ЈАВНА НАУЧНОИСТРАЖИВАЧКА
УСТАНОВА
ИНСТИТУТ ЗА ЗАШТИТУ И ЕКОЛОГИЈУ
РЕПУБЛИКЕ СРПСКЕ
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SUMMARY

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT STUDY

FOR THE *PROJECT OF CONSTRUCTION AND USE OF THERMAL POWER PLANT "UGLJEVIK 3", MUNICIPALITY OF UGLJEVIK, CAPACITY OF 2 x 350 MW "*

August 2021, Banja Luka

Contents:

SUBJECT:	**Draft Environmental Impact Assessment Study for the Project of Construction and Use of Thermal Power Plant "Ugljevik 3 Municipality Ugljevik, Capacity of 2 x 350 MW "**
INVESTOR:	**"COMSAR ENERGY REPUBLIKA SRPSKA" Ltd.**
DEVELOPED BY:	**PSRI Institute for Protection and Ecology of the Republic of Srpska, Banja Luka**

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ENVIRONMENTAL PROTECTION LICENCE

РЕПУБЛИКА СРПСКА
ВЛАДА
МИНИСТАРСТВО ЗА ПРОСТОРНО УРЕЂЕЊЕ, ГРАЂЕВИНАРСТВО И ЕКОЛОГИЈУ

Министар за просторно уређење, грађевинарство и екологију на основу члана 67. Закона о заштити животне средине („Службени гласник Републике Српске“, бр. 71/12 и 79/15), члана 5. Правилника о условима за обављање дјелатности из области заштите животне средине („Службени гласник Републике Српске“, број 28/13 и 74/18) и Рјешења о испуњености услова за обављање дјелатности из области заштите животне средине број 4-Е/03 од 20.06.2019. године, **и з д а ј е**

Л И Ц Е Н Ц У

Јавна научноистраживачка установа „ИНСТИТУТ ЗА ЗАШТИТУ И ЕКОЛОГИЈУ РЕПУБЛИКЕ СРПСКЕ“ Бања Лука

Испуњава услове за обављање дјелатности из области заштите животне средине. Ова лиценца важи од 20.06.2019. године до 20.06.2023. године. Провјера испуњености услова за обављање дјелатности из области заштите животне средине вршиће се у складу са одредбама Закона о заштити животне средине и Правилника о условима за обављање дјелатности из области заштите животне средине.

Број регистра: 4-Е/03

Бања Лука: 20.06.2019.године

МИНИСТАР
Срећенка Голић

ENVIRONMENTAL PROTECTION LICENCE

Pursuant to Article 67 of the Law on Environmental Protection (the Official Gazette of the Republic of Srpska, number 71/12 and 79/15, and Article 5 of the Rulebook on Pursuing Environmental Protection activity (the Official Gazette of the Republic of Srpska, number 28/03 and 74/18, as well as the Decision on meeting the requirements to pursue environmental protection activity number 4-E/03 from 20 June 2019, the Minster has issued the following

LICENCE

Public scientific-research institution "INSTITUTE FOR ENVIRONMENTAL PROTECTION AND ECOLOGY" Banja Luka has met all the requirements to pursue the activity of environmental protection.
This Licence shall be valid from **20 June 2019 to 20 June 2023**. Verification of compliance with the requirements for environmental protection activities shall be conducted in accordance with the provisions of the Law on Environmental Protection and the Rulebook on requirements to pursue the activity of environmental protection.

Register number: 4-E/03

Banja Luka, 20 June 2029

MINISTER
(*signature illegible)
Srebrenka Golić

(*stamp)

Rationale

Having in mind the legal provisions, the services to be delivered by the consultant would include the preparation of the Environmental Impact Study with identification, determination, analysis and assessment of direct and indirect impacts of the project for the construction of Thermal Power Plant „Ugljevik 3", with capacity of 2x350 MW in the Municipality of Ugljevik, and proposed solutions for preventing and reducing the impacts. The Impact Study refers to the facilities of the new units of the Thermal Power Plant Ugljevik with all the accompanying facilities and auxiliary facilities on the territory of the Municipality of Ugljevik, while the analysis will include the following elements and factors:

- people, flora and fauna,
- land, water, air, climate and landscape,
- material goods, cultural and natural heritage,
- interaction of the above stated factors.

