the Natura areas, valuable natural features and EPO.
2. It must be planned in a way that ensures that in areas worthy of nature protection and habitats of protected and endangered species, destruction occurs only in the most limited scope.
3. Special attention should be paid to the assessment of impacts on the *tetrao urogallus*.
4. As part of the assessment made in the planning phase, the impact of routes should be carefully studied, and the routes changed if necessary (for instance, a combination of both variants of routes would be preferable from the point of view of nature protection).

A comprehensive assessment of acceptability must be carried out during the phase of preparing more detailed plans or interference, in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

Mitigation measures for long-distance power line Cirkovce-Podlog

1. In the area of SCI Ličenca pri Poljčanah, pylons should not be placed in the NV Ličenca – valley. If this is not possible, the route of the long-distance power lines must be planned in a way which preserves the existing flood meadows, with ponds and riparian vegetation, as much as possible.
2. The route of the long-distance power line west of Poljčane (at SCI Ličenca pri Poljčanah) should be transferred approximately 200 metres to the north, which would enable the route to avoid interference with the EPO Ličenca and the qualifying HT Illyrian oak-hornbeam forests.
3. Where the route crosses the IBA Četa, the impact on *ixobrychus minutus* (the little bittern), *aythya nyroca (the* ferruginous duck*)* and *porzana porzana (*the spotted crake) should be assessed.
4. The habitats of *unio crassus, lycaena dispar* (large copper), *lucanus cervus* and *carabus variolosus* north of Poljčane should be interfered with as little as possible.
5. In the area of SCI Kočno ob Ložnici, the long-distance power line route should be moved outside the Natura area.

A comprehensive assessment of acceptability must be carried out during the phase of preparing more detailed plans or interference, in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

Cultural heritage

Long-distance power lines 2x400 kV Okroglo – Udine

There are quite a few areas and structures of cultural heritage within the corridors of both planned long-distance electric power routes.

The eastern part of route H, compared to the eastern part of route G, passes by more areas and structures of cultural heritage. The eastern part of route H also passes by several broader areas of protected religious structures which form a recognisable spatial feature in this section. Both routes cross the area of the Praprotno – Selška Sora cultural landscape (Heritage Register Number EŠD 18168) in the settlement corridor Dolenja vas – Ševlje – Bukovica, and pass the protected cultural landscape area of Gorenje and Dolenje Žetine (Heritage Register Number EŠD 16486).

The western part of route H touches several smaller areas and structures of cultural heritage, mostly in the area of Orehek pri Cerknem, Bukovno, Grahovo ob Bači, Podmelec and Tolmin. The western part of route G touches greater areas of protected cultural heritage in the areas of Šebrelje, Šentviška gora, Polje pri Šentviški gori, Pečine and Slap ob Idrijci.

Both routes touch several archaeological sites; however, it has been assessed that when planning routes in this area in more detail, these sites could be avoided by the careful placing of pylons.

Long-distance power line 220 kV Cirkovce – Podlog

The corridor of the 220 kV Cirkovce – Podlog long-distance power line is planned along the existing long-distance power line corridor. Due to this fact, greater additional negative impacts on the protected areas and structures of cultural heritage are not expected in this area.

Overall evaluation

With due consideration given to the assessment that during the following phases of planning, the routes of these long-distance power lines could be optimised, the impacts of the expected corridors at the strategic level or the NEP level are assessed as insignificant, provided that mitigation measures are implemented (grade C). The corridors and their variants should be planned in more detail and compared by respecting the principles of protection of cultural heritage.

Guidelines and mitigation measures for the 2x400 kV Okroglo – Udine

1. Route G:

- The long-distance power line crosses the area Praprotno – Selška Sora cultural landscape (Heritage Register Number EŠD 18168) between the settlements of Dolenja vas and Ševlje: the possibilities of optimising the route of the long-distance power line should be studied in order to keep changes in the current environment to a minimum and not visibly exposed. When planning in more detail, the heritage spatial qualities should be taken into account.
- The long-distance power line crosses the area of Sopotnica – the military road Blegoš (Heritage Register Number EŠD 21476) under Martinj vrh in two places: the possibilities of optimising the route of the long-distance power line should be studied in order to prevent interference with the protected area.
- The long-distance power line passes north of the protected area of cultural landscape of Gorenje and Dolenje Žetine (Heritage Register Number EŠD 16486) on the northern slope of Martinj Vrh: the route should be planned in a way that it is invisible from the area of protected landscape.
- The route also touches several protected archaeological sites near or in the settlements of Bukovščica, Šebrelje, Šentviška Gora, Polje pri Šentviški Gori, Pečine and Slab ob Idrijci: preliminary archaeological studies should be made; appropriate measures determined in accordance with the guidelines set by the appropriate services, and the archaeological site should be avoided or at least interfered with as little as possible.
- The route also touches broader protected areas, or a greater number of individual protected structures in the area of the following settlements: Gorenji Novaki, Šebrelije, Dabra, Šentviška Gora, Pole pri Šentviški Gori, Pečine and Slap ob Idrijci. The possibilities of optimising the route of the long-distance power line should be studied in order to interfere with the protected areas as little as possible. The visual perception from and to the areas and structures of cultural heritage should be taken into account. When planning in more detail, the heritage spatial qualities should be taken into account. Impact during construction should be prevented; if necessary, in the case of solutions which would have an impact, the possibility of preservation should be studied.

- The probable change in the broader ambience and views of a number of protected structures and/or areas of influence of religious structures: the long-distance power lines should be planned in a way that would prevent changes in the image of the landscape and the landscape features characteristic of this area. When planning in more detail, the heritage spatial qualities should be taken into account.

2. Route H:

- The long-distance power line crosses the area of Praprotno – Selška Sora cultural landscape (Heritage Register Number EŠD 18168) between the settlements of Dolenja vas and Ševlje: the possibilities of optimising the route of the long-distance power line should be studied in order to make the change in the current environment as small as possible and not visibly exposed. When planning in more detail, the heritage spatial qualities should be taken into account.
- The long-distance power line crosses the area of Sopotnica – the military road Blegoš (Heritage Register Number EŠD 21476) near Stari vrh: the possibilities of optimising the route of the long-distance power line should be studied in order to prevent the interference with the protected area.
- The long-distance power line route passes south of the protected area of the cultural landscape of Gorenje and Dolenje Žetine (Heritage Register Number EŠD 16486) on the southern slope of Malenski Vrh: the route should be planned in a way which makes it invisible from the area of protected landscape.
- The route touches several protected archaeological sites near or in the settlements of Kranj, Bukovica pri Železnikih, Podvrh pod Starim vrhom, Javorje pri Delnicah, Dolenčice, Volaka, Stara Oselica, Zakriž, Bukovno, Podmelec, Koritnica ob Bači, Prapetno, Tolmin, Volče pri Tolminu. Preliminary archaeological studies should be made; appropriate measures determined in accordance with the guidelines set by the appropriate services, and the archaeological site should be avoided or at least interfered with as little as possible.
- The route also touches broader protected areas or a greater number of individual protected structures in the areas of the following settlements: Podvrh pod Starim vrhom, Javorje pri Delnicah Strmica, Dolenčice, Bukovo, dolina Bače, Podmelec, Ljubinj, Prapetno, Tolmin, Volče pri Tolminu. The possibilities of optimising the route of the long-distance power line should be studied, so that there is as little interferences with the protected areas as possible. The view from and to the areas and structures of cultural heritage should be taken into account. When planning in more detail, the heritage spatial qualities should be taken into account. Impact during construction should be prevented; if necessary, in the case of solutions which would have an impact, the possibility of preservation should be studied.
- The probable change in the broader ambience and the views of a number of protected structures and/or areas of influence of important sacral structures: the long-distance power lines should be planned in a way which would prevent changes in the image of the landscape and the landscape features characteristic of this area. When planning in more detail, the heritage spatial qualities should be taken into account.

Guidelines and mitigation measures for the long-distance power line 220 kV Cirkovce – Podlog

- The long-distance power line should follow the corridor of the existing long-distance power line. The pylons and accompanying infrastructure should be planned in a way which would cause as little interference with areas and structures of cultural heritage as possible. When planning in more detail, the heritage spatial qualities should be taken into account.

Landscape

Long-distance power line 2x400 kV Okroglo – Udine

On the basis of the Determination Study of the Feasibility of the 400 kV Long-Distance Power Line Okroglo (Slovenia) – Italian Border, Final report, University of Ljubljana, Faculty of Biotechnology, Department of Landscape Architecture (*Študije za določitev pasu izvedljivosti 400kV daljnovoda Okroglo (SLO) - italijanska meja, končno poročilo, Univerza v Ljubljani, Biotehnična fakulteta, Oddelek za krajinsko arhitekturo, 2007*), the key optimisation has already been made – the determination of a potential corridor in a way which would minimise the impacts of interference.

The route of the long-distance power line 2x400 kV Okroglo – Udine is not yet finally determined. Two general corridors have been suggested. Both are planned to cross the valley of the Selška Sora River, which is protected as a heritage cultural landscape. Visual exposure of the long-distance power line is expected on the slopes and when crossing the open floor of the valley.

The eastern part of route G of this corridor mostly traverses areas of continuous forest. The forest areas are interspersed with settlements and clearings of meadows and fields. The route to Cerkno crosses the functional areas of the settlements of Zabrekve - Pozirno - Dolenja vas and Novaki. It crosses the valley of the Selška Sora River at the Dolenja vas settlement. A greater impact of visual change in the image of the landscape is expected from more visibly prominent areas and areas where people spend more time.

The whole eastern part of route H of this corridor, to the settlement of Cerkno, touches a greater number of settlements, remote farms, settlement areas and their functional areas. It also touches a number of exposed areas of ridge flats with religious structures which represent a characteristic spatial element in this area.

The routes of corridors H and G merge near the Podlanišče settlement and follow the slopes south of Cerkno together. A change in the broader Cerkno area is expected.

The western part of route G of this corridor crosses the Cerknica valley and then turns to the northern slopes of the Idrijca valley. It crosses the Idrijca valley in two places between Reka and Daber. A greater impact on the visual quality of this area is expected. Next, the route touches the settlement areas of Daber – Zakraj – Šentviška Gora – Polje – Prapetno Brdo, where greater impact is expected on the change in the broader image of the landscape due to the broader view from the flats, which will partly be more open. The route crosses the Idrijca valley near the settlement Slap ob Idrijci, from where it passes through the functional and visual areas of the settlements Tolminski Lom and Kanalski Lom. From there it crosses the Soča valley, and then to the Italian border, where the route passes through a woodland area; greater negative impacts on the quality of the landscape here are not expected.

The western part of route H of this corridor starts from the slopes south of Cerkno and then joins the corridor of the existing 110 kV long-distance power line, which it follows all the way to the state border. The placement of the additional power line will cause an increase in an element already present in the environment, and thus potential negative effects in the changes in landscape features.

In terms of landscape quality, both corridors are acceptable. A more detailed optimisation and comparison between the two routes would be needed in order to determine the final acceptability of the route of this long-distance power line. In the current phase of planning, priority is being given to the northern variant of both routes: the eastern part of route H of this corridor crosses undulating terrain with a greater number of settlement areas in the clearings and on the flats. A greater negative impact on the broader image of the landscape is expected in comparison with the eastern part of route G, which mostly passes through woodland areas. The western part of route H will probably have a smaller impact on the change of the landscape and the visual perception of the terrain, because the majority of this route follows the corridor of the existing 110 kV long-distance power line. On the other hand, the western part of route G would open a new corridor in the environment, which has not been burdened with similar interference.

Long-distance power line 220 kV Cirkovce – Podlog

The corridor of the 220 kV Cirkovce – Podlog long-distance power line is planned along the existing long-distance corridor. Due to this fact, greater additional negative impacts on the quality of the landscape are not expected in this area.

Construction of a high-voltage 110 kV grid and distribution substations

When constructing the high-voltage 110 kV grid and distribution substations, their scope and subsequent cumulative impact on the landscape must be taken into account. The impact is shown mostly as a general increase in the perception of electric power infrastructure in a certain environment, which usually has negative impacts on the quality of the landscape. When planning and implementing the system, it is therefore necessary to carefully respect the recommendations for installing such devices in the environment.

Overall evaluation

With due consideration given to the assessment that during the following phases of planning the routes of these long-distance power lines, these could be optimised, the impacts of the expected corridors at the strategic level or the NEP level are assessed as insignificant, provided that mitigation measures are implemented (grade C). The corridors and their variants should be planned in more detail and compared by respecting the principles of protection of landscape.

General guidelines and mitigation measures

The guidelines listed in the manual *Načrtovanje in krajinsko oblikovanje koridorjev daljnovodov in cevnih vodov (Marušič I. et al, MOP, 1998)* should be taken into account when planning in more detail. The measures refer to two levels – the level of implementation in the environment and the level of design. At the level of implementation of long-distance power lines, the following should be taken into account:

- the relation between the long-distance power line and the relief of the terrain,
- the relation between the long-distance power line and vegetation,
- the relation between the long-distance power line and bodies of water,
- the relation between the long-distance power line and settlement areas and habitations,
- the relation between the long-distance power line and the existing long-distance lines and infrastructure lines,

- the relation between the long-distance power line and the structural arrangement of the environment,
- the landscape aspects of placing distribution substations in the environment.

Regarding the level of design of long-distance power lines, the following should be taken into account:

- management of damaged areas,
- management of damaged areas,
- management of access paths,
- appropriate design of the long-distance power line which is to pass through cleared woodland,
- appropriate vegetation planted at the foot of pylons,
- appropriate arrangement of vegetation around other structures,
- appropriate architectural solutions for the design of pylons,
- colour adaptation of pylons,
- appropriate architecture of accompanying structures.

Guidelines and mitigation measures for the 2x400 kV Okroglo – Udine

1. Route H:

- The detailed route of the long-distance power line passing Sveti Jošt hill above Kranj should be prepared in a way which would prevent the line from being visually exposed.
- Crossings of settlement areas and their functional areas should be planned in a way which would minimise interference with these settlement areas and prevent the visual degradation of more broadly recognisable spatial features (religious structures at more prominent relief points, clearings and the view from the settlements).
- The crossing of the Selška Sora River should be planned so that the interference will not be visually prominent. Also, special attention should be paid to planning the route of the long-distance power line where it passes the Gorenja and Dolenja Žetina settlements, preventing it from being visible from this area.
- The route of the long-distance power line near Cerkno should be planned so that interference will not be visually prominent from the direction of Cerkno.
- If possible, the route should be planned in a way which prevents further crossings of the Idrijca valley.
- The possibility of the route passing outside the settlement areas of Daber – Zakraj – Šentviška Gora – Polje – Prapetno Brdo should be studied.
- The possibility of the route passing outside the functional and visual area of the Slap ob Idrijci settlement, and of it not crossing the Idrijca River valley should be studied.
- The route of the long-distance power line should be planned so that interference will not be visually prominent from the direction of Most na Soči.
- The crossing of the Soča River should be planned so that interference will not be visually prominent.

2. Route G:

- A detailed route of the long-distance power line, passing Sveti Jošt hill above Kranj, should be planned in a way which would prevent the line from being visibly exposed.
- In the areas of the settlements of Zabrekve, Pozirno, Dolenja vas and Novaki, the route should be planned so that interference will not be visually prominent from the direction of these settlements and so that the route will not touch the settlement areas if possible.

- The crossing of the Selška Sora River should be planned so that the interference will not be visually prominent. Also, special attention should be paid to planning the route of the long-distance power line where it passes the Gorenja and Dolenja Žetina settlements, preventing it from being visible from this area.
- The crossing of the Kopačnica valley should be planned so that the interference will not be visually prominent.
- The passing of the long-distance power line near Cerkno should be planned so that the interference will not be visually prominent from the direction of Cerkno.
- The route of the new long-distance power line should follow the route of the existing line so that the interference will be as inconspicuous as possible and so that there are no conflicts with settlement areas or their functional areas. All quality views should be preserved. The interference should be planned by implementing measures for greater integration into the environment (planting of vegetation, taking into account the existing relief, etc.).

Guidelines and mitigation measures for the long-distance power line 220 kV Cirkovce – Podlog

- The long-distance power line should follow the corridor of the existing long-distance power line. The pylons and the accompanying infrastructure should be planned so that the interference will be as integrated into the environment as possible and as inconspicuous as possible.

Health

With regard to the impact on health, the measures implemented as part of the sub-programme of the transmission of electricity are rated C (assessment of significance of impacts on the environment), provided that mitigation measures are implemented which reduce the exposure of inhabitants to EMR during the implementation period of the NEP.

Mitigation measures for decreasing the exposure of inhabitants to EMR must be ensured by planning the routes outside settlement areas. If this is not be possible, the long-distance power lines must be placed underground, regardless of the costs of such construction, which should also be respected when reconstructing the existing long-distance power lines.

10.7.2 Overall assessment of the significant environmental impacts of the sub-programme for the transmission of electricity

Table 37: Assessment of significant environmental impacts of the sub-programme for the transmission of electricity

Measure / significant impacts	Nature	Cultural heritage	Landsca pe	Health
LONG-DISTANCE POWER LINES 2x400 kV Okroglo – Udine (connection with Italy) **LONG-DISTANCE POWER LINES 220 kV Cirkovce – Podlog**	**C**	**C**	**C**	**C**
DS and junctions	**C**	**C**	**C**	**C**
Lines: LONG-DISTANCE POWER LINES 110 kV, LONG-DISTANCE POWER LINES 2x110 kV, KBV 110 kV, KBV 2x110	**C**	**C**	**C**	**C**

kV, [connection] – new constructions and reconstructions, in accordance with companies' development plans				

10.8 Electricity distribution grid sub-programme

10.8.1 Mitigation Measures and Guidelines

Nature

A long-distance power line is a lethal barrier for birds and fragments their habitat. The flight corridors near waterways, wintering areas near the water, flight areas of large birds, implementation of the long-distance power lines through woodland areas, etc. must be given special attention.

Power lines - general mitigation measures:

1. In the area of intrusion upon qualifying habitat types, surfaces must be renewed and restored to their previous condition if possible.
2. The impact of power lines on birds can be reduced by the well-planned and implemented placement of structures. To this end, the following is recommended:

- Amendments should be made to national technical standards with regard to the types of pylon and isolator, where these do not yet take into account the problem of the electrocution of birds. The number of casualties among the birds due to electrocution may be significantly reduced by using 'bird-friendly' pylons, which make it impossible for the birds to cause a short circuit.
- All new power lines should correspond to new standards and the old ones should be replaced with new ones as soon as possible.
- Before the power lines are placed, all alternative routes should be studied. Usually, birds choose to fly on certain, relatively narrow routes, while they almost never fly on certain others.
- Wherever possible, power lines should be placed underground. Such placement is mandatory in areas where birds fly frequently.
- The height of the power lines should be in harmony with objects in the vicinity, such as buildings, trees, forests, hills, etc. as much as possible.
- Power lines should follow existing corridors, or at least existing barriers, such as railways and roads.
- Power lines should ideally be placed at only one vertical level, or as close to this requirement as possible.
- Large, clearly visible black-and-white markings which make the power lines more visible should be placed on the lines in areas, where the possibility of a collision of a bird with a power line is greater. It is recommended that new lines are not built in areas where the probability of a collision of birds with power lines is greater (for instance, near known greater wintering areas or migration routes).
- It is favourable that, in the phase of variant studies, birds are surveyed on all routes in order to determine the real differences between the routes with regard to the protection of nature. In any case, such a survey needs to be made at least in areas where the construction of a power plant is planned. If the survey shows that the impact could be great, the plans must be adjusted accordingly.
- The survey must include the nesting, wintering and, above, all the flight of birds and must therefore continue for at least one year.
- Surveys must be performed by expert personnel.

Guidelines:

- It is recommended that power lines are planned outside of protected areas, Natura areas, or valuable natural features.
- If power lines cross significant areas of nature protection (protected areas or SPA), cables should be placed underground if possible.

Provided that mitigation measures are implemented, the construction is acceptable (grade C).

Cultural heritage

The principles of protection of cultural heritage should be respected when planning in more detail – especially the principle of avoiding structures and areas of cultural heritage; also, individual protected heritage features should be taken into account in the same manner. Mitigation measures which refer to the protection of landscape should also be implemented. The impact of this sub-programme is assessed as insignificant (grade C), provided that the appropriate mitigation measures are implemented.

Landscape

This sub-programme is assessed as insignificant (grade C), provided that mitigation measures which refer to the following to levels are observed:

- the level of implementation in the environment (preservation of landscape features) and
- the level of design (use of supporting pylons of modern design).

The guidelines listed in the manual *Načrtovanje in krajinsko oblikovanje koridorjev daljnovodov in cevnih vodov (Marušič I. et al, MOP, 1998)* should also be taken into account when planning in more detail. The solutions should be adapted to individual spatial planning problems.

Health

With regard to the impact on health, the measures implemented as part of the electricity distribution grid sub-programme are rated grade C (assessment of significance of impacts on the environment), provided that mitigation measures are implemented which reduce the exposure of inhabitants to EMR during the implementation period of the NEP.

The mitigation measures for reducing the level of exposure of inhabitants to the EMR must always be implemented by planning the power lines as underground cables in settlement areas or areas intended for settlement according to spatial plans; the same should be respected when reconstructing existing lines.

10.8.2 Overall assessment of the significant environmental impacts of the electricity distribution grid sub-programme

Table 38: Assessment of the significant environmental impacts of the electricity distribution grid sub-programme

Measure / significant impacts	Nature	Cultural	Landsca	Health

		heritage	pe	
high-voltage 110 kV grid: long-distance power line 110 kV, long-distance power line 2x110 kV, KBV 110 kV, KBV 2x110 kV, – new constructions and reconstructions, in accordance with the companies' development plans	C	C	C	C
distribution substations 110 kV/SN	C	C	C	C
other investments in the reconstruction of the 110 kV grid and an increase in capacity, reconstruction of DS 110 kV/SN (medium-voltage) until 2020:	C	C	C	C

10.9 Natural gas supply sub-programme

10.9.1 Guidelines and Mitigation Measures

<u>Nature</u>

Destruction, fragmentation and reductions in the surface of land and aquatic habitat types and habitats of species occur during the construction of the gas pipeline. Such construction could have the most extensive permanent impact on the environment near waterways and wetlands.

Gas pipeline - general mitigation measures:

1. The gas pipeline route should not be sited on SCI areas – the inner zones of hydrophilous habitat types and species.
2. The gas pipeline route should not be sited on wetlands.
3. In the area of intrusion upon qualifying habitat types the surfaces must be renewed and restored to their previous condition if possible.
4. Substitution of habitats should be ensured if necessary.

Guidelines:

- It is recommended that gas pipeline routes are planned outside protected areas, Natura 2000 areas, or valuable natural features.
- Waterways should be crossed by sub-surface drilling wherever possible.

Gas pipeline M9b Kidričevo - Vodice

The route of the corridor suggests that it will cross several Natura areas. South-west of Kidričevo lies the SPA Dravinja valley and SCI Dravinja pri Poljčanah. The corrections to the following SCI areas are suggested: Češeniška gmajna and Rovščica, Dobje (Cerovec) and Boč – Haloze - Donačka gora. The new SCI Dravinja and Savinja areas have also been suggested (The Institute of the Republic of Slovenia for Nature Conservation, IRSNC, February 2011). The gas pipeline could affect the integrity and functional cohesion of Natura areas, with broader impacts on SCI Dravinja pri Poljčanah. Such construction could have the most extensive permanent impact on the environment near waterways and wetlands.

The corridor follows the southern edge of the SCI Ličenca pri Poljčanah, and crosses the SCI Ložnica and the SCI Savinja Letuš. The crossing of waterways must be done by sub-surface drilling in order to avoid the impact on aquatic organisms during construction.

Along the Dravinja River there is an important area of nature protection for the HT Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; the broader area is a habitat of the protected *rhinolophus hipposideros*; the waterway is the habitat of the *austropotamobius torrentium*. The Savinja River is a habitat of the qualifying species *hucho hucho* and *barbus meridionalis*, as well as of the protected *gobio uranoscopus*. The area of Prevaljske gmajne and Rovščica contains important HT of nature protection: the HT natural eutrophic lakes, HT transition mires and quaking bogs, and HT depressions on peat substrates of the Rhynchosporion. This area is also a habitat of the following protected species: *austropotamobius torrentiumI, bombina variegata* and *lutra lutra*.

There are a number of protected areas (points) inside the area of influence. The gas pipeline should be planned to avoid at least the points of protected units, and if possible, also other protected areas. In the event of interference with the protected areas, the protection regime prescribed by a valid legal act should be taken into account.

The route will also have a direct or indirect impact on the NV Dravinja, NV Ličenca – Poljčane, NV Ponikovski kras, NV Rovščica in the upper section, NV Volčji potok – arboretum, EPO Dravinja valley, EPO Ložnica, etc.

Mitigation measures for M9b Kidričevo – Vodice

1. The route should be located north of the SCI Dravinja pri Poljčanah as much as possible, outside the habitats of qualifying species.
2. In the area of SCI Dravinja pri Poljčana, the route must be planned outside hydrophilous habitats. A map of habitat types should be prepared.
3. Important habitat types of nature protection and habitats of protected and endangered species should be interfered with as little as possible. Waterways should be crossed by subsurface drilling.
4. In the area of Prevaljske gmajne and Rovščica, the route should be planned outside HT natural eutrophic lakes, HT transition mires and quaking bogs, and HT depressions on peat substrates of the Rhynchosporion. A map of habitat types should be prepared.
5. The gas pipeline route should avoid qualifying HT in the area of SCI Ličenca pri Poljčanah.
6. Near Polzela, the route should avoid the area of SCI Ložnica and the protected area of Ložnica River with its flood area.
7. The gas pipeline should be planned to avoid at least the points of protected units, and if possible, other protected areas. In the event of interference with the protected areas, the protection regime prescribed by a valid legal act should be taken into account.

A comprehensive assessment of acceptability must be carried out during the phase of preparing more detailed plans or interference, in accordance with Article 25.a of the Rules on the assessment of acceptability of impacts caused by the execution of plans and activities affecting nature in protected areas.

Provided that mitigation measures are implemented, the construction is acceptable (grade C).

Cultural heritage

Gas pipeline M9b Kidričevo - Vodice

The gas pipeline route M9b Kidričevo – Vodice touches several areas and structures of cultural heritage. Between Vodice and Radomlje, the route follows the corridor of the planned gas pipeline M 2/1 in a parallel manner (this gas pipeline was determined by the Decree on the National Spatial Plan for the gas pipeline M 2/1 on the section between Trojane and Vodice pri Ljubljani, Official Gazette of the Republic of Slovenia, No. 40/2010). The corridor of the M9b crosses several broader protected areas:

- the settlement heritage of Topole village (Heritage Register Number EŠD 10655),
- the archaeological site Drnovo pri Mengšu (Heritage Register Number EŠD 10624),
- the area of prehistoric settlement near Homec (Heritage Register Number EŠD 10617) and its area of influence, where several protected structures of cultural heritage lie in the direct vicinity,
- the area along the Radomeljska Mlinščica waterway (Heritage Register Number EŠD 13772),
- the protected area Arboretum – Volčji Potok, which is a monument of national importance (Heritage Register Number EŠD 7904) and its area of influence, Official Gazette of the Republic of Slovenia, Nos. 82/99, 111/00 and Nos. 82/99, 22/02).

East of Radomlje, the corridor of the gas pipeline M9b turns north from the planned M 2/1, where it touches the following areas with a greater number of protected structures and areas of protected cultural heritage: Veliki Rakitovec, Bela, Motnik.

Near Ločica pri Vranskem, the route of the gas pipeline follows the corridor of the planned gas pipeline M 2/1 more or less in a parallel manner (this gas pipeline was determined by the Decree on the National Spatial Plan for the gas pipeline M 2/1 on the section between Rogaška Slatina and Trojane (Official Gazette of the Republic of Slovenia, No. 41/2010); from Ločica ob Savinji onwards, the route also follows the corridor of the planned 220 kV long-distance power line Cirkovce – Podlog. This area is fairly densely populated. The corridor touches smaller protected areas and structures within settlement areas and some broader protected areas of the following villages: Pondor, Ojstriška vas, Laze pri Dramljah, Zgornje Polčane and Studenice. The corridor then crosses the area of Štatenberg – castle (Heritage Register Number EŠD 761). It also touches a smaller number of archaeological sites.

Overall evaluation

It has been assessed that during the ensuing phases of planning, such optimisation of the gas pipeline route is possible which would prevent negative impacts on cultural heritage such as the destruction or damage of the heritage structures or elements which should be protected, or an impact on the integrity of heritage areas. The structures located in the direct vicinity of the excavation work could be appropriately protected during construction. No impacts on structures of cultural heritage are expected during operation. The impacts of the planned route of the corridor on a strategic level or the level of the NEP are assessed as insignificant, provided that mitigation measures are taken into account (grade C). The gas pipeline route should be planned in more detail and compared by respecting the principles of protection of cultural heritage. The impacts on the archaeological heritage cannot be assessed in more detail in the phase of the strategic environmental assessment.

General mitigation measures

The fundamental protection platform is that gas pipeline routes must avoid protected areas and structures of cultural heritage, while the solutions must observe the preservation of protected heritage features. Special attention needs to be paid to the location and design of facilities constructed above ground.

Along the gas pipeline route, preliminary archaeological studies and protective excavations must be performed as a rule, and solutions adapted accordingly if necessary.

The structures and areas of cultural heritage must also be protected from damage or destruction during construction – the protection of monuments needs to be ensured in the vicinity of excavation works, as well as rehabilitation and the arrangement of the landscape in damaged areas, etc.

Landscape

Gas pipeline M9b Kidričevo - Vodice

The gas pipeline M9b Kidričevo – Vodice route interferes with various areas of landscape types (according to the Regional Distribution of Landscape Types in Slovenia, MOP UPR, 1998) with the following characteristics:

- The Bistrica plain (Bistriška ravan): mostly non-separated agricultural areas, level terrain, reclaimed areas; the scope of the settlement remains acceptable; the level of preservation of nature and the diversity of the landscape are reduced due to the intensive agriculture;
- Črni graben: narrow valley, agricultural landscape on slopes exposed to the sun; valley floor with several dense settlements; continuous forests on slopes not exposed to the sun; there are several causes of degradation (stone quarry, regulations), however, compared to the valley floor, the slopes exposed to the sun have retained their identity;
- the Tuhinj valley (Tuhinjska dolina): the valley still preserves its natural (relief, vegetation, etc.) and cultural features. There are no bigger agricultural land reclamations; waterways are only rarely regulated. The valley remains for use in a traditional agricultural manner;
- The peripheral hills of the Savinja valley in the south: the picturesque hills make up the contours of the valley; there are individual more serious examples of degradation;
- The central area of the Savinja valley – Celje Basin (Celjska kotlina): densely populated valley used for agriculture and industry. A non-separated agricultural landscape is characteristic of this area. The special feature of the agriculturally intensive land are hop fields;
- Konjiška gora and the catchment area of the Pešnica and Slomščica waterways: from a landscape point of view, this is an interestingly structured area with minor degradations;
- Dravinja Valley: a narrow valley with the preserved meandering mid-section of the Dravinja River; the intensive agricultural use of fields and meadows is adapted to the plain on the valley floor. The lower section of the Dravinja River has been denaturalised by regulation; the river remains an inconspicuous part of the landscape;
- The Dravinja hills (Dravinjske gorice): a broader area of low hills at the southern contour of the Drava field (Dravsko polje) with a mosaic landscape pattern and vineyards, partly degraded by holiday homes;
- Dravsko polje (Drava field): a landscape of intensive urbanisation and agriculture, and only few natural features. Infrastructure, such as long-distance power lines connected with industrial facilities and channel HPPs on the Drava River, is especially prominent.

The gas pipeline route interferes with the Volčji potok area, which is recognised as an area of recognisable landscape features at the national level, in accordance with the Spatial Development Strategy of Slovenia (Official Gazette of the Republic of Slovenia, No. 76/2004). The area extends across an undulating cultural landscape at the crossroads of historically important roads crossing the Bistrica plain (Bistriška ravnina) and Črni graben. Four flat-land castles are included in this area: Volčji Potok, Kolovec, Češenik and Črnel. The old Radomeljska Mlinščica stream, which flows under

Homec Hill (Homški hrib) with two watermills still preserved, is of great cultural importance, as is Homec Hill itself with a church on top. The central monument of this area is Volčji Potok Arboretum, with its park and the greatest collection of woody plants in Slovenia. The area includes the settlements of Rova, Žiče, Zagorica and Dolenje, which have kept their dense character despite expansion.

The corridor of the gas pipeline will cross the area of Štatenberg Castle, which is a unique landscape site on the eastern edges of the extraordinary Pleterje region.

Overall evaluation

The impact of the gas pipeline route on the quality of the landscape will appear where the route will be visible – the areas where the gas pipeline is to pass through a continuous overgrowth of high vegetation. The construction and operation of the gas pipeline demands higher vegetation to be removed from the corridor, which makes the route visible when it crosses forests, shrubs, riparian vegetation, hedges, parks and gardens. The planning of the route to cross the forest areas therefore has a greater impact from in terms of the quality of the landscape, than planning the route to cross other areas (for instance, agricultural land). The assessment of impact therefore depends mostly on the level of change in the visual quality of the environment.

During further planning phases, the route should be optimised to be as invisible as possible, especially in areas of higher quality landscape (the broader area of Volčji potok, Dravinja hills, finely structured areas of valley floors and higher areas near settlements). The impacts of the sub-programme on the landscape are assessed as insignificant, provided that mitigation measures and the above-mentioned landscape features are taken into account (grade C).

General mitigation measures

- the route of the gas pipeline should follow as closely as possible the existing routes and infrastructure (the road network and long-distance power lines),
- in order to integrate the route into the environment as much as possible, it should take the relief features of individual terrain into account, avoiding relief edges and sharp passages; relief edges should be used to disguise the passages,
- when crossing continuous vegetation, the route should follow existing clearings, and field and forest paths as closely as possible,
- in forest areas, the operational area should be as narrow as possible,
- the route should avoid clearings and changes in the use of the land in corridors where the route is visible from points of interest (settlements, tourist and recreational paths, spatial dominants, etc.),
- the landscape architecture plan should foresee appropriate rehabilitation after construction, especially in areas where the route interferes with higher vegetation (forest, shrubs, riparian vegetation, hedges),
- the final solution should follow the surrounding terrain as closely as possible.

The guidelines listed in the manual *Načrtovanje in krajinsko oblikovanje koridorjev daljnovodov in cevnih vodov (Marušič I. et al, MOP, 1998)* should also be taken into account when planning in more detail. The solutions should be adapted to individual spatial planning problems.

10.9.2 Overall assessment of the significant environmental impacts of the natural gas supply sub-programme

Table 39: Assessment of the significant environmental impacts of the natural gas supply sub-programme

Measure / significant impacts	Nature	Cultural heritage	Landscape
Gas pipeline M9b Kidričevo – Vodice, until 2020	**C**	**C**	**C**

10.10 Liquid fuel sub-programme

10.10.1 Mitigation Measures and Guidelines

Climatic factors

The production of biofuels from processing wood biomass according to the FT procedure is rated grade A (assessment of significance of impacts on the environment) from the point of view of impact on climatic factors, because the production of biofuels leaves a carbon footprint below 30% of the carbon footprint of the biofuels thus produced.

Nature

The following measures need to be taken into account:

- An appropriate plan for handling the digestate must be prepared before the biogas plant begins operations.
- The introduction of monocultures in important areas of nature protection is not acceptable.
- Only forest biomass from areas of overgrowth may be used for the production of biofuels.

The measures taken as part of the liquid fuel sub-programme are rated C for their impact on nature.

Landscape

The introduction or encouragement of the use of biofuels may indirectly cause an increase in the production of plants that may be used for the production of biofuels. Such is usually the case of monocultures in extensive areas which demand an adaptation of agricultural production (employment of agrarian operations) and therefore have a negative impact on the pattern of the landscape. The possibility of the use of various biomasses for the production of so-called green bio-diesel, according to the Fischer-Tropsch procedure, could be one of the measures for preserving the cultural landscape intended for overgrowth, because it offers a solution to the problem of handling the removed plant material and at least partly covers the cost of such maintenance. On the above-mentioned conditions, the impact of this sub-programme could be assessed as positive (grade A).

Material assets

When planning new storage capacities for mandatory supplies in the RS, the following mitigation measures must be implemented with regard to the impact on material assets:

- new storage facilities must be planned on existing locations of industrial or energy facilities, if possible near existing storage facilities for liquid fuels,
- the use of the existing industrial or energy infrastructure must be implemented as much as possible,
- the new liquid fuel storage facility must be planned away from settlements in order to avoid a significant negative impact on the settlements in the vicinity.

With regard to the impact on material assets, the measures implemented as part of the liquid fuel sub-programme are rated C (assessment of significance of impacts on the environment), provided that mitigation measures for their impact on material assets are implemented.