In order to ensure more efficient protection and improvement of the environment, the Ministry of Spatial Planning, Civil Engineering and Ecology, pursuant to Article 5, paragraph 2 of the Regulations on the requirements for pursuing activities of legal entities in the field of environmental protection, by the Decision number 4-E/03 from 20 June 2019, authorised JNU „Institute for Environmental Protection and Ecology of the Republic of Srpska" Banja Luka, to pursue the activities in the field of environmental protection.
Based on the said Decision and on the grounds of the investor's request defining the conditions for the Environmental Impact Study, the Institute prepared an Environmental Impact Study for the construction of the Thermal Power Plant „Ugljevik 3" with the capacity of 2x350 MW in the municipality of Ugljevik.
The attached project-technical documentation as well as various available literature sources from this field were used in the process of preparing this Study.

In accordance with the Decision of the Ministry of Spatial Planning, Civil-Engineering and Ecology Banja Luka, number 15.04-96-124/19 dated 12 November 2019, the investor is obliged to submit to this Ministry an Environmental Impact Study in order to proceed to a further procedure of environmental impact assessment and obtain a decision on environmental permit.

Legal Framework

The implementation of environmental impact assessment is based on the Law on Environmental Protection (the Official Gazette of the Republic of Srpska, No. 71/12, 79/15, 70/20), which provides the legal framework for issuing environmental licences, including provisions on additional procedures such as impact assessment, based on the concept of integrated pollution prevention and control. The law stipulates that all plants that are on the list defined by the bylaw (i.e. the Rulebook on plants subject to obtaining environmental licence (the Official Gazette of the Republic Srpska, No. 124/12) can be built only if they have an environmental permit issued in accordance with the provisions of that Law. In addition, no authorised institution may issue a building permit or any other required permit, including an environmental permit, for projects subject to environmental impact assessment process, unless the applicant has attached a copy of the approved Environmental Impact Study or Decision approving the Study. Environmental impact assessment is the systematic identification and

assessment of the potential impacts of proposed projects, plans, programs or legal ventures on the physical-chemical, biological, cultural and socio-economic components of the overall environment.

Having in mind the obligations under the Law on Environmental Protection as well as the Rulebook on projects subject to environmental impact assessment and the criteria on deciding on the obligation to conduct and scope of environmental impact assessment (the Official Gazette of the Republic of Srpska, No 124/12), the Thermal Power Plant "Ugljevik 3" with the capacity of 2x350 MW, in the municipality of Ugljevik is one of the plants for which the Ministry decides on environmental impact assessment, and accordingly, the Ministry of Spatial Planning, Civil-Engineering and Ecology, by the Decision number 15.04-96-124/19 from 12 November 2019, required the investor "COMSAR ENERGY REPUBLIKA SRPSKA" Ltd. Banja Luka, to conduct an environmental impact assessment for the subject facility.

Integrating environmental impact assessment into the project cycle can be of great benefit to the investor as the Environmental Impact Study can provide timely information at key stages of the project cycle. Preliminary findings from the Draft Environmental Impact Study may indicate certain practical changes in the project so as to avoid or reduce negative environmental impacts and/or better understand the environmental benefits.

The investor may decide to adopt these changes at an early stage of the project planning so that the final environmental impact study could be based on a revised plan, describing reduced impacts and less need for impact management. Also, the relevant ministry is in the position to review and comment on the project and, if needed, request amendments to avoid or reduce negative environmental impacts before irrevocable project decisions are made.

Foundations for the Study

Given the nature, size and location of the project, as well as the impact it could have on the environment, acting in accordance with the Law on Environmental Protection (the Official Gazette of the Republic of Srpska no. 71/12, 79/15 and 70/20)) and the Rulebook on projects subject to environmental impact assessment and criteria for deciding on the need for assessment and the scope of environmental impact assessment (the Official Gazette of the Republic of Srpska no. 124/12), **"COMSAR ENERGY REPUBLIKA SRPSKA" Ltd.,** as the project holder, initiated the environmental impact assessment procedure.