10.10.2 Overall assessment of the significant environmental impacts of the liquid fuel sub-programme

Table 7: Assessment of the significant environmental impacts of the liquid fuel sub-programme

Measure / significant impacts	Climatic factors	Nature	Landscape	Material assets
Development of the production of biofuels in Slovenia: biofuels from the processing of wood biomass according to the FT procedure	**A**	**C**	**A**	**-**
New storage capacities for assuring mandatory supplies in Slovenia (existing industrial locations)	**-**	_	**-**	**C**

11 Evaluation of impacts and comparison of NEP scenarios

The evaluation and comparison of impacts includes 8 NEP scenarios, which are determined in more detail in Tables 42 and 43 NEP Scenarios.

The considered NEP scenarios are assessed for the 2010–2030 period. All the NEP scenarios considered meet the environmental objectives defined in this environmental report as relevant environmental objectives for a comprehensive assessment of the impacts of NEP scenarios on the environment; above all, all the NEP scenarios considered meet the objectives for 2020 as stipulated in the EU Climate and Energy Package adopted in 2008.

11.1 Evaluation of impacts

11.1.1 Comparison of impacts by sub-programme

The results of the evaluation of impacts of individual NEP scenarios on the environment differ according to the characteristics and the scope of impacts of individual measures within the NEP sub-programmes on natural resources (forests and soil, water, nature, cultural heritage, health, landscape and material assets). As regards the impacts of individual measures within the NEP sub-programmes on natural resources due to burdening with waste and the impact on air and climatic factors, the impacts are evaluated monetarily, and the values acknowledged by the EU for limiting external environmental costs are used to calculate the environmental costs.

Efficient energy use sub-programme

There are two important impacts on the environment within the efficient energy use sub-programme: the impact on cultural heritage when implementing measures for improving the energy efficiency of buildings (which could be mitigated by taking the conservation platform into account) and the impact on climatic factors. Otherwise, the impacts of this sub-programme are extremely positive. The efficient energy use sub-programme has a significant influence on the reduction of GHG, while its positive effects on the environment are monetarily evaluated within the framework of the assessment of monetarily evaluated environmental benefits due to the reduction of GHG emissions of individual NEP scenarios.

Energy use in the transport sub-programme

There are two important impacts on the environment resulting from energy use in the transport sub-programme: the impact on air and the impact on climatic factors; the effects of both are monetarily evaluated within the framework of the assessment of monetarily evaluated environmental benefits or damage of individual NEP scenarios with regard to the emission of pollutants into the air and with regard to the emissions of GHG. The impacts of this sub-programme are positive.

Renewable energy sources sub-programme

There are several important impacts on the environment within the renewable energy sources sub-programme: impacts on natural resources, water, nature, cultural heritage, landscape and material assets.

The results of the evaluation of impacts with regard to their character and scope have been used for comparison between impacts caused by various measures of this sub-programme; the following has been determined and taken into account during evaluation:

- In none of the NEP scenarios does the quantity of WB used for the generation of energy exceed the threshold which would endanger the sustainable use of forest biomass (the planned annual quantity of the use of WB for the generation of energy is approximately 2 million tonnes, while the annual increment in the supply of wood in Slovenian forests is assessed at 7 million tonnes); furthermore, the planned use of WB guarantees the principal importance of the use of forest biomass in wood-processing industries, because use for the generation of energy is oriented towards the use of waste forest biomass or forest biomass of lower quality, as well as solid fuels made of waste wood products.
- The intensive use of water for the generation of energy on one body of water (one of the rivers) is an acceptable alternative to the dispersed impact of the use of various rivers. This type of use could primarily be possible in the mid-section of the Sava River. The intensive use of the Mura River for the generation of energy has already been determined as unacceptable along the whole length of the river due to its multi-faceted significance. Other Slovenian rivers which have thus far not been used for the generation of energy should remain also not be used for this purpose in the long term.
- A greater percentage of the use of WB for the generation of energy will demand the gradual (until 2020) implementation of new techniques of heating devices in order to reduce the emissions of total dust below the limit value of $30mg/m^3$, as is determined for larger heating devices using WB by the draft of the new IPPC Directive.
- The impact of the use of renewable energy sources on climatic factors does not equal the effect of energy substitution of fossil fuels – the impact on climatic factors must also include emissions of GHG during the entire life span of the renewable energy source (life cycle assessment - LCA), in accordance with the Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

Although it does have a generally positive environmental image, the renewable energy sources sub-programme shows a great number of negative impacts on the environment. They mostly relate to the construction of wind turbines and small hydro-electric power plants, which could have a significant impact on nature, cultural heritage and landscape, while the construction of small hydro-electric power plants could also have a significant impact on waters. The effects of the sub-programme are problematic due to their physical impact, appearance, and wide great dispersal which is anticipated, which could affect the general image of Slovenian territory.

The use of renewable energy sources, including geothermal sources, solar power plants and solar thermal collectors must also ensure that the carbon footprint of their use is significantly lower than the carbon footprint resulting from the use of fossil fuels. One should also realise that the introduction of renewable energy sources is by no means environmentally straightforward, because - while it does have a positive impact on air and climate - it could also have significant impact on other environmental elements.

Local energy supply sub-programme

There are two important impacts on the environment within the local energy supply sub-programme: the impact on air and impact on climatic factors. The effects of both these impacts are monetarily evaluated within the framework of the assessment of monetarily evaluated environmental benefits, or damage of individual NEP scenarios with regard to the emission of pollutants into the air and with regard to the emissions of GHG.

Sub-programme of co-generation of electricity and thermal energy by NG

There are two important impacts on the environment within the sub-programme for the co-generation of electricity and thermal energy: the impact on air and the impact on climatic factors. The effects of both of these impacts are monetarily evaluated within the framework of the assessment of monetarily evaluated environmental benefits or damage of individual NEP scenarios with regard to the emission of pollutants into the air and with regard to the emissions of GHG.

When evaluating the impacts of this sub-programme, the impacts on air and climatic factors are assessed as environmentally beneficial only when the additional generation of electricity from new CHP devices on NG replaces the generation of electricity from other fossil fuels.

Generation of electricity sub-programme

There are several important impacts on the environment relating to generation in the electricity sub-programme: impacts on natural resources, air, water, nature, cultural heritage, climatic factors, health, landscape and material assets.

The results of evaluation of these impacts with regard to their character and scope have been used for comparison between impacts caused by the measures of this sub-programme; the following has been determined and taken into account during evaluation:

- The implementation of HPPs as large infrastructural objects and the implementation of all accompanying measures would cause significant impacts on the environment; however, it can constitute a reasonable alternative to the various and dispersed impacts of other energy sources.
- The use of fossil fuels for the generation of electricity could generally be acceptable if the evaluation of impacts on air determine that emissions will be reduced in accordance with the European Thematic Strategy on Air Pollution (2005), as is determined for the period 2000-2020; however, this is not an energy source appropriate for use in the long-term.
- In the event that, due to the implemented measures of efficient energy use or a greater generation of electricity from renewable energy sources and CHP devices on NG, the generation of electricity would surpass its demand in Slovenia; the generation of electricity from solid fossil fuels would decrease.
- Considering the impacts on natural resources, nature, cultural heritage, health, landscape and material assets, the generation of electricity from nuclear energy is considered an appropriate alternative to other energy sources, because the impacts are limited and fairly small compared to other sources, provided that the construction of new facilities takes place in the area of the existing NPP in Krško. Such a source is also an interesting alternative to the dispersed impacts of several smaller sources (the safety of supply in the event of power failure is not assessed in this environmental report). Any doubts arising from environmental concerns regarding the use of nuclear energy would therefore stem primarily from the risks due to ionising radiation, handling of waste nuclear fuel, and partly from the impact on water caused by the existing NPP.

The implementation of this sub-programme is connected with pronounced impacts on the environment; however, the scenarios in question differ significantly with regard to the source of the generation of electricity, which demands and enables further discussions on the acceptability of the impacts of the NEP.

The sub-programme for the transmission of electricity and the sub-programme for the electricity distribution grid

The important impacts on the environment within the sub-programme of transmission of electricity are impacts on nature, cultural heritage, health and landscape.

From the environmental point of view, both sub-programmes are highly problematic. Compared to other NEP sub-programmes, these two do not have any direct positive impacts on the environment. During the following procedures of assessing the impacts on the environment with regard to the implementation of these two sub-programmes, special attention must be paid to the rationalisation of the grid, more detailed spatial implementation, clearer platforms for determining routes, and the use of more modern types of power line installed above ground. The demand for cable conduits for the transfer and mostly the distribution of electricity in areas of settlement must also be seen as a guideline for the existing long-distance and other power lines, primarily due to the spatial optimisation in these areas and the demands for the reduction of exposure of the inhabitants to electromagnetic radiation.

Natural gas supply sub-programme

The important impacts on the environment within the natural gas supply sub-programme are impacts on nature, cultural heritage and landscape. There are no significant environmental doubts with regard to the measures taken as part of the natural gas supply sub-programme, provided that the planning of these measures takes into account the rationalisation of the gas pipeline grid and implementation of such mitigation measures as would enable the impacts on the environment to be assessed as insignificant.

Liquid fuel sub-programme

The important impacts on the environment within the liquid fuel sub-programme are impacts on climatic factors, landscape and material assets. The impacts of the generation of liquid fuels from renewable energy sources are assessed as acceptable, provided that the biomass is processed into liquid biofuels using 2nd and 3rd generation techniques for the generation of biofuels from biomass, which leave a carbon footprint of less than 30% of the carbon footprint of the biofuels so produced. The impacts of the storage of liquid fuels in order to maintain mandatory supplies in Slovenia are acceptable for the environment, provided that such storage facilities are placed at existing industrial or energy locations, if possible in the vicinity of the existing storage facilities for liquid fuels.

11.1.2 Comparison of impacts on elements of the environment

The results of the evaluation of impacts of individual NEP scenarios on the environment are comprehensive with regard to an individual scenario, meaning that the evaluation includes assessments of impacts on all elements of the environment which among themselves are difficult to compare, except for the financial evaluation of impacts on natural resources due to the generation of waste and the financial evaluation of impacts on air and climatic factors.

Impacts on natural resources (forest and soil)

There are significant impacts on natural resources due to the energy use of WB and the use of finite supplies of Velenje coal for the further generation of electricity from solid fossil fuels, which also has a significant impact on the environment due to the handling of waste from the incineration of solid fossil fuels.

The impact of the NEP scenarios on natural resources is insignificant due to the planned use of WB for the generation of energy, because the quantity of the planned use of WB for the generation of energy does not endanger the sustainable use of forest biomass (the planned annual quantity of the use of WB for the generation of energy is approximately 2 million tonnes, while the annual increment of the supply of wood in Slovenian forests is assessed to be 7 million tonnes); furthermore, the planned use of WB guarantees enough quantities of quality wood to the wood-processing industries, since the use of WB for the generation of energy is oriented towards the use of waste forest biomass or forest biomass of lower quality, as well as solid fuels made of waste wood products.

Impacts on air

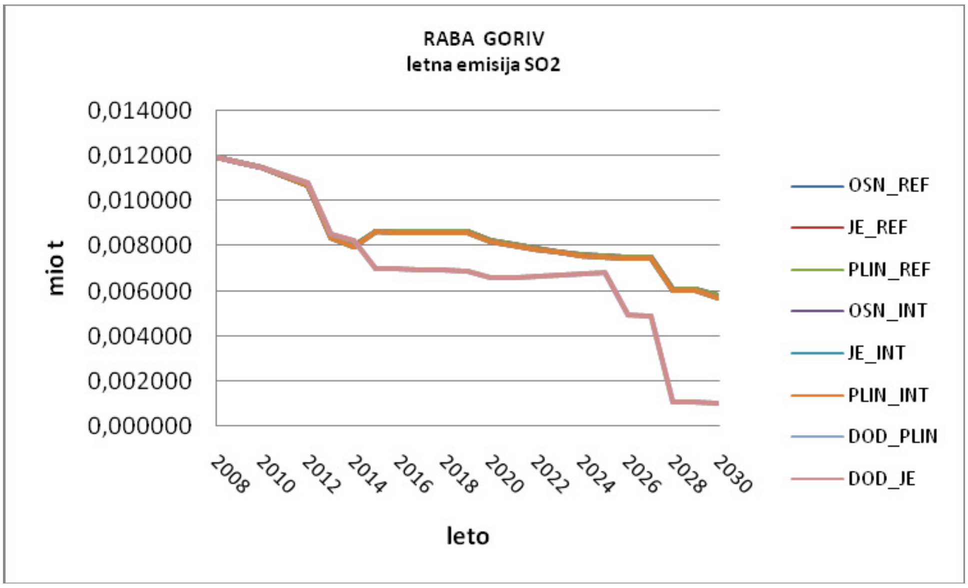
There are important impacts on air due to the use of fuels for the generation of heat and electricity, and the use of liquid fuels in transportation.

The impacts of all NEP scenarios on air due to emissions of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) for the supply of electricity and heat are assessed as acceptable (insignificant), because the annual emission of pollutants is decreasing in accordance with the aims of the European Thematic Strategy on Air Pollution (2005):

- emissions of sulphur dioxide (SO_2) will decrease to 8,217 tonnes by 2020, according to the scenarios marked "_REF"; to 8,168 tonnes according to scenarios marked "_INT"; and to 6,573 tonnes according to scenarios marked ADD_GAS (DOD_PLIN) and ADD_NPP (DOD_JE); therefore, in all scenarios, by more than 68% compared to the year 2000,
- emissions of nitrogen oxides (NO_x) will decease to 28,912 tonnes by 2020, according to the scenarios marked "REF"; to 29,073 tonnes according to scenarios marked "INT"; and to 29,495 tonnes according to scenarios marked ADD_GAS (DOD_PLIN) and ADD_NPP (DOD_JE); therefore, in all scenarios by more than 49% compared to the year 2000.

Due to the expected increase in the use of biomass for the supply of electricity and heat, annual emissions of primary particles PM_{10} from this sector will increase by 2020 to approximately 1,100 tonnes; however, the total annual emissions of PM_{10} due to the use of fuels will decrease by 2020 to 5,050 tonnes according to scenarios marked "_REF"; to 5,235 tonnes in scenarios marked "_INT", and to 5,190 tonnes in scenarios marked ADD_GAS (DOD_PLIN) and ADD_NPP (DOD_JE); therefore, by more than 39% compared to the year 2000.

The following diagrams show the expected emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x) and primary particles PM_{10}, according to the measures planned in all eight NEP scenarios.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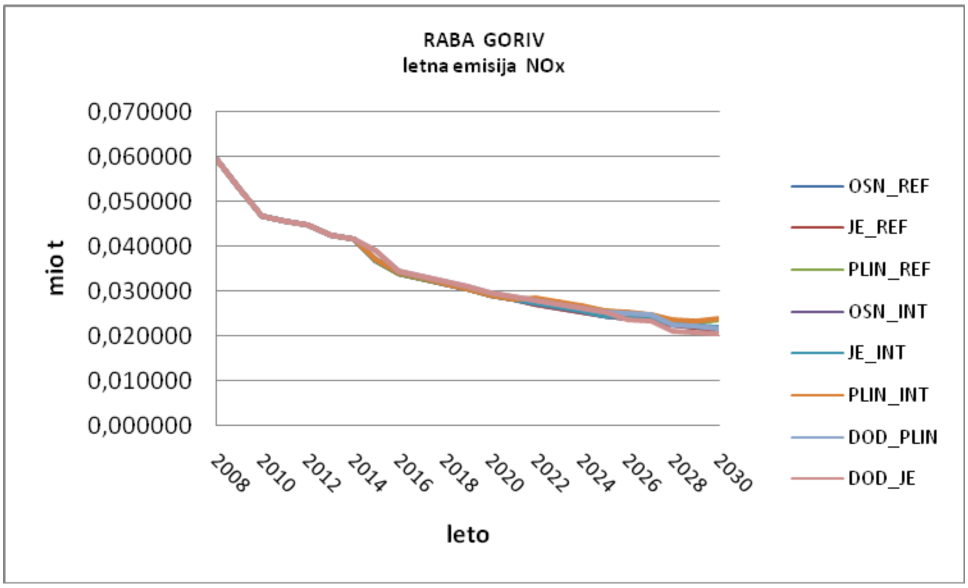
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DOD_PLIN
DOD_JE

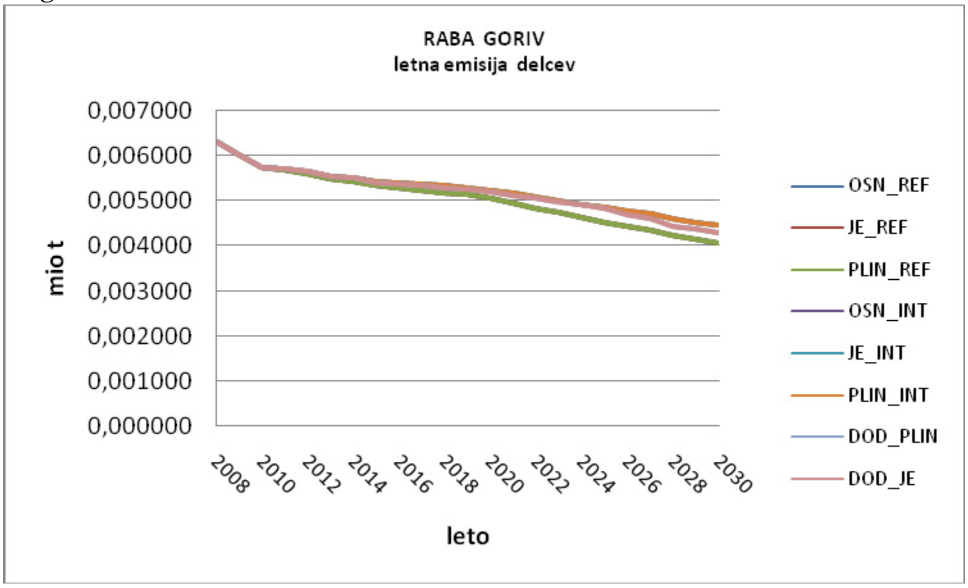

Figure 31: The expected timescale of the reduction in SO_2, NO_x and PM_{10} emissions due to the use of fuels

Impact on water

There are important impacts on water due to the use of running water for the generation of electricity in sHPPs and HPPs, as well as due to the use of waters in the cooling systems of thermal power plants and nuclear power plants.

NEP scenarios have a significant impact on waters, so mitigation measures must be implemented in order to ensure the following:

- During the construction and operation of sHPPs and HPPs, the limitations and conditions intended to reduce the adverse impacts on hydro-morphological changes in the waters must be implemented, as well as for the assurance of the constant minimal water flow necessary for the preservation of acceptable ecological conditions of waters (mostly run-of-the-river type of sHPPs and HPPs). The measures implemented for the generation of electricity in an HPP must make use of their multi-functionality with regard to the protection of people and assets from the adverse impacts of high waters.
- The cooling systems in thermal power plants and nuclear power plants must use surface water (mostly recirculating) as their secondary cooling medium.

Impacts on nature

There are important impacts on nature due to the generation of electricity in wind turbines, sHPPs and HPPs, as well as due to the implementation of the planned measures for the transmission and distribution of electricity. There is also an important impact on nature (although smaller in scale) due to the planned measures implemented as part of the sub-programme of natural gas supply.

The greatest adverse impact is expected in the event of planning and subsequently carrying out of interventions in protected areas, Natura 2000 areas, areas of valuable natural features and habitats of protected and endangered species. So as to avoid a significant impact, interventions should be planned outside these areas; however, if this is not possible, adequate mitigation measures should be implemented and alternative habitats ensured. Locating interventions in protected areas is acceptable under the condition that such interventions are permitted by a legislative act, while the objectives and regimes laid down for protected areas need to be provided for during planning.

The impacts of siting HPPs on the mid-section of the Sava River, from Jevnica to Suhadole, are acceptable with regard to their impact on nature, provided that mitigation measures are implemented and the guidelines of this Environmental report are taken into account with further planning and operation. The energy use of the Mura River (total power from 1.5 MW to 55 MW, depending on the environmental acceptability) could potentially be possible on the section between the border with Austria and the motorway bridge near Vučja vas on the inner Mura River.

Impacts on cultural heritage

The specification of fairly significant impacts on cultural heritage with regard to individual NEP scenarios stems from the great potential impacts on cultural heritage which have been determined. Previous experience of the preparation of implementation spatial planning acts based on programmes such as the NEP still shows a misunderstanding of the importance of protecting cultural heritage and, therefore, the inappropriate implementation of protection platforms during more detailed spatial planning. The contents of this Environmental report should therefore be taken primarily as a warning that the planning of the detailed energy infrastructure needs the greatest care and spatial planning concepts and concepts of construction at national and local level defined more clearly, so that heritage protection is taken into account.

Impacts on climatic factors

The reduction of impacts on climatic factors is the most important indicator of the efficiency of measures implemented by individual NEP scenarios. With regard to climatic factors, the NEP scenarios have been evaluated in terms of the long-term reduction of emissions of GHG, as well as in terms of reaching the goals set for 2020 in the Climate and Energy Package adopted by the EU.

<u>Long-term objectives of reducing greenhouse gas emissions</u>

The NEP scenarios are consistent with the objective of a transition towards a low-carbon society; the objectives of a long-term reduction of GHG emissions from burning of fuels have been taken into account. The results of the evaluation of emissions of GHG suggest that a common goal of not increasing global temperature by more than 2ºC above the pre-industrialisation level has been taken into account, in accordance with the finding of the fourth IPCC report that in order to achieve that, the developed countries must reduce their GHG emissions by 88-90% by the year 2050. In accordance with the opinions of the EU expressed in international climate negotiations and the findings of the IPCC, the NEP scenarios take into account the aim of reducing part of the GHG emissions of developed countries by international mechanisms, and that EU Member States will share their obligations (mostly by emissions trading).

The assessed values of a long-term reduction in GHG emissions are shown in the following table for each of the eight NEP scenarios.

Table 41: Reduction of greenhouse gas emissions.

Type of scenario	2005	2008	2010	2015	2020	2025	2030	2020/ 2005	2030 /2005
ETS									
BAS (OSN) and NPP_REF (JE_REF)	7.919	7.754	7.415	6.854	6.761	6.294	5.522	-15%	-30%
GAS_REF (PLIN_REF)	7.919	7.754	7.415	6.854	6.761	7.151	7.237	-15%	-9%
BAS (OSN) and NPP_INT (JE_INT)	7.919	7.754	7.410	6.873	6.741	6.278	5.486	-15%	-31%
GAS_INT (PLIN_INT)	7.919	7.754	7.410	6.873	6.741	7.135	7.201	-15%	-9%
ADD_GAS (DOD_PLIN)	7.919	7.754	7.410	6.290	6.795	6.878	4.055	-14%	-48%
ADD_NPP (DOD_JE)	7.919	7.754	7.410	6.290	6.795	6.874	2.985	-14%	-62%
non ETS									
REF	7.905	9.055	7.869	7.503	7.309	7.238	7.340	-8%	-7%
INT	7.905	9.055	7.866	7.423	7.170	7.047	7.086	-9%	-10%
TOTAL									
BAS (OSN) and NPP_REF (JE_REF)	15.824	16.809	15.284	14.357	14.071	13.532	12.862	-11%	-19%
GAS_REF (PLIN_REF)	15.824	16.809	15.284	14.357	14.071	14.390	14.577	-11%	-8%
BAS (OSN) and NPP_INT (JE_INT)	15.824	16.809	15.276	14.295	13.912	13.324	12.572	-12%	-21%
GAS_INT (PLIN_INT)	15.824	16.809	15.276	14.295	13.912	14.182	14.287	-12%	-10%
ADD_GAS (DOD_PLIN)	15.824	16.809	15.276	13.713	13.966	13.925	11.141	-12%	-30%
ADD_NPP (DOD_JE)	15.824	16.810	15.276	13.713	13.966	13.921	10.071	-12%	-36%

All scenarios anticipate a significant reduction in total GHG emissions by 2030; in BAS_INT (OSN_INT) and NPP_INT (JE_INT), total emissions will be reduced by 19% by the year 2030 compared to emissions in 2005. Emissions within the ETS sector will be reduced by 31%, while emissions outside the ETS sector will be reduced by 10%. According to the NEP projections, the structure of GHG emissions from sources not included in the emissions trading scheme will change significantly: by 2030, transport will account for 72% of all emissions from burning fuels, and these are not included in the emissions trade. Excluding emissions from transport, the non ETS category will see a reduction in emissions of 40% by the year 2030 compared to 2005.

In the generation of electricity, the ADD_GAS (DOD_PLIN) and ADD_NPP (DOD_JE) scenarios foresee a substitution of lignite with natural gas, which would reduce GHG emissions by a further million tonnes of GHG. The ADD_GAS (DOD_PLIN) and ADD_NPP (DOD_JE) scenarios foresee the greatest reduction in GHG emissions in the ETS sector: in the ADD_GAS (DOD_PLIN) scenario, a reduction of 48%, and in the ADD_NPP (DOD_JE) scenario a reduction of 62%. These two scenarios are undoubtedly oriented towards attaining the long-term objective of reducing GHG emissions in developed countries by 88-90% by the year 2050.

The reached reduction of emissions constitutes very ambitious NEP measures in the field of substitution of fossil fuels for the generation of heat. The NEP's efficiency in reducing emissions in transport is limited, because the reduction in this sector will be achieved by implementing measures influencing the scope of transport, an issue not dealt with by energy policies – they are subject to spatial and transport policies, and transport and other EU policies (enlargement of the EU). After

2025, emissions of GHG from transformations will be limited to emissions from the co-generation of heat and electricity and emissions from a single device using local fossil resources.

Achieving the objectives of the EU Climate and Energy Package by 2020

These are the sources of the objectives set by the EU Climate and Energy Package for the reduction of GHG emissions:
- for the ETS sector: Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC; Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community;
- for the non ETS sector: Decision No. 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments by 2020.

The ETS sector

Two Directives, 2003/87EC and 2009/29/EC, regulate the reduction of GHG emissions in sectors included in emissions allowance trading within the entire Community, but do not prescribe national quotas or other national obligations to Member States with regard to the reduction of GHG emissions. The Directives prescribe the common quantity of the Community's allowance, determined annually (beginning in 2013), which began to linearly decrease in the middle of the 2008-2012 period. The total quantity of the allowance is decreasing by a linear factor of 1.74% compared to the average total annual allowance issued by Member States in accordance with the Commission's provisions on national plans for the distribution of allowance for the period 2008-2012.

The EST sector does not deal with the national allowance, but with the common quantity of the Community's allowance; therefore, the possibility of individual business entities buying additional allowances on the emissions market due to objective reasons on their part (in Slovenia, such reasons are economies of scale of the operation of thermal power plants – individual operating units – based on local fossil fuel, the economies of scale of extracting such fuels, the diversification of the energy mix, the import dependency of Slovenia and the need for a flexible generation unit is completely within the environmental objectives set by Directives 2003/87/EC and 2009/29/EC.

The fact that in these NEP scenarios, the planned emissions of GHG in the period 2013-2020 decreases more slowly within the Slovenian energy ETS sector than the common quantity of the Community's allowance, as determined in this environmental report, does not constitute a breach of environmental goals. The actual annual decrease in GHG emissions of the Slovenian energy ETS sector is 0.9% in the period 2010-2020 (according to all the scenarios, GHG emissions will decrease by 9% - 10% in this period). Regardless of fulfilling the mandatory objectives set for the ETS sector by 2020, the comparison of GHG emissions in the period 2010-2030 shows that all scenarios are graded as environmentally acceptable, except scenarios GAS_REF (PLIN_REF) and GAS_INT (PLIN_INT). These two do not show a further reduction in GHG emissions after the year 2020.

Non ETS sector

Decision 406/2009/EC lays down the minimum contribution of Member States to meeting the greenhouse gas emission reduction commitment of the Community for the period 2013-2020 for greenhouse gas emissions not included in the system of emissions allowance trade within the Community.
On the basis of this decision, by 2020 Slovenia may increase GHG emissions from the non ETS sector by +4% compared to the initial year 2005. Slovenia is allowed the increase of GHG emissions due to emissions from transit transport.

All NEP scenarios show a decrease in GHG emissions by 2020, in accordance with the objectives of the EU Climate and Energy Package:
- the expected GHG emissions due to the use of fossil fuels, which are not included in the EU trading scheme, will fall below the mark determined for Slovenia by 2020 (a 4% increase in GHG emissions compared to the initial year 2005). In the period 2005-2020, the GHG emissions not included in the EU trading scheme will decrease by 2%, whereas the scenario marked "-.INT" will see a decrease of 4%,
- in the period 2005-2020, the expected GHG emissions of devices using fossil fuels included in the EU trading scheme will decrease by 8-9%; additionally, by 2030 in scenarios marked "_INT" to approximately 10%; in scenarios marked "_REF", GHG emissions will slightly increase in the 2020-2030 period,
- total GHG emissions due to the use of fossil fuels (the sum of emissions included in the EU trading scheme, excluding GHG emissions) will decrease by 11-12% in all scenarios in the period 2005-2020.

Impacts on human health

Due to the fact that the evaluation of impacts on health due to emissions of pollutants and the impact on drinking water have been included in the evaluation of impacts on air and water, the impacts on health are evaluated with regard to the exposure of people to EMR during the transmission and distribution of electricity. The impacts are evaluated as moderate, provided that new long-distance and other power lines in settlement areas are located underground and the long-term approach to the maintenance of existing power lines in settlement areas includes locating them underground.

Impacts on landscape

The impacts of the implementation of NEP sub-programmes will be greatest on the landscape. Considering the dispersal of measures, changes are expected in the characteristics of the landscape over a great part of Slovenian territory. Energy infrastructure facilities could also interfere with remoter, preserved landscape areas and, due to their scope, constitute a significant spatial change. The dimensions of energy infrastructure facilities allow a relatively narrow manoeuvring space for their non-intruding implementation into the landscape, especially in places characterised by high visual exposure, small scale, and the high fragmentation of landscape elements. An increase in the scope of transferable energy networks and the presence of new forms of energy facilities, wind turbines and photovoltaic systems, could further and significantly change the image of Slovenian landscapes. All this demands a careful evaluation of the planned arrangements and the creation of clear strategic guidelines for their implementation in the landscape, as well as their further optimisation during the phase of drafting implementing spatial acts.

Impact on material assets

There are important impacts on material assets due to the generation of electricity in sHPPs and HPPs, the implementation of a new NPP and of planned measures for storing liquid fuels in order to ensure the mandatory supply obligation of the Republic of Slovenia. The impacts on material assets are insignificant with respect to the environment, provided that mitigation measures are implemented and the guidelines of this Environmental report are followed.

11.2 Results of evaluation of impacts

The results of the evaluation of impacts of individual NEP scenarios on the environment, according to the classification of impacts of individual sub-programmes and measures into 16 classes according to their significance, are shown in tables 42 to 47 with regard to their impact on natural resources (forest and soil), water, natural environment, cultural heritage, health, landscape and material assets.

In tables 42—47 the significance of an impact is also colour coded, in accordance with the colour scale set by table 4 in chapter 7.3.4.

The results of the evaluation of individual NEP scenarios with regard to their impact on the environment according to marginal external environmental cost due to the generation of waste, emissions of pollutants into ambient air and GHG emissions, are listed in tables 48 and 49.

Table 42: Description of NEP scenarios

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
1. SUB-PROGRAMME – EFFICIENT USE OF ENERGY							NO
• low-energy, passive and almost no-energy buildings in the housing sector and service industries, all new buildings and renovations of buildings in the scope of 4% of the housing fund annually;	2,800,000 m² of residential surfaces of low-energy and passive construction by 2030 – new buildings Renovations of 4% of the housing fund annually			2,500,000 m² of residential surfaces of low-energy and passive construction by 2030 – new buildings Renovations of 2% of the housing stock annually			-
• measures for improving the efficiency of buildings: replacement of windows, thermal insulation of facades, improvement of the efficiency of heating systems	Reconstruction of 66% of buildings in the public sector by 2030 (of which 59% with a low-energy standard) 46% in the rest of the service sector (of which, 26% to an improved standard)			Reconstruction of 41% of buildings in the public sector by 2030 (of which 59% with a low-energy standard) 35% in the rest of the service sector (of which, 26% with improved standard)			-
• energy-efficient household appliances	improved intensity of new devices, more rapid substitution with new ones by approx. 20% compared to the reference strategy			an improved intensity of new devices			-
• EUE measures in service industries (office equipment, lighting, technologies in service industries, etc.)							-
• EUE measures in energy-intensive industries of the processing industry:							-
○ electric arc furnaces for the production of steel: further implementation of measures for the reduction of intensity (modernisation of furnaces, installation of oxy-fuel burners, injection of oxygen, use of natural gas for initial smelting of input, pre-heating of input, injection of carbon materials for slag foaming, etc.)	a reduction of a specific use of energy by 20% by 2030			a reduction of a specific use of energy by 7% by 2030			
○ thermal processes in the production of paper (recuperation of waste heat, replacement and modernisation of paper machines, organisational measures)							
• implementation of measures of the National action plan for energy efficiency 2008-2016 and additional activities: • horizontal EUE measures in industry: ○ frequency regulation of electric motors, ○ energy-efficient electric motors, pumps and ventilators,	a reduction of a specific use of energy by 24% by 2030			a reduction of a specific use of energy by 13% by 2030			-

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
○ EUE measures with regard to compressed air, ○ energy-efficient lighting, ○ energy-efficient industrial boilers, ○ heat pumps, WB boilers, ○ other measures: • energy-efficient public lighting	90% market share by 2030 70-80% market share by 2030 an average decrease of use by 20% market share of the implementation of measures 95% an improvement of specific use an improvement of utilisation rate by 2% - 6% an improvement of specific use by 0.5% annually an improvement of specific use			65% market share by 2030 40-50% market share by 2030 an average decrease of use by 20% market share of the implementation of measures 60% an improvement of specific use an improvement of a utilisation rate by 2% - 6% an improvement of specific use by 0.5% annually an improvement of specific use			-
2. SUB-PROGRAMME – USE OF ENERGY IN TRANSPORT							**YES**
• introduction of biofuels – adding biodiesel to diesel fuel and bio ethanol to petrol • promoting the use of biofuels in specific areas: agriculture, public transport • improving energy efficiency of vehicles with internal combustion engines, including using energy efficient tyres • electric battery vehicles • hybrid vehicles • plug-in hybrid vehicles • hydrogen-powered vehicles • vehicles powered by liquefied petrol gas (LPG) • vehicles powered by compressed natural gas • charging infrastructure for: ○ electric vehicles,	additional 6.84 PJ by 2020 and 0.66 PJ by 2030 10% share in public transport, 35% share of engine fuels in agriculture in accordance with the requirements for minimum energy and emission efficiency of vehicles and tyres in the EU 2.7% of vehicle fleet by 2020 and 10.2% by 2030 5.9% of vehicle fleet by 2020 and 29.2% by 2030 4% of vehicle fleet by 2020 and 12.6% by 2030 1% of vehicle fleet by 2020 and 5.1% by 2030 0.7% of vehicle fleet by 2020 and 0.9% by 2030 0.7% of vehicle fleet by 2020 and 0.9% by 2030 3000 public charging points for electric vehicles by			additional 6.84 PJ by 2020 and 0.66 PJ by 2030 10% share in public transport, 35% share of engine fuels in agriculture in accordance with the requirements for a minimum energy and emission efficiency of vehicles and tyres in the EU 1.3% of vehicle fleet by 2020 and 5.9% by 2030 5.8% of vehicle fleet by 2020 and 29.9% by 2030 1.3% of vehicle fleet by 2020 and 5.9% by 2030 0.4% of vehicle fleet by 2020 and 3.3% by 2030 0.6% of vehicle fleet by 2020 and 0.8% by 2030 0.6% of vehicle fleet by 2020 and 0.8% by 2030 2000 public charging points for electric vehicles by			additional 6.84 PJ by 2020 10% share in public transport, 35% share of engine fuels in agriculture - - - - - - -

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
○ hydrogen-powered vehicles,	2020			2020			
○ vehicles powered by liquefied petrol gas (LPG)	20 charging points for hydrogen by 2020			12 charging points for hydrogen by 2020			
○ vehicles powered by compressed natural gas	appropriate coverage			appropriate coverage			
	appropriate coverage			appropriate coverage			
3. SUB-PROGRAMME – RENEWABLE ENERGY SOURCES							**YES**
Micro, small and medium power plants:							
• wind farms (119 MW by 2020 and 295 MW by 2030)	119 MW by 2020 and 295 MW by 2030			103 MW by 2020 and 130 MW by 2030			103 MW by 2020
• small HPPs (43 MW by 2020 and 18 MW by 2030)	43 MW by 2020 and 18 MW by 2030			22 MW by 2020 and 16 MW by 2030			22 MW by 2020
• solar power plants (336 MW by 2020 and 567 MW by 2030)	336 MW by 2020 and 567 MW by 2030			126 MW by 2020 and 96 MW by 2030			126 MW by 2020
• geothermal power plants (25 MW by 2030)	0 MW by 2020 and 25 MW by 2030			0 MW by 2020 and 10 MW by 2030			0 MW by 2020
• co-generation of electricity and heat by wood biomass (14 MW by 2020 and 20 MW by 2030)	14 MW by 2020 and 20 MW by 2030			8 MW by 2020 and 9 MW by 2030			8 MW by 2020
• landfill gas	32 MW by 2020 and 1 MW by 2030			32 MW by 2020 and 1 MW by 2030			32 MW by 2020
• other biogases and water treatment plants (32 MW by 2020 and 1 MW by 2030)	10 systems by 2020 and 20 systems by 2030			10 systems by 2020 and 20 systems by 2030			10 systems by 2020
Heating systems using renewable sources of energy:							
• geothermal heating systems: 10 systems by 2020 and 20 systems by 2030	669,000 m² by 2020 and 1,557,000 m² by 2030			545,000 m² by 2020 and 1,225,000 m² by 2030			545,000 m² by 2020
	78,000 units by 2020 and 122,000 units by 2030			79,000 units by 2020 and 123,000 units by 2030			79,000 units by 2020
• solar thermal collectors:	8,000 units by 2020 and 16,000 units by 2030			8,000 units by 2020 and 15,000 units by 2030			8,000 units by 2020
• boilers powered by wood biomass (WB) in households:	200 units by 2020 and 280 units by 2030			100 units by 2020 and 140 units by 2030			100 units by 2020
• boilers powered by WB in the public sector and service industry:	50 units by 2020 and 70 units by 2030			26 units by 2020 and 35 units by 2030			26 units by 2020
• boilers powered by WB in industry (220 kW):	55 systems by 2020 and 67 systems by 2030			42 systems by 2020 and 50 systems by 2030			42 systems by 2020
• boilers powered by WB in industry (2,000 kW):	370 systems by 2020 and 417 systems by 2030			280 systems by 2020 and 312 systems by 2030			280 systems by 2020
• WBDH systems (> 1MW):	52,000 units by 2020 and 107,000 units by 2030			53,000 units by 2020 and 108,000 units by 2030			53,000 units by 2020
• local WBDH systems (> 1MW):							
• heat pumps:							

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
Further promotion of a wide array of technologies for the use of renewable energy sources for heating purposes until 2030							
4. SUB-PROGRAMME – LOCAL ENERGY SUPPLY							**YES**
Measures in district heating systems:							
• connecting consumers to the network;	an increase in the share in heat supply by 33.8% by 2020 and by 19.7% by 2030			an increase in the share in heat supply by 26.5% by 2020 and by 14.3% by 2030			-
• expanding district heating networks;							-
• efficient use of energy in district heating and cooling systems;							-
• construction of DH systems:							-
○ small district heating systems with an average calorific power of 500 kW,	an increase in the generation of heat in DH systems by 15.4% by 2020 and by 8.2% by 2030 within existing and new DH systems			An increase in the generation of heat in DH systems by 10.2% by 2020 and by 4.1% by 2030 within existing and new DH systems			-
○ bigger systems with an average size of 4 MWt							
• construction of district cooling systems;	at least 60 MW DH systems by 2030			at least 60 MW DH systems by 2030			-
• use of waste for energy purposes (measures are included in operational programmes for waste management)	7 MWe (1.5 PJ fuel annually)			7 MWe (1.5 PJ fuel annually)			7 MWe (1.5 PJ fuel annually)
5. SUB-PROGRAMME – CO-GENERATION OF HEAT AND ELECTRICITY							**NO**
Co-generation of heat and electricity (replacement or modernisation of old facilities, systems for heat supply and new systems):							
• co-generation of heat and electricity by way of natural gas in industry	165 MW by 2020 and 95 MW by 2030			93 MW by 2020 and 50 MW by 2030			-
• co-generation of heat and electricity by way of natural gas in DH systems	19 MW by 2020 and 6 MW by 2030 28 MW by 2020 and 27 MW by 2030			14 MW by 2020 and 6 MW by 2030 20 MW by 2020 and 17 MW by 2030			-
• co-generation of heat and electricity by way of natural gas in service industries	11 MW by 2020 and 27 MW by 2030			14 MW by 2020 and 6 MW by 2030			-
• co-generation of heat and electricity by way of natural gas in							-

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
households These are different technologies for highly efficient co-generation of heat and electricity from natural gas. Co-generation of heat and electricity from renewable energy sources is listed in the sub-programme: renewable energy sources.							
6. SUB-PROGRAMME – GENERATION OF ELECTRICITY							**Yes**
Measures in the field of electricity generation							
• extending the life span of the NEK nuclear power plant until 2043	yes	yes	yes	yes	yes	yes	-
• TEŠ6, 549 MW, in 2014	549 MW	549 MW	549 MW	549 MW	549 MW	549 MW	-
• TET coal-fired power plant: with further exploitation of the location	yes	yes	yes	yes	yes	yes	-
for energy purposes:	no	no	no	no	no	no	
○ (option 290 MW, combined cycle power plant, in 2015,	yes	yes	yes	yes	yes	yes	
○ option 130-190 MW tertiary reserves etc.)	yes	yes	yes	yes	yes	yes	-
• TE-TOL, up to 134 MW in 2015 and up to 134 MW by 2020	yes	yes	yes	yes	yes	yes	-
• TEB thermal power plant – replacement of existing units (for example	yes	yes	yes	yes	yes	yes	yes
153 MW, gas turbine, 2015)	yes	yes	yes	yes	yes	yes	yes
• reconstruction of HPPs: Zlatoličje, additional 24 MW, 2013	yes	yes	yes	yes	yes	yes	yes
• reconstruction of HPPs: Formin, additional 12 MW, 2013							
• finalisation of the chain of HPPs on the lower section of the Sava	yes	yes	yes	yes	yes	yes	-
River: HE Krško, 39 MW in 2013, HE Brežice, 41 MW in 2015 and	yes	yes	yes	yes	yes	yes	
HE Mokrice 30 MW in 2018	yes	yes	yes	yes	yes	yes	yes
• Pumped storage HPP Kozjak 400 MW, 2018	yes	yes	yes	yes	yes	yes	-
• chain of HPPs on the mid-section of the Sava River:							
○ 78 MW by 2020 (HPP Suhadol, HPP Trbovlje)	yes	yes	yes	yes	yes	yes	
○ 162 MW by 2030 (HPP Renke, HPP Ponoviče, HPP	yes	yes	yes	yes	yes	yes	-

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
Kresnice, HPP Jevnica) • reconstruction of the HPP Moste by 2022, variants, additional 34 MW • other HPPs by 2030, 246 MW ○ the area of potential energy use of the Mura River – the section between the border with Austria and the motorway	yes	yes	yes	yes	yes	yes	-
bridge near Vučja vas on the inner Mura River (total power from 1.5 MW to 55 MW, depending on environmental							-
acceptability)	yes	yes	yes	yes	yes	yes	
○ the area of potential energy use of the mid-section of the Sava River, phase II, depending on the environmental acceptability in the section between Medvode and Jevnica ○ other not yet determined locations from 2020 to 2030	no	1100 MW in 2022	no	no	1100 MW in 2022	no	-
• new sources, tertiary reserves (existing energy and industry locations), 170 MW by 2020;	no	no	2 x 396 MW	no	no	2 x 396 MW	-
• pumped storage HPP, other units 200 MW, from 2020 to 2030							
• JEK2 NPP, 1,000 or 1,600 MW, from 2020 to 2030	1635 TJ in 2020	1635 TJ in 2020	1635 TJ in 2020	1635 TJ in 2020	1635 TJ in 2020	1635 TJ in 2020	1635 TJ annually in 2020
• reconstruction of HPPs: additional 48 MW, from 2020 to 2030 • two combined cycle plants, 2 x 396 MW, from 2020 to 2030 (existing energy and industry locations) • Use of WB in large CHP units with a high utilisation rate (existing energy and industry locations)	837 TJ in 2030	837 TJ in 2030	837 TJ in 2030	837 TJ in 2030	837 TJ in 2030	837 TJ in 2030	
7. SUB-PROGRAMME – TRANSMISSION OF ELECTRICITY							**No**
• long-distance power line 2x400 kV Beričevo – Krško, by 2015;	yes						-
• long-distance power line 2x400 kV Podlog – Šoštanj (transition from	yes						-

Measures and groups of measures of NEP	**BAS_INT (OSN_INT)**	**NPP_INT (JE_INT)**	**GAS_INT (PLIN_INT)**	**BAS_REF (OSN_REF)**	**NPP_REF (JE_REF)**	**GAS_REF (PLIN_REF)**	**RES AP (AN OVE)**
220 kV to 400 kV, connecting to TEŠ6), by 2014;							
• long-distance power line 2x400 kV Cirkovce – Pince (connection with	yes						-
Hungary), by 2016;	yes						-
• long-distance power line 2x400 kV Okroglo – Udine (connection with	yes						-
Italy), until 2018;							-
• connecting the pumped storage HPP on the Drava River to the grid	yes						
and a long-distance power line link to the Maribor distribution							-
substation by 2018;							
• long-distance power line 2x400 kV Divača –Beričevo-Podlog-Cirkovce	yes						-
(transition from 220 kV to 400 kV and the DS Kleče), in 2020;	yes						
• DS and junctures:	yes						
○ DS 400/220/110 kV Divača, cross transformer, in 2012;	yes						
○ DS 400/110 kV Krško second transformer, long-distance	yes						
power line field, in 2012;	yes						
○ DS 400kV TEŠ6, in 2014;	yes						
○ NEK 400 kV juncture, in 2016;	yes						
○ DS 400/110 kV Cirkovce, in 2016	yes						
○ DS 400/110 kV Beričevo, 300 MVA, in 2016;	yes						
○ DS 400/110 kV Podlog, 300 MVA, in 2016;	yes						
○ DS 400/110 kV Divača, second transformer 300 MVA, in	yes						-
2016;							
○ DS pumped storage HPP Kozjak, in 2018;							
○ DS 400/220/110 kV Okroglo, cross transformer, in 2020;	yes						-
○ DS 400/110 kV Avče, in 2020;							
• power lines: long-distance power line 110 kV, LONG-long-distance							
power line 2x110 kV, KBV 110 kV, KBV 2x110 kV, [connecting] –							
new constructions and reconstruction, in accordance with development							

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
plans of companies; • DS 110/20 kV, DS 110 kV – various locations in accordance with development plans of companies							
8. SUB-PROGRAMME – ELECTRICITY DISTRIBUTION GRID							**No**
• high-voltage 110 kV grid: long-distance power line 110 kV, LONG-long-distance power line 2x110 kV, KBV 110 kV, KBV 2x110 kV, – new constructions and reconstruction, in accordance with the	yes						-
companies' development plans	yes						-
• distribution substations 110 kV/SN	yes						-
• other investments in the reconstruction of the 110 kV grid and an							
increase in capacity, reconstruction of DS 110 kV/SN by 2020:	yes						
○ 7,000 km of new medium-voltage power lines	yes						
○ 5,600 km of reconstructed medium-voltage power lines	yes						
○ 40 new medium-voltage distribution substations	yes						
○ 35 reconstructions of medium-voltage distribution	yes						
substations	yes						
○ 5,300 new medium-voltage substations /0.4 kV	yes						
○ 2,200 reconstructions of medium-voltage substations /0.4	yes						
kV							-
○ 3,700 km of new low-voltage power lines	yes						
○ 8,300 km of reconstructed low-voltage power lines	yes						
• transition to active grids and grid management:	yes						
○ automation and management of a medium-voltage grid							
○ operation of medium-voltage grid – grounding of a neutral							
point	yes						
○ facilitated introduction of active grids, smart measuring	yes						

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
devices and calculators used by consumers of electricity and	yes						
multiple producers	yes						
○ distribution management centres and call centres							
○ telecommunication infrastructure							
○ electricity metering systems							
○ information support							
9. SUB-PROGRAMME – NATURAL GAS SUPPLY							**No**
Construction of compression stations (CSs):							-
• CS Kidričevo 1st phase (50 bar, 3rd unit), 2016*	yes						
• CS Kidričevo 2nd phase (70 bar) 2016*	yes						
• CS on M2/1 (70 bar) by 2020*	yes						
• CS Rogatec by 2020*	yes						
Construction of transferable gas pipelines by 2020:							
• M1/1 Ceršak - Kidričevo, 2011	yes						
• M2/1 Rogaška Slatina – Trojane, 2013	yes						-
• M2/1 Trojane – Vodice, 2013	yes						-
• M5 and R51 Vodice – Jarše – TE-TOL, 2014	yes						-
• M3/1 Kalce – Ajdovščina, by 2020*	yes						-
• M3/1 Ajdovščina – Miren, by 2020*	yes						-
• M3/1 Kalce – Vodice, by 2020*	yes						-
• M6 Ajdovščina – Lucija, by 2020*	yes						-
• M8 Kalce – Jelšane, by 2020*	yes						-
• M9a Kidričevo – Lendava, by 2020*	yes						-
• M9b Kidričevo – Vodice, by 2020	yes						-
• M10 Vodice – Žirovnica – Rateče, by 2020*	yes						-
• Interconnector Slovenia – Hungary: Pince – Kidričevo, by 2020	yes						-

Measures and groups of measures of NEP	**BAS_INT (OSN_INT)**	**NPP_INT (JE_INT)**	**GAS_INT (PLIN_IN T)**	**BAS_REF (OSN_REF)**	**NPP_REF (JE_REF)**	**GAS_REF (PLIN_RE F)**	**RES AP (AN OVE)**
Identification of a location for natural gas storage (studies) Distribution of natural gas: • new distribution networks • expansion of the existing networks	yes yes yes						- - - - -
10. SUB-PROGRAMME – LIQUID FUELS							**No**
• new storage capacities to meet Slovenia's mandatory supply obligation (existing industry locations); • development of the generation of biofuels in Slovenia; • performance of studies to record potential hydrocarbon sites in the Republic of Slovenia • [inclusion in the PEOP (Pan European Oil Pipeline) project];	yes yes yes			yes yes yes			- - - -
11. SUB-PROGRAMME – NUCLEAR ENERGY							**No**
• Construction of a low and medium level radio-active waste repository at the location of Vrbina in the municipality of Krško (in accordance with the Decree on the national spatial plan (Official Gazette of the RS, No. 114, dated 31 December 2009) Note: The extension of the life span of the existing NEK nuclear power plant and the construction of NEK2 are included in the sub-programme generation of electricity.	yes	yes	yes	yes	yes	yes	-
12. SUB-PROGRAMME – COAL MINING							**No**
• gradual reduction of production in the Velenje coal mine as of 2021, from 4 million tonnes annually to 2 million tonnes annually by 2040, and the preservation of this level until the conclusion of exploitation,	exploitation by 2054						-

Measures and groups of measures of NEP	BAS_INT (OSN_INT)	NPP_INT (JE_INT)	GAS_INT (PLIN_INT)	BAS_REF (OSN_REF)	NPP_REF (JE_REF)	GAS_REF (PLIN_REF)	RES AP (AN OVE)
probably in 2054							
• closure of the Trbovlje-Hrastnik coal mine (RTH) by 2015 (the Act on the gradual closure of the Trbovlje–Hrastnik coal mine);	yes yes						- -
• research on confirmation of coal reserves on sites in Prekmurje and other reserves in the Trbovlje–Hrastnik coal mine in order to register natural assets;	yes						-
• research and development projects in the field of technologies of carbon storage and technologies of underground coal gasification.							

Legend:

BAS_INT (OSN_INT): intensive basic scenario
NPP_INT (JE_INT): intensive nuclear scenario
GAS_INT (PLIN_INT): intensive gas scenario
BAS_REF (OSN_REF): reference basic scenario
NPP_REF (JE_REF): reference nuclear scenario
GAS_REF (PLIN_REF): reference gas scenario
RES AP (AN OVE): Renewable Energy Sources Action Plan (yes= the sub-programme is included in the RES AP, no= the sub-programme is not included in the RES AP)

Table 43: Description of additional scenarios

Measures and groups of measures of NEP	ADD_NPP (DOD_JE)	ADD_GAS (DOD_PLIN)
1. **SUB-PROGRAMME – EFFICIENT USE OF ENERGY** 2. **SUB-PROGRAMME – USE OF ENERGY IN TRANSPORT** 3. **SUB-PROGRAMME – RENEWABLE ENERGY SOURCES** 4. **SUB-PROGRAMME – LOCAL ENERGY SUPPLY** 5. **SUB-PROGRAMME – CO-GENERATION OF HEAT AND ELECTRICITY**	Measures are the same as in scenarios BAS_INT (OSN_INT), NPP_INT (JE_INT) and GAS_INT (PLIN_INT)	

Measures and groups of measures of NEP	ADD_NPP (DOD_JE)	ADD_GAS (DOD_PLIN)
6. **SUB-PROGRAMME – GENERATION OF ELECTRICITY**	**ADD_NPP (DOD_JE)**	**ADD_GAS (DOD_PLIN)**
Measures in the field of electricity generation		
• TEŠ6, 549 MW, in 2014	no	no
• renovation and environmental restoration of TEŠ4 and TEŠ5,	yes	yes
operation by 2027	yes	no
• JEK2, 1,000 or 1,600 MW, from 2020 to 2030	396 MW	369 MW
• combined cycle power plant, in 2016,		369 MW
• combined cycle power plant, in 2022,	761 TJ in 2020, 0TJ in 2030	761 TJ in 2020, 0TJ in 2030
• use of WB in large co-generation of heat and electricity units with a high utilisation rate – co-incineration (existing energy and industrial locations)	Yes	yes
• tertiary reserve sources		
Other measures (NEK, HPP, TE TOL, TET, TEB, pumped storage HPP) are the same as in other scenarios		
7. **SUB-PROGRAMME – TRANSMISSION OF ELECTRICITY**	Measures within the same framework as in other scenarios	
8. **SUB-PROGRAMME – ELECTRICITY DISTRIBUTION GRID**	Measures are the same as in other scenarios	
9. **SUB-PROGRAMME – NATURAL GAS SUPPLY**	Measures within the same framework as in other scenarios	
10. **SUB-PROGRAMME – LIQUID FUELS**	Measures are the same as in other scenarios	
11. **SUB-PROGRAMME – NUCLEAR ENERGY**	**ADD_NPP (DOD_JE)**	**ADD_GAS (DOD_PLIN)**
• Construction of a low and medium level radioactive waste repository at the location of Vrbina in the municipality of Krško (in accordance with the Decree on the national spatial plan (Official Gazette of the RS, No. 114, dated 31 December 2009)	Yes	yes
Note: The extension of the life span of the existing NEK nuclear power plant and the construction of NEK2 are included in the generation of electricity sub-programme.		

Measures and groups of measures of NEP	**ADD_NPP (DOD_JE)**	**ADD_GAS (DOD_PLIN)**
12. **SUB-PROGRAMME – COAL MINING**	**ADD_NPP (DOD_JE)**	**ADD_GAS (DOD_PLIN)**
• gradual reduction of production in the Velenje coal mine and a termination of exploitation in 2027 Other measures are the same as in other scenarios	Exploitation by 2027	

Legend:
ADD_NPP (DOD_JE): additional nuclear scenario
ADD_GAS (DOD_PLIN): additional gas scenario
BAS_INT (OSN_INT): intensive basic scenario
NPP_INT (JE_INT): intensive nuclear scenario
GAS_INT (PLIN_INT): intensive gas scenario
BAS_REF (OSN_REF): reference basic scenario
NPP_REF (JE_REF): reference nuclear scenario
GAS_REF (PLIN_REF): reference gas scenario

Table 44: Evaluation of the BAS_INT (OSN_INT) scenario based on the classification of impacts according to their significance

SCENARIJ: INT_OSN	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj			OCENA PODPROGRAMOV
																							OCENA SKUPINE UKREPOV	
																						OCENA UKREPOV		
1. UČINKOVITA RABA ENERGIJA	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	0	0	0	0	0	0			-3
2. RABA ENERGIJE V PROMETU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
3. OBNOVLJIVI VIRI ENERGIJE																								-62
3.1 Mikro, male in srednje elektrarne																							-49	
3.1.1 vetrne elektrarne	0	0	0	0	0	0	-2	3	-6	-2	2	-4	0	0	0	-3	3	-9	0	0	0	-19		
3.1.2 male hidroelektrarne	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	0	0	0	-2	3	-6	-1	1	-1	-20		
3.1.3 sončne elektrarne	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.1.4 geotermalne elektrarne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.1.5 SPTE na lesno biomaso	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-13	
3.2.1 geotermalni ogrevalni sistemi	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1	-2		
3.2.2 sončni kolektorji	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.2.4 toplotne črpalke	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
5. SPTE NA ZEMELJSKI PLIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
6. PROIZVODNJA EL. ENERGIJE																								-33
6.1 proizvodnja el. energije na fosilna goriva	-3	1	-3	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-4	
6.2 proizvodnja el. energije v HE	0	0	0	-3	2	-6	-3	2	-6	-3	2	-6	0	0	0	-3	2	-6	-1	1	-1		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
6.4 proizvodnja el. energije iz jedrske energije	0	0	0	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
7. PRENOS EL. ENERGIJE	0	0	0	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	0	0	0	0	-2	2	-4	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	0	0	0	0	-1	2	-2	-1	2	-2	0	0	0	-1	2	-2	0	0	0			-6
10. TEKOČA GORIVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	-1	1	-1			2
		SKUPAJ	-7		SKUPAJ	-17		SKUPAJ	-30		SKUPAJ	-34		SKUPAJ	-2		SKUPAJ	-50		SKUPAJ	-4		SCENARIJ SKUPAJ	-144

Table 45: Evaluation of the JE_INT (NPP_INT) scenario based on the classification of impacts according to their significance

SCENARIJ: INT_JE	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	OCENA UKREPOV	OCENA SKUPINE UKREPOV	OCENA PODPROGRAMOV
1. UČINKOVITA RABA ENERGIJA	0	0	**0**	0	0	**0**	0	0	**0**	-1	3	**-3**	0	0	**0**	0	0	**0**	0	0	**0**			-3
2. RABA ENERGIJE V PROMETU	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
3. OBNOVLJIVI VIRI ENERGIJE																								-62
3.1 Mikro, male in srednje elektrarne																							-49	
3.1.1 vetrne elektrarne	0	0	**0**	0	0	**0**	-2	3	**-6**	-2	2	**-4**	0	0	**0**	-3	3	**-9**	0	0	**0**	-19		
3.1.2 male hidroelektrarne	0	0	**0**	-2	3	**-6**	-2	3	**-6**	-1	1	**-1**	0	0	**0**	-2	3	**-6**	-1	1	**-1**	-20		
3.1.3 sončne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	-1	3	**-3**	0	0	**0**	-2	3	**-6**	0	0	**0**	-9		
3.1.4 geotermalne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.1.5 SPTE na lesno biomaso	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-13	
3.2.1 geotermalni ogrevalni sistemi	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1	1	**-1**	-2		
3.2.2 sončni kolektorji	0	0	**0**	0	0	**0**	0	0	**0**	-1	3	**-3**	0	0	**0**	-2	3	**-6**	0	0	**0**	-9		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.2.4 toplotne črpalke	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
5. SPTE NA ZEMELJSKI PLIN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
6. PROIZVODNJA EL. ENERGIJE																								-38
6.1 proizvodnja el. energije na fosilna goriva	-3	1	**-3**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-4	
6.2 proizvodnja el. energije v HE	0	0	**0**	-3	2	**-6**	-3	2	**-6**	-3	2	**-6**	0	0	**0**	-3	2	**-6**	-1	1	**-1**		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-2	1	**-2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-2	
6.4 proizvodnja el. energije iz jedrske energije	0	0	**0**	-2	1	**-2**	-1	2	**-2**	-1	1	**-1**	0	0	**0**	-1	1	**-1**	-1	1	**-1**		-7	
7. PRENOS EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	3	**-6**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	2	**-4**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	**0**	0	0	**0**	-1	2	**-2**	-1	2	**-2**	0	0	**0**	-1	2	**-2**	0	0	**0**			-6
10. TEKOČA GORIVA	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	1	3	**3**	-1	1	**-1**			2
		SKUPAJ	-7		SKUPAJ	-17		SKUPAJ	-32		SKUPAJ	-35		SKUPAJ	-2		SKUPAJ	-51		SKUPAJ	-5		SCENARIJ SKUPAJ	-149

Table 46: Evaluation of the GAS_INT (PLIN_INT) scenario based on the classification of impacts according to their significance

SCENARIJ: INT_PLIN	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	OCENA UKREPOV	OCENA SKUPINE UKREPOV	OCENA PODPROGRAMOV
1. UČINKOVITA RABA ENERGIJA	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	0	0	0	0	0	0			-3
2. RABA ENERGIJE V PROMETU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
3. OBNOVLJIVI VIRI ENERGIJE																								-62
3.1 Mikro, male in srednje elektrarne																							-49	
3.1.1 vetrne elektrarne	0	0	0	0	0	0	-2	3	-6	-2	2	-4	0	0	0	-3	3	-9	0	0	0	-19		
3.1.2 male hidroelektrarne	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	0	0	0	-2	3	-6	-1	1	-1	-20		
3.1.3 sončne elektrarne	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.1.4 geotermalne elektrarne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.1.5 SPTE na lesno biomaso	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-13	
3.2.1 geotermalni ogrevalni sistemi	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1	-2		
3.2.2 sončni kolektorji	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.2.4 toplotne črpalke	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
5. SPTE NA ZEMELJSKI PLIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
6. PROIZVODNJA EL. ENERGIJE																								-34
6.1 proizvodnja el. energije na fosilna goriva	-3	1	-3	-1	1	-1	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0		-5	
6.2 proizvodnja el. energije v HE	0	0	0	-3	2	-6	-3	2	-6	-3	2	-6	0	0	0	-3	2	-6	-1	1	-1		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
6.4 proizvodnja el. energije iz jedrske energije	0	0	0	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
7. PRENOS EL. ENERGIJE	0	0	0	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	0	0	0	0	-2	2	-4	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	0	0	0	0	-1	2	-2	-1	2	-2	0	0	0	-1	2	-2	0	0	0			-6
10. TEKOČA GORIVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	-1	1	-1			2
		SKUPAJ	-7		SKUPAJ	-17		SKUPAJ	-31		SKUPAJ	-34		SKUPAJ	-2		SKUPAJ	-50		SKUPAJ	-4		SCENARIJ SKUPAJ	-145

Table 47: Evaluation of the BAS_REF (OSN_REF) scenario based on the classification of impacts according to their significance

SCENARIJ: REF_OSN	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	OCENA UKREPOV	OCENA SKUPINE UKREPOV	OCENA PODPROGRAMOV
1. UČINKOVITA RABA ENERGIJA	0	0	**0**	0	0	**0**	0	0	**0**	-1	3	**-3**	0	0	**0**	0	0	**0**	0	0	**0**			-3
2. RABA ENERGIJE V PROMETU	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
3. OBNOVLJIVI VIRI ENERGIJE																								-45
3.1 Mikro, male in srednje elektrarne																							-35	
3.1.1 vetrne elektrarne	0	0	**0**	0	0	**0**	-2	2	**-4**	-2	2	**-4**	0	0	**0**	-3	2	**-6**	0	0	**0**	-14		
3.1.2 male hidroelektrarne	0	0	**0**	-2	2	**-4**	-2	2	**-4**	-1	1	**-1**	0	0	**0**	-2	2	**-4**	-1	1	**-1**	-14		
3.1.3 sončne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	-1	2	**-2**	0	0	**0**	-2	2	**-4**	0	0	**0**	-6		
3.1.4 geotermalne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.1.5 SPTE na lesno biomaso	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-10	
3.2.1 geotermalni ogrevalni sistemi	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1	1	**-1**	-2		
3.2.2 sončni kolektorji	0	0	**0**	0	0	**0**	0	0	**0**	-1	2	**-2**	0	0	**0**	-2	2	**-4**	0	0	**0**	-6		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.2.4 toplotne črpalke	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
5. SPTE NA ZEMELJSKI PLIN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
6. PROIZVODNJA EL. ENERGIJE																								-32
6.1 proizvodnja el. energije na fosilna goriva	-3	1	**-3**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-4	
6.2 proizvodnja el. energije v HE	0	0	**0**	-3	2	**-6**	-3	2	**-6**	-3	2	**-6**	0	0	**0**	-3	2	**-6**	-1	1	**-1**		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-1	
6.4 proizvodnja el. energije iz jedrske energije	0	0	**0**	-2	1	**-2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-2	
7. PRENOS EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	3	**-6**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	2	**-4**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	**0**	0	0	**0**	-1	2	**-2**	-1	2	**-2**	0	0	**0**	-1	2	**-2**	0	0	**0**			-6
10. TEKOČA GORIVA	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1	1	**-1**			-1
		SKUPAJ	-6		SKUPAJ	-15		SKUPAJ	-26		SKUPAJ	-32		SKUPAJ	-2		SKUPAJ	-44		SKUPAJ	-4		SCENARIJ SKUPAJ	-129

Table 48: Evaluation of the NPP_REF (JE_REF) scenario based on the classification of impacts according to their significance

SCENARIJ: REF_JE	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj			OCENA PODPROGRAMOV
																							OCENA SKUPINE UKREPOV	
																						OCENA UKREPOV		
1. UČINKOVITA RABA ENERGIJA	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	0	0	0	0	0	0			-3
2. RABA ENERGIJE V PROMETU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
3. OBNOVLJIVI VIRI ENERGIJE																								-45
3.1 Mikro, male in srednje elektrarne																							-35	
3.1.1 vetrne elektrarne	0	0	0	0	0	0	-2	2	-4	-2	2	-4	0	0	0	-3	2	-6	0	0	0	-14		
3.1.2 male hidroelektrarne	0	0	0	-2	2	-4	-2	2	-4	-1	1	-1	0	0	0	-2	2	-4	-1	1	-1	-14		
3.1.3 sončne elektrarne	0	0	0	0	0	0	0	0	0	-1	2	-2	0	0	0	-2	2	-4	0	0	0	-6		
3.1.4 geotermalne elektrarne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.1.5 SPTE na lesno biomaso	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-10	
3.2.1 geotermalni ogrevalni sistemi	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1	-2		
3.2.2 sončni kolektorji	0	0	0	0	0	0	0	0	0	-1	2	-2	0	0	0	-2	2	-4	0	0	0	-6		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.2.4 toplotne črpalke	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
5. SPTE NA ZEMELJSKI PLIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
6. PROIZVODNJA EL. ENERGIJE																								-37
6.1 proizvodnja el. energije na fosilna goriva	-3	1	-3	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-4	
6.2 proizvodnja el. energije v HE	0	0	0	-3	2	-6	-3	2	-6	-3	2	-6	0	0	0	-3	2	-6	-1	1	-1		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-1	
6.4 proizvodnja el. energije iz jedrske energije	0	0	0	-2	1	-2	-2	1	-2	-1	1	-1	0	0	0	-1	1	-1	-1	1	-1		-7	
7. PRENOS EL. ENERGIJE	0	0	0	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	0	0	0	0	-2	2	-4	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	0	0	0	0	-1	2	-2	-1	2	-2	0	0	0	-1	2	-2	0	0	0			-6
10. TEKOČA GORIVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1			-1
		SKUPAJ	-6		SKUPAJ	-15		SKUPAJ	-28		SKUPAJ	-33		SKUPAJ	-2		SKUPAJ	-45		SKUPAJ	-5		SCENARIJ SKUPAJ	-134

Table 49: Evaluation of the GAS_REF (PLIN_REF) scenario based on the classification of impacts according to their significance

SCENARIJ: REF_PLIN	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	OCENA UKREPOV	OCENA SKUPINE UKREPOV	OCENA PODPROGRAMOV
1. UČINKOVITA RABA ENERGIJA	0	0	**0**	0	0	**0**	0	0	**0**	-1	3	**-3**	0	0	**0**	0	0	**0**	0	0	**0**			-3
2. RABA ENERGIJE V PROMETU	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
3. OBNOVLJIVI VIRI ENERGIJE																								-45
3.1 Mikro, male in srednje elektrarne																							-35	
3.1.1 vetrne elektrarne	0	0	**0**	0	0	**0**	-2	2	**-4**	-2	2	**-4**	0	0	**0**	-3	2	**-6**	0	0	**0**	-14		
3.1.2 male hidroelektrarne	0	0	**0**	-2	2	**-4**	-2	2	**-4**	-1	1	**-1**	0	0	**0**	-2	2	**-4**	-1	1	**-1**	-14		
3.1.3 sončne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	-1	2	**-2**	0	0	**0**	-2	2	**-4**	0	0	**0**	-6		
3.1.4 geotermalne elektrarne	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.1.5 SPTE na lesno biomaso	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-10	
3.2.1 geotermalni ogrevalni sistemi	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1	1	**-1**	-2		
3.2.2 sončni kolektorji	0	0	**0**	0	0	**0**	0	0	**0**	-1	2	**-2**	0	0	**0**	-2	2	**-4**	0	0	**0**	-6		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
3.2.4 toplotne črpalke	0	0	**0**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
5. SPTE NA ZEMELJSKI PLIN	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**			0
6. PROIZVODNJA EL. ENERGIJE																								-33
6.1 proizvodnja el. energije na fosilna goriva	-3	1	**-3**	-1	1	**-1**	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-5	
6.2 proizvodnja el. energije v HE	0	0	**0**	-3	2	**-6**	-3	2	**-6**	-3	2	**-6**	0	0	**0**	-3	2	**-6**	-1	1	**-1**		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-1	1	**-1**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-1	
6.4 proizvodnja el. energije iz jedrske energije	0	0	**0**	-2	1	**-2**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**		-2	
7. PRENOS EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	3	**-6**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	**0**	0	0	**0**	-2	2	**-4**	-2	3	**-6**	-1	1	**-1**	-3	3	**-9**	0	0	**0**			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	**0**	0	0	**0**	-1	2	**-2**	-1	2	**-2**	0	0	**0**	-1	2	**-2**	0	0	**0**			-6
10. TEKOČA GORIVA	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	-1	1	**-1**			-1
		SKUPAJ	-6		SKUPAJ	-15		SKUPAJ	-27		SKUPAJ	-32		SKUPAJ	-2		SKUPAJ	-44		SKUPAJ	-4		SCENARIJ SKUPAJ	-130

Table 8: Evaluation of the ADD_GAS (DOD_PLIN) scenario based on the classification of impacts according to their significance

SCENARIJ: DOD_PLIN	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	OCENA UKREPOV	OCENA SKUPINE UKREPOV	OCENA PODPROGRAMOV
1. UČINKOVITA RABA ENERGIJA	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	0	0	0	0	0	0			-3
2. RABA ENERGIJE V PROMETU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
3. OBNOVLJIVI VIRI ENERGIJE																								-62
3.1 Mikro, male in srednje elektrarne																							-49	
3.1.1 vetrne elektrarne	0	0	0	0	0	0	-2	3	-6	-2	2	-4	0	0	0	-3	3	-9	0	0	0	-19		
3.1.2 male hidroelektrarne	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	0	0	0	-2	3	-6	-1	1	-1	-20		
3.1.3 sončne elektrarne	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.1.4 geotermalne elektrarne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.1.5 SPTE na lesno biomaso	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-13	
3.2.1 geotermalni ogrevalni sistemi	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1	-2		
3.2.2 sončni kolektorji	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.2.4 toplotne črpalke	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
5. SPTE NA ZEMELJSKI PLIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
6. PROIZVODNJA EL. ENERGIJE																								-36
6.1 proizvodnja el. energije na fosilna goriva	-2	1	-2	-1	1	-1	-1	1	-1	-1	1	-1	0	0	0	-1	1	-1	-1	1	-1		-7	
6.2 proizvodnja el. energije v HE	0	0	0	-3	2	-6	-3	2	-6	-3	2	-6	0	0	0	-3	2	-6	-1	1	-1		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
6.4 proizvodnja el. energije iz jedrske energije	0	0	0	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
7. PRENOS EL. ENERGIJE	0	0	0	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	0	0	0	0	-2	2	-4	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	0	0	0	0	-1	2	-2	-1	2	-2	0	0	0	-1	2	-2	0	0	0			-6
10. TEKOČA GORIVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	-1	1	-1			2
		SKUPAJ	-6		SKUPAJ	-17		SKUPAJ	-31		SKUPAJ	-35		SKUPAJ	-2		SKUPAJ	-51		SKUPAJ	-5	SCENARIJ SKUPAJ		-147

Table 51: Evaluation of the ADD_NPP (DOD_JE) scenario based on the classification of impacts according to their significance

SCENARIJ: DOD_JE	naravni viri			voda			narava			kulturna dediščina			zdravje			krajina			materialne dobrine					
PODPROGRAM	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj	značaj	obseg	skupaj			OCENA PODPROGRAMOV
																							OCENA SKUPINE UKREPOV	
																						OCENA UKREPOV		
1. UČINKOVITA RABA ENERGIJA	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	0	0	0	0	0	0			-3
2. RABA ENERGIJE V PROMETU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
3. OBNOVLJIVI VIRI ENERGIJE																								-62
3.1 Mikro, male in srednje elektrarne																							-49	
3.1.1 vetrne elektrarne	0	0	0	0	0	0	-2	3	-6	-2	2	-4	0	0	0	-3	3	-9	0	0	0	-19		
3.1.2 male hidroelektrarne	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	0	0	0	-2	3	-6	-1	1	-1	-20		
3.1.3 sončne elektrarne	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.1.4 geotermalne elektrarne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.1.5 SPTE na lesno biomaso	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.1.6 odlagališčni plin, drugi bioplini in ČN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3.2 Sistemi za ogrevanje, ki izkoriščajo OVE																							-13	
3.2.1 geotermalni ogrevalni sistemi	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	1	-1	-2		
3.2.2 sončni kolektorji	0	0	0	0	0	0	0	0	0	-1	3	-3	0	0	0	-2	3	-6	0	0	0	-9		
3.2.3 ogrevalni sistemi na lesno biomaso (LBM)	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
3.2.4 toplotne črpalke	0	0	0	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1		
4. LOKALNA OSKRBA Z ENERGIJO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
5. SPTE NA ZEMELJSKI PLIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0
6. PROIZVODNJA EL. ENERGIJE																								-37
6.1 proizvodnja el. energije na fosilna goriva	-2	1	-2	-1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-3	
6.2 proizvodnja el. energije v HE	0	0	0	-3	2	-6	-3	2	-6	-3	2	-6	0	0	0	-3	2	-6	-1	1	-1		-25	
6.3 LBM v velikih enotah SPTE z visokim izk.	-2	1	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		-2	
6.4 proizvodnja el. energije iz jedrske energije	0	0	0	-2	1	-2	-1	2	-2	-1	1	-1	0	0	0	-1	1	-1	-1	1	-1		-7	
7. PRENOS EL. ENERGIJE	0	0	0	0	0	0	-2	3	-6	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-22
8. DISTRIBUCIJA EL. ENERGIJE	0	0	0	0	0	0	-2	2	-4	-2	3	-6	-1	1	-1	-3	3	-9	0	0	0			-20
9. OSKRBA Z ZEMELJSKIM PLINOM	0	0	0	0	0	0	-1	2	-2	-1	2	-2	0	0	0	-1	2	-2	0	0	0			-6
10. TEKOČA GORIVA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3	-1	1	-1			2
		SKUPAJ	-6		SKUPAJ	-17		SKUPAJ	-32		SKUPAJ	-35		SKUPAJ	-2		SKUPAJ	-51		SKUPAJ	-5		SCENARIJ SKUPAJ	-148

11.2.1 Comparison of NEP scenarios

The final evaluations of impacts on the environment according to each NEP scenario are shown in the following tables, arranged by individual impacts. They are expressed in parameter units describing the impact on the environment, as well as in percentages with regard to the maximum value of impact among all the scenarios in question.

Due to the comparability of evaluations of individual types of impact, the impacts on air and climatic factors include only emissions into the air and GHG emissions due to the implementation of NEP sub-programmes no. 4, 5 and 6 (local energy supply, co-generation of heat and electricity, generation of electricity). When evaluating the impacts on climatic factors, the GHG emissions during the entire life span of a device for the generation of heat and electricity have been taken into account.

Table 52: Evaluation of impact values according to the significance of the impact and marginal external cost

vrsta vpliva	vrednosti po razvrstitvi glede na pomen vpliva in mejne zunanje stroške								
	enota	OSN_INT	JE_INT	PLIN_INT	OSN_REF	JE_REF	PLIN_REF	DOD_PLIN	DOD_JE
naravni viri-gozd, tla	št. točk	7,00	7,00	7,00	6,00	6,00	6,00	6,00	6,00
naravni viri-odpadki	mio EUR	764,31	764,31	764,31	764,32	764,32	764,32	555,78	555,78
zrak	mio EUR	6.290,74	6.409,78	6.490,82	6.068,12	6.187,17	6.268,21	5.850,81	5.842,47
voda	št. točk	17,00	17,00	17,00	15,00	15,00	15,00	17,00	17,00
narava	št. točk	30,00	32,00	31,00	26,00	28,00	27,00	31,00	32,00
kulturna dediščina	št. točk	34,00	35,00	34,00	32,00	33,00	32,00	35,00	35,00
podnebni dejavniki	mio EUR	3.183,28	3.214,60	3.449,83	3.121,37	3.186,97	3.422,20	3.132,58	3.012,55
zdravje	št. točk	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
krajina	št. točk	50,00	51,00	50,00	44,00	45,00	44,00	51,00	51,00
materialne dobrine	št. točk	4,00	5,00	4,00	4,00	5,00	4,00	5,00	5,00

Table 53: Normalised evaluated values of impacts, in percentage according to the maximum grade of impact

vrsta vpliva	normirane vrednosti vrednotenja (v % največje vrednosti)								
	enota	OSN_INT	JE_INT	PLIN_INT	OSN_REF	JE_REF	PLIN_REF	DOD_PLIN	DOD_JE
naravni viri-gozd, tla	%	100,00	100,00	100,00	85,71	85,71	85,71	85,71	85,71
naravni viri-odpadki	%	83,58	83,58	83,58	83,58	83,58	83,58	60,78	60,78
zrak	%	96,92	98,75	100,00	93,49	95,32	96,57	90,14	90,01
voda	%	100,00	100,00	100,00	88,24	88,24	88,24	100,00	100,00
narava	%	93,75	100,00	96,88	81,25	87,50	84,38	96,88	100,00
kulturna dediščina	%	94,44	97,22	94,44	88,89	91,67	88,89	97,22	97,22
podnebni dejavniki	%	92,27	93,18	100,00	90,48	92,38	99,20	90,80	87,32
zdravje	%	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
krajina	%	98,04	100,00	98,04	86,27	88,24	86,27	100,00	100,00
materialne dobrine	%	80,00	100,00	80,00	80,00	100,00	80,00	100,00	100,00

The comparison of scenarios of intensive implementation of RES and EUE measures (scenarios marked "_INT" and scenarios ADD_GAS and ADD_NPP) with scenarios of moderate implementation of these measures (scenarios marked "_REF") shows that all intensive scenarios have a greater impact on natural resources (forest, soil, air, water, natural environment, cultural heritage and landscape than the reference scenarios.

The impacts on climatic factors are usually greater from scenarios entailing the intensive implementation of RES and EUE measures than with the reference scenarios, while scenarios ADD_GAS and mostly ADD_NPP show the least impact on climatic factors.

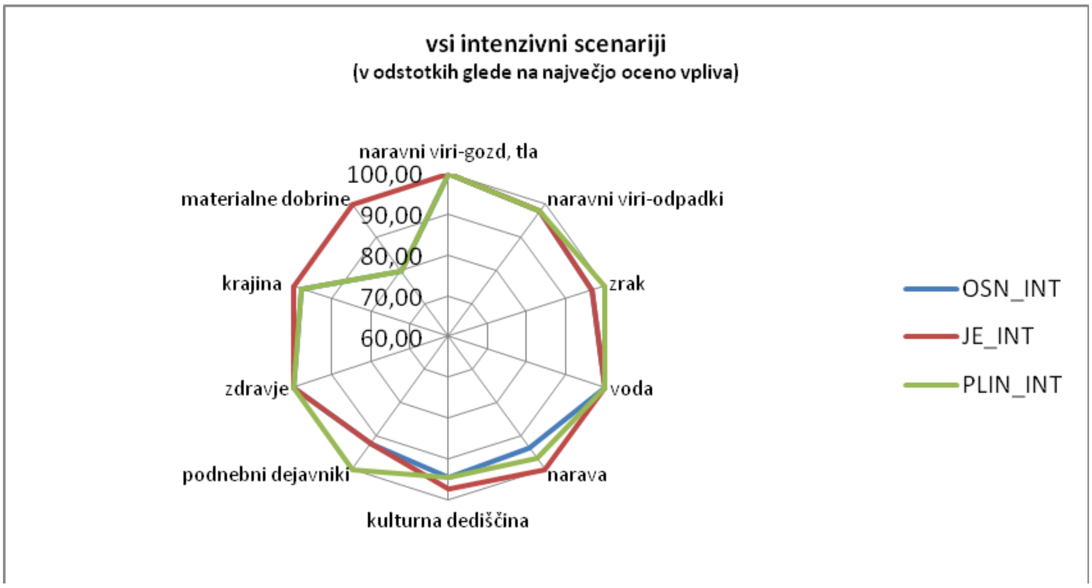

Figure 31: Evaluation of impacts of intensive NEP scenarios

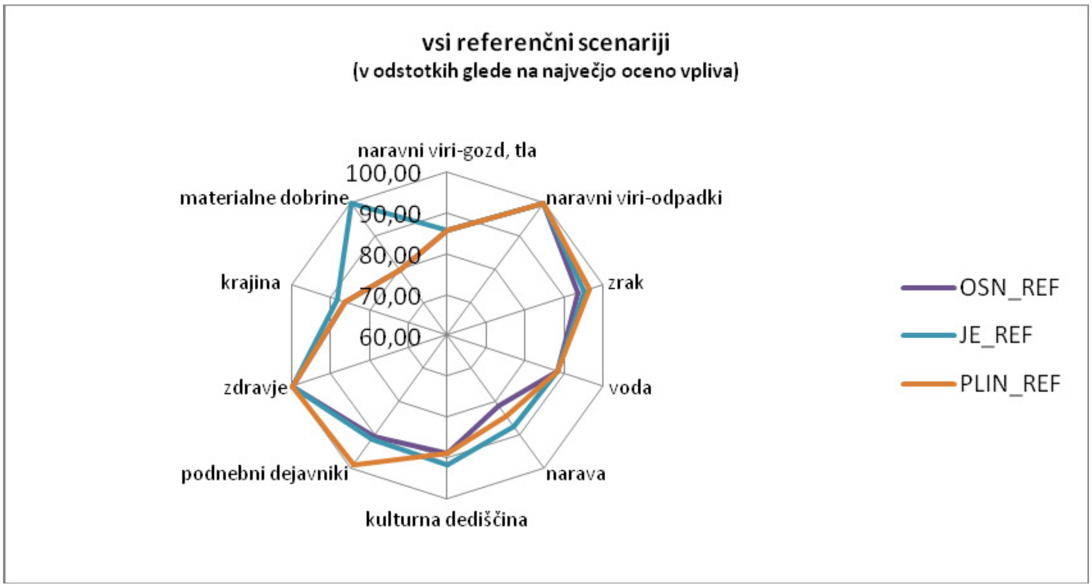

Figure 23: Evaluation of impacts of reference NEP scenarios

The comparison of scenarios according to the type of development of the generation of electricity (scenarios marked "BAS_", "NPP_" and "GAS_") shows that these scenarios differ mostly in their impact on air and climatic factors; the basic scenarios show the least impact on these two types, while the scenario of nuclear energy is not very different from the basic one with regard to these two types of impacts in the 2010-2030 period (the new NPP is expected to start operating at the end of the period for which the evaluation of impacts has been made); the scenario of the generation of electricity in combined cycle power plants (marked "GAS_") has the greatest impact on air and climatic factors.

The difference between the scenarios of intensive implementation of RES and EUE measures and the reference scenarios is most clearly visible from the comparison of scenarios BAS_INT and BAS_REF. The diagram on the figure below shows the greater impact of the BAS_INT scenario on natural resources (forest, soil), air, water, cultural heritage and landscape. Due to the greater use of gas in the co-generation of heat and electricity, the intensive implementation of RES and EUE measures will also not reduce the impact on climatic factors.

When comparing the scenarios marked BAS_INT and BAS_REF, a certain fact must be emphasised: in the 2020-2030 period, following the INT_BAS scenario, there will be a large surplus of produced electricity above Slovenia's consumption requirements. Provided that this surplus of electricity substituted for the generation of electricity from the most damaging generation from fossil fuels, the BAS_INT scenario would show a significant reduction of impact on climatic factors and air, making the BAS_INT scenario more acceptable that the BAS_REF scenario in terms of its impact on the environment.

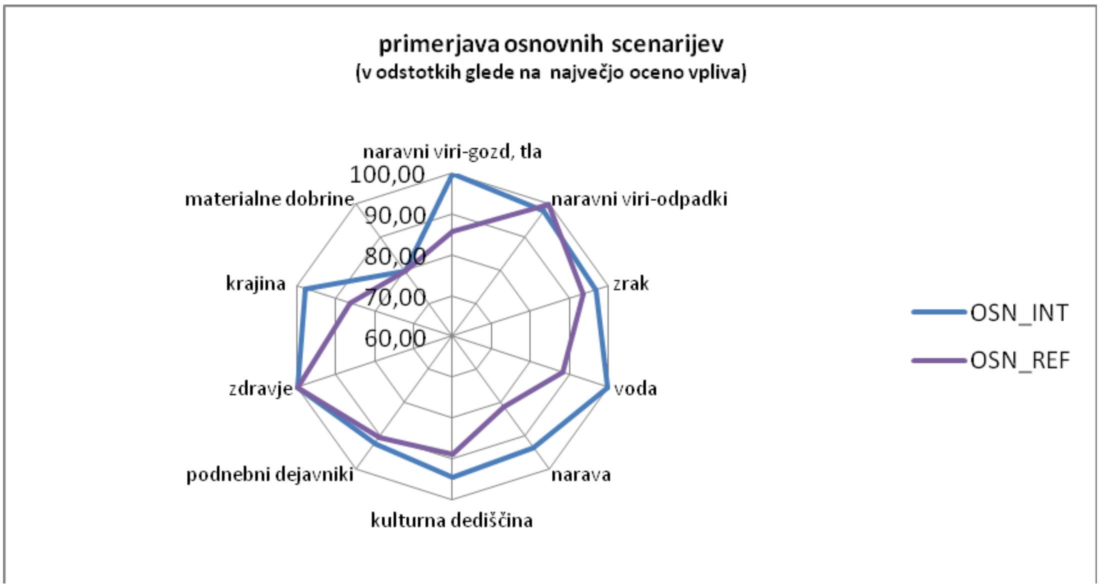

Figure 33: Comparison of impacts of the basic, intensive and reference scenarios

According to their impact on climatic factors, the most acceptable scenarios are ADD_GAS and especially ADD_NPP. Both involve an intensive implementation of RES and EUE measures, while the generation of electricity is based on the use of natural gas or nuclear power. According to the equal impacts of RES and EUE measures and the long-term sustainability of measures according to these two scenarios, the comparison diagram on the figure below shows that the most appropriate NEP scenario is ADD_NPP.

Despite the evaluation of environmental impacts, there are doubts associated with the proposal for the DOD_NPP scenario that stem from the fact that there is unease associated with the nuclear safety of the NPP and the implementation of long-term storage or removal of high-level radio-active waste. The risks associated with nuclear safety and the implementation of sustainable handling of high-level nuclear waste are not included in the evaluation of environmental impacts of NEP measures. There is no doubt, however, that the final decision on the extension of operation of the existing NPP and the decision on the construction of a new NPP is left – provided stricter standards in the area of nuclear safety are observed – to the procedure for the adoption of a safety report and the issue of a suitable operating licence in accordance with the act governing nuclear safety, and that the issue associated with the handling of high level radioactive waste should be unequivocally resolved simultaneously with the realisation of additional electricity generation from nuclear fuel.

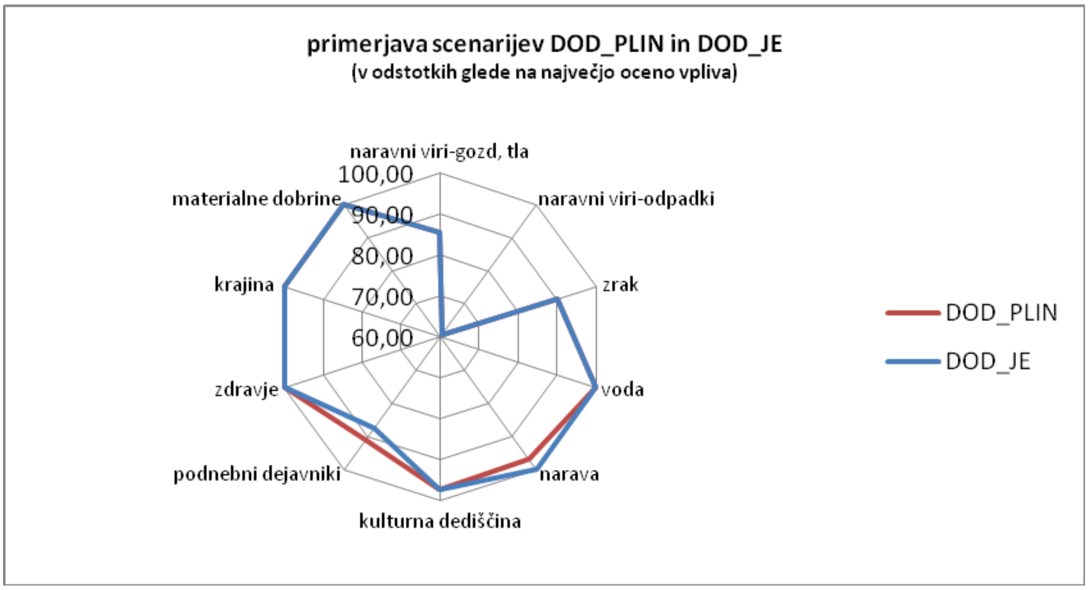

Figure 34: Comparison of impacts of the ADD_GAS and ADD_NPP scenarios

11.2.2 Classification of NEP scenarios according to their impact on the environment

The ADD_NPP scenario is the most acceptable for the environment in terms of impacts on the environment in the period 2010–2030 and with respect to the long-term consequences of the implementation of NEP scenarios. It is followed by the ADD_GAS and BAS_REF scenarios.

With respect to its environmental impact, the BAS_INT scenario is less acceptable than BAS_REF, unless electricity generation from solid fossil fuels is reduced in the event of a surplus of electricity generation over consumption in Slovenia as a result of the implementation of efficient energy use measures or the generation of new electricity from renewable energy sources or new CHP and NG plants. If the surplus of produced electricity over its consumption in Slovenia replaces the generation of electricity from solid fossil fuels, the BAS_INT scenario is the third most acceptable NEP scenario in terms of environmental impacts.

The NPP_REF and NPP_INT scenarios are also environmentally acceptable. The scenarios designated "NPP_" have a greater impact on air than the BAS_REF and BAS_INT scenarios because of the emissions of ionising radiation that exposes the population to such radiation in the entire life span of the NPP, including the life span of nuclear fuel. However, under the assumption that the reprocessing of spent nuclear fuel and storage of the remains from such reprocessing as well as the storage of other radio-active materials occurring during the use of nuclear energy will be ensured in the long term, the generation of electricity in the NPP has a far lesser long-term impact on air and waters than electricity generation from fossil fuels and, because of smaller needs for renewable energy sources of electricity (water, wood biomass), indirectly causes the least long-term impacts on nature and landscape. Although in the period 2010-2030, Slovenia will not require electricity produced in the new NPP, it is recommended that the construction of the new NPP begin in the period 2020-2030, in order to relieve the impacts on the environment which would be caused when the existing NPP stops operating. Such construction would ensure that the new NPP would be ready to start operating by the time the existing NPP expires.

As regards environmental impacts, the GAS_REF and GAS_INT scenarios are also acceptable because of the adopted environmental objectives, but of all the NEP scenarios, it is these two that constitute the greatest burden on the environment. The GAS_REF and GAS_INT scenarios cause a greater impact on air and climatic factors than other NEP scenarios, and are also not in accordance with EU guidelines on the further decrease of pressures on climatic and other environmental factors after 2020, i.e. the period for which EU environmental objectives have already been adopted, because of the increase in the emissions of pollutants and GHGs in the period 2020–2030.

12 Monitoring of impacts and recommendations for further implementation of measures

Monitoring of impacts on natural resources

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring the following indicators of the sustainable use of natural resources:

- annual use of coal for the generation of energy,
- annual use of forest biomass for the generation of energy and annual use of wood in the wood processing industry,
- annual generation of biofuels by processing lignocellulose fibres.

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures.

Monitoring of impacts on air

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring the indicators of achieving national upper limits of emissions of pollutants into the ambient air (SO_2, NO_x, VOC, NH_3 and PM TSP, PM_{10} in $PM_{2,5}$).

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures.

Monitoring of impacts on waters

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring the indicators of the condition of surface waters (chemical, ecological or quantity characteristics) in areas where water is used for electricity generation in HPPs or for cooling in power plants using fossil fuels or nuclear energy.

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures.

Monitoring of impacts on nature

Three indicators show the status of natural environment and biodiversity:

- A change in the status of conservation of species and habitat types listed in a Report prepared on the basis of Article 17 of the Habitats Directive (92/43/EEC).
- A change in the conservation status of species in SPA areas and in the entire territory of Slovenia listed in a Report prepared on the basis of Article 12 of the Conservation of Wild Birds Directive (79/409/EEC).

- The scope and nature of interventions in important areas of nature protection: Natura 2008 Areas (SCI, SPA and SPA annexes), Ecologically Important Areas, Protected Areas, Valuable Natural Features, Ramsar Wetlands, Biosphere Reserves, UNESCO's Natural Heritage and Important Bird Areas.

The client monitors the status of the indicators that must be checked every four years with respect to the implemented NEP measures. The status of species and habitat types should be checked on the basis of a report prepared on the basis of Article 17 of the Habitats Directive (92/43/EEC) and a report prepared on the basis of Article 12 of the Conservation of Wild Birds Directive (79/409/EEC). The Member States are required to prepare a report on the basis of Article 17 of the Habitats Directive every six years, and a report on the basis of Article 12 of the Conservation of Wild Birds Directive every three years. Qualifying and key species and habitat types that would be significantly affected by the implemented NEP measures should be determined; subsequently, a conclusion would ensue, with regard to the data from the reports, on whether a change in conservation status has occurred.

The surface of important areas of nature protection should be verified with regard to the Report on the status of the environment in the Republic of Slovenia, issued every four years by the Ministry of the Environment and Spatial Planning. With regard to the implemented NEP measures, important areas of nature protection that would be significantly affected by these measures should be determined and conclusions drawn as to whether the scope and character of these areas have changed.

Monitoring of impacts on cultural heritage

The indicator for monitoring the status of cultural heritage is:
- cultural heritage "at risk" level (according to the English Heritage Risk Scale, which is based on the evaluation of status and use).

The client should monitor the status of the indicators in cooperation with the competent cultural heritage protection services. Such monitoring could form part of the regular monitoring of the status of cultural heritage at national level. The indicators must be verified every four years with regard to the implemented NEP measures. The monitoring of the status should be implemented by qualified experts from the field of cultural heritage protection. Monitoring with regard to the implementation of individual NEP measures should be determined within the framework of a detailed spatial planning procedure.

Monitoring of impacts on climatic factors

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring the following indicators:

- percentage of final consumption of electricity from renewable energy sources,
- a positive contribution to a reduction of GHG emissions.

The client monitors the status of the indicators which must be checked every four years with respect to the implemented NEP measures.

Monitoring of impacts on health

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring the following indicators:

- the number of buildings with protected spaces which are overburdened with EMR,
- the percentage of distribution grid power lines placed underground in settlement areas.

The client monitors the status of the indicators which must be checked every four years with respect to the implemented NEP measures.

Monitoring of impacts on landscape

The indicators for monitoring the status of landscape are as follows:

- preservation of landscape features,
- preservation and integrity of landscape areas with distinctive features at the national level, and exceptional landscapes.

The client should monitor the status of the indicators in cooperation with the competent landscape development and protection services. Such monitoring could form part of the regular monitoring of the status of landscape at a national level. The indicators must be verified every four years with regard to the NEP measures implemented. The monitoring of the status should be carried out by qualified experts from the field of landscape protection. Monitoring with regard to the implementation of individual NEP measures should be determined within the framework of a detailed spatial planning procedure.

Monitoring of impacts on material assets

The monitoring of achieving environmental objectives and sub-objectives of NEP measures is ensured by monitoring an indicator for a number of new larger energy locations.

The client monitors the status of the indicator which must be checked every four years with respect to the implemented NEP measures.

13 Sources

- Slovenian Environment Agency, *Atlas okolja* (Environment Atlas), August 2010. Webpage: http://gis.arso.gov.si/atlasokolja/
- Slovenian Environment Agency, February 2008. *Okolje na dlani: Slovenija* (Environment at a glance: Slovenia).
- *Analiza sprememb radioloških in toplotnih vplivov NEK na okolje po zgraditvi HE Brežice* (Analysis of changes of radiological and heat impacts of the NEK NPP on the environment after the HPP Brežice is constructed). The study was ordered by the Ministry of the Economy (2006) and prepared by the "Jožef Stefan" Institute in cooperation with the Faculty of Civil and Geodetic Engineering (FGG) – Fluid Mechanics Chair), the Institute of Sanitary Engineering, and the Elektroprojekt engineering bureau (IBE).
- Aquarius: *Strokovne podlage za Nacionalni energetski program* (Expert groundwork for the National Energy Programme, 2010-2030 period): *Celovit pregled potencialno ustreznih območij za izkoriščanje vetrne energije* (A comprehensive overview of potentially suitable areas for the utilisation of wind energy), February 2011.
- *Poročilu o določitvi obsega celovite presoje vplivov na okolje Nacionalnega energetskega programa za obdobje 2010 – 2030* (Report determining the scope of the comprehensive assessment of environmental impacts of the National Energy Programme for the 2010–2030 period), Aquarius, September 2010, amendments March 2011.
- Beltram Gordana, 2003: *Vodno bogastvo Slovenije, Mokrišča* (Water wealth of Slovenia, wetlands), ARSO (Slovenian Environment Agency) 2003.
- BirdLife International and Directorate of Culture and Cultural and Natural Heritage 2003. Draft A Recomendation on minimising adverse effects of wind power generation on birds.
- BirdLife International on behalf of the Bern Convention 2003. Protecting Birds from Powerlines: a practical guide on the risks to birds from electricity transmission facilities and how to minimise any such adverse effect.
- Božič, 2003: *Mednarodno pomembna območja za ptice v Sloveniji 2, Predlogi posebnih zaščitenih območij (SPA) v Sloveniji* (Internationally important bird areas in Slovenia 2, Proposals for special protected areas, SPA, in Slovenia) DOPPS (Society for Observation and Study of Birds of Slovenia), DOPPS Monograph No. 2, Ljubljana.
- *Celosten pogled na vode porečja Mure in upravljanja z njimi* (A comprehensive view of the waters of the Mura River and their management), Lidija Globevnik, Institute for Water of the Republic of Slovenia, 2007.
- Clean Air for Europe (CAFE) Programme: Damage per tonne emission of PM2.5, NH3, SO2, NOx and VOCs from each EU25 Member State (excluding Cyprus) and surrounding seas.
- Combining building thermal simulation methods and LCA methods; *Frank Pedersen et al., Danish Building Research Institute, 2008.*
- COMPARISON OF ENERGY SYSTEMS USING LIFE CYCLE ASSESSMENT; A Special Report of the World Energy Council, July 2004.
- Čušin, B. (ed.), 2004, *Natura 2000 v Sloveniji. Rastline* (Natura 2000 in Slovenia. Plants) Založba ZRC publishing, ZRC SAZU, Ljubljana.
- Digital data from the register of cultural heritage, 2010, INDOK Center, Ministry of Culture.
- DOPPS (Society for Observation and Study of Birds of Slovenia): *Vodnik po mednarodno pomembnih območjih za ptice (IBA) v Sloveniji* (A guidebook of internationally important bird areas (IBA) in Slovenia), 1999.
- *EN35 External costs of electricity production, European Environment Agency.*
- Estimation of the Years of Lost Life (YOLL) as a consequence of the nuclear fuel cycle; Ove Edlund; Studsvik Eco & Safety AB; Sweden, 2001.

- European Landscape Convention - the implementation in Slovenia, 2008, Ministry of the Environment and Spatial Planning, Ljubljana.
- Hlad B. and Skoberne P. 2001. *Pregled stanja biotske raznovrstnosti in krajinske pestrosti v Sloveniji* (Review of biodiversity and landscape diversity in Slovenia), Ministry of the Environment and Spatial Planning, ARSO (Slovenian Environment Agency), Ljubljana.
- Hladnik J., November 2008. *Evropska konvencija o krajini – izvajanje v Sloveniji* (The European Landscape Convention - implementation in Slovenia). Ministry of the Environment and Spatial Planning.
- HSE Invest & IBE, September 2010: *Možnost energetske izrabe reke Mure – variantni prikaz možnih lokacij objektov HE* (Possibility of energy use of the Mura River – a variant study of potential locations for HPP facilities).
- http://sl.wikipedia.org/, cited in September 2010.
- Hudoklin J. Selak I. and Simič S. 2005. *Smernice za celostno ohranjanje dediščinske kulturne krajine* (Guidelines for the comprehensive preservation of landscape cultural heritage), ACER Novo mesto d.o.o., Novo mesto.
- The "Jožef Stefan" Institute, (Faculty of Civil and Geodetic Engineering (FGG) – Fluid Mechanics Chair), Institute of Sanitary Engineering, and Elektroprojekt engineering bureau (IBE): *Analiza sememb radioloških in toplotnih vplivov NEK na okolje po zgraditvi HE Brežice* (Analysis of changes of radiological and heat impacts of the NEK NPP on the environment after the HPP Brežice is constructed), 2006.
- The "Jožef Stefan" Institute, *Predlog Nacionalnega energetskega programa RS za obdobje 2010-2030 – osnutek* (A draft proposal of the National Energy Programme of the Republic of Slovenia for the period 2010-2030), May 2011.
- Slovenian Environment Agency webpage, *Atlas okolja* (Environment atlas), August 2010 (http://gis.arso.gov.si/atlasokolja/).
- The Ministry of Agriculture, Forestry and Food webpage: http://rkg.gov.si/GERK/, cited in August 2010.
- The Ministry of Culture webpage: http://www.mk.gov.si/, cited in August 2010.
- Jogan N., June 2007. *Poročilo o stanju ogroženih rastlinskih vrst, stanju invazivnih vrst ter vrstnega bogastva s komentarji* (A report on the status of endangered plant species, the status of invasive species and on the diversity of species, with commentary). ARSO (Slovenian Environment Agency), Ljubljana.
- Marine Scotland: Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters, 2010.
- Marušič I. and Jakl F. 1998. *Načrtovanje in krajinsko oblikovanje koridorjev daljnovodov in cevnih vodov: Priročnik* (Planning and landscape design of long-distance line corridors and cable lines: Handbook), Ministry of the Environment and Spatial Planning, Ljubljana.
- Marušič J. Ogrin D. et al. 1998. *Regionalna razdelitev krajinskih tipov v Sloveniji* (Regional classification of landscape types in Slovenia), Ministry of the Environment and Spatial Planning, Spatial Planning Office of the Republic of Slovenia, *Biotehniška fakulteta*, *Oddelek za krajinsko arhitekturo* (Faculty of Biotechnology (BF), Landscape Architecture Department), Ljubljana.
- Mlakar A., Jankovič K. and Mlakar B. 2005. *Vključevanje varstva kulturne dediščine v pripravo okoljskih poročil in celovite presoje vplivov na okolje* (Taking the preservation of cultural heritage into account when preparing environmental reports and comprehensive assessments of environmental impacts; based on the Environment Protection Act ZVO-1), LUZ d.d., Ministry of Culture, Ljubljana.
- Ministry of the Environment and Spatial Planning, March 2009: *Poročilo po 12. členu Direktive 79/409/EGS o ohranjanju prosto živečih ptic o izvajanju te direktive v obdobju 2005-2007* (Report on the basis of Article 12 of the Directive 79/409/EEC on the preservation of free-ranging birds with regard to the implementation of this Directive in the 2005-2007 period).

- Ministry of the Environment and Spatial Planning: *Poročilo o stanju okolja v Sloveniji 2009* (Report on the status of the environment in Slovenia 2009), documents for public debate, published on the Internet, report dated 9 July 2010.
- Mršić, N., 1997: *Biotska raznovrstnost v Sloveniji, Slovenija- »vroča točka Evrope«* (Biodiversity in Slovenia, Slovenia – "a hot spot of Europe"). Ministry of the Environment and Spatial Planning, Administration for Nature Protection of the Republic of Slovenia, Ljubljana.
- *Nacionalni program za kulturo 2008-2011* (National Programme for Culture 2008-2011). 2007. Ministry of Culture, Ljubljana.
- Evaluation of impacts of the thematic strategy for the pollution of air (*Tematska strategija o onesnaževanju zraka*) and the Directive on ambient air quality and cleaner air for Europe; SEC (2005) 1133.
- *Okolje na dlani: Slovenija* (Environment at a glance: Slovenia). ARSO (Slovenian Environment Agency), Ljubljana.
- *Okoljsko poročilo za postopek celostne presoje vplivov na okolje nove JEK2 na planskem nivoju za Nacionalni energetski program* (Environmental report with regard to the comprehensive environmental impact assessment procedure for the new JEK2 NPP at planning level for the National Energy Programme), ZVD Zavod za varstvo pri delu d.d., 2010.
- *Poročilo po 17. členu Direktive o habitatih v obdobju 2001 – 2006* (Report on the basis of Article 17 of the Habitats Directive in the 2001-2006 period) (http://www.zrsvn.si/sl/informacija.asp?id_meta_type=65&id_informacija=579, cited in October 2010).
- Draft Directive on industrial emissions (IPPC - integrated pollution prevention and control) [COM(2007) 843 final].
- Council Recommendation 1999/519/EC on the limitation of exposure of the general public to electromagnetic fields (EMF).
- *Priročnik pravnih režimov varstva, ki jih je treba upoštevati pri prostorskem načrtovanju in posegih v prostor v območjih kulturne dediščine* (Handbook of legal protection regimes which must be taken into account in spatial planning and interfering with the environment in areas of cultural heritage, http://giskd2s.situla.org/evrdd/P_09_04_03.htm).
- REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling - SEC(2010) 65 final.
- *Strategija ohranjanja biotske raznovrstnosti v Sloveniji* (The Strategy for the Preservation of Biodiversity in Slovenia). Ministry of the Environment and Spatial Planning of the Republic of Slovenia, 2002.
- *Strategija prostorskega razvoja Slovenije* (Spatial Planning Strategy of the Republic of Slovenia), 2004, Ministry of the Environment and Spatial Planning, Ljubljana.
- Supplementary Planning Guidance to Accompany Planning Policy Statement 18 "Renewable Energy": Wind Energy Development in Northern Ireland's Landscapes, 2010.
- *Tematske strategije o onesnaževanju zraka* (Thematic strategies for air pollution) and the Directive on ambient air quality and cleaner air for Europe; SEC (2005) 1133.
- The Impacts and Costs of Climate Change; Final Report September 2005, AEA Technology Environment in Stockholm Environment Institute, Oxford; Commissioned by European Commission DG Environment Prepared as task 1 of the project 'Modelling Support for Future Actions – Benefits and Cost of Climate Change Policies and Measures'.
- The Minister of the Environment, Heritage and Local Government. Section 28 of the Planning and Development Act: Wind Energy Development Guidelines, Ireland, 2000.
- The Scottish Government. Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters, Edinburgh, 2010.

- *Urejanje vodnega režima reke Mure v povezavi z možnostjo energetske izrabe reke* (Management of the water regime of the Mura River with regard to the potential energy use of the river, No. 3148/09, October 2009; VGB Maribor).
- *Usmeritve za urejanje izjemnih krajin v Sloveniji* (Guidelines for the management of exceptional landscapes in Slovenia). 1998. Acer Novo mesto d.o.o., Novo mesto.
- VARSTVO NARAVE - revija za teorijo in prakso ohranjanja narave (Protection of nature – a magazine for the theory and practice of nature protection): http://www.zrsvn.si/dokumenti/63/2/2008/petkovsek_1341.pdf, cited in September 2010.
- Vodnogospodarski biro Maribor: *Preveritev lokacij z vidika varstva narave -strokovne podlage za obravnavo HE na Mur* (Verification of locations from the point of view of nature protection – expert groundwork for the consideration of HPPs on the Mura River), partial report, August 2010.
- Vreš B., 2000. *Floristične in taksonomske raziskave* (Flora and taxonomy studies). Published in: *50 let Biološkega inštituta Jovana Hadžija* (50 years of the Jovan Hadžija Biological Institute), Ljubljana: ZRC SAZU, Založba ZRC publishing.
- Western Australian planning commission, Guidelines for Wind Farm Development, 2010.
- www.ramsar.si, cited in September 2010; http://sl.wikipedia.org/, cited in September 2010.
- Zabric D.; 2008. *Stanje in varstvo sulca (Hucho hucho) v Sloveniji* (The status and protection of the *Hucho hucho* species in Slovenia), ZZRS, Ljubljana.
- ZRSVN: *Strokovne podlage za dopolnitev območij Natura 2000* (Expert groundwork for the supplementation of Natura 2000 areas), February 2011.