"COMSAR ENERGY REPUBLIKA SRPSKA" Ltd. from Banja Luka submitted a request to the Ministry of Spatial Planning, Civil-Engineering and Ecology of the Republic of Srpska in order to assess the environmental impact for the construction of the Thermal Power Plant Ugljevik Block 3, with a capacity of 2x350 MW, in the municipality of Ugljevik.
In accordance with the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) (the Official Gazette of Bosnia and Herzegovina –MU number 08/09), the following is a Summary of the Environmental Impact Study for the project of construction and use of the Thermal Power Plant "Ugljevik 3", the municipality of Ugljevik, with a capacity of 2 x 350 MW."

a) Description of the proposed activity and its purpose

The planned Thermal Power Plant "Ugljevik 3" will consist of two blocks, each with a capacity of 350 MW. Each unit will consist of one boiler, one turbine, and one generator.
It is envisaged that both blocks have a common system for water supply, fuel, limestone etc.
It is envisaged that the new block is divided in several segments, which presumes the construction of:

- main electric power building,
- coal supply system,
- cooling system,
- supporting facilities (central control building, transformer space, combined ash handling system, slag silo, fire powder silo, auxiliary boiler room, desulphurisation plant etc.).

For the cooling system, in accordance with the submitted Preliminary design, a technology that integrates the chimney and the cooling tower is provided. A coal transport system (coal dump, bunkers, etc.) is planned in the southern part of the plant.

The auxiliary system of the thermal power plant is provided in three parts:

- the first part is planned nearby the main area for electricity production, which includes the construction of an administrative building, service building, industrial wastewater treatment plant, pumping station and the like. (planned in the northern part of the catchment);
- the second part is planned next to the secondary entrance located approximately 250 m west of the main electricity generation area. This part includes the construction of a water purification plant, (raw water), a pre-treatment station, combined pumping stations for water supply, etc.
- the third part is planned south of the coal yard. In this part, an ash silo, limestone, fuel tank, ammonium water storage space, maintenance building, warehouses, etc. ;
- an entrance is planned in the southern part to ensure easier access to trucks.

The technical section of the new unit should consist of installation systems designed to work with supercritical steam parameters, and of primary facilities, including:

- Construction of the main building and control room - units - general construction and assembly works;
- Installation of CFB steam boiler/s with SNCR + SCR system;
- Installation of condensing turbine unit with planned gross production up to 350MWe;
- Auxiliary process equipment and systems in the main building;
- Equipment and systems for power supply to auxiliary facilities of the block;
- Water cooling system, including wet cooling tower, pumping station, water cooling pipelines, cooling water treatment plants;
- Auxiliary facilities (outside the main building), such as electrostatic precipitator and bag filter (ESP + FF), ammonia water system, external slag transport system, limestone crushing and separation system;
- Flue gas desulphurization unit with sorbent and gypsum handling systems;
- Power of electricity on generator voltage, by means of auxiliary and common transformers;
- Visualization, instrumentation and control system for equipment and auxiliary devices, etc.

For the needs of the technological process, provide the following:
- Turbine generator set - one-way two-cylinder condensing steam turbine with supercritical parameters, medium reheating, rated power 350 MW;
- Generator of estimated power of 350MW;
- Generator cooling system;
- Cooling circuit;
- Separator and pumps for water recirculation;
- Air coolers;
- Lubricating system;
- Oil purification system (oil maintenance system);
- Sealing system;
- Drainage system;
- Units to supply control fluids;
- Condensing plant;

For auxiliary units provide:
- Stator water system;
- Compressed air system;
- Steam system;
- Auxiliary steam system;
- Condensate system;
- Condensate pump system;
- Supply water system;
- Sewage disposal station;
- Water cooling system;

For auxiliary systems and installation units provide:
- Steam and water sampling and analysis system:
- Condensing polishing system;
- Chemical dosing system;
- Ammonia storage and transport system;
- Absorption and flue gas system;
- Water process system;
- FGD wastewater treatment system;
- Slag removal system;
- Chemical water system;
- Industrial wastewater treatment system;
- Chemical laboratory with instruments for analysis and equipment;

For the hydraulic structure provide:
- Construction of a pump for water circulation;
- Construction of water circulation channels;
- Construction of a plant for coal wastewater treatment;
- Construction of a foamy fire room.

Heating, ventilation and air conditioning of spaces that require heating, ventilation and air conditioning (HVAC system) to provide from their own boiler room – heating station.
HVAC system shall include the central control building, the coal handling building, the chemical building, the laundry handling building, the ash handling building, the hydraulic building and other associated ancillary production facilities where required.

The heating steam comes from the turbine reduction steam, which will produce heating water of 110/70°C.

Envisage the temperature mode of the network 110/70 ° C. Assume that the heating station is used for heating, ventilation and air conditioning systems of the entire plant, and its capacity is about 20 MW. Lay the pipe network for heating/cooling from the boiler room to the heated/cooled buildings underground or above ground. For heating and/or heating/cooling bodies in the heated/cooled areas, provide heaters and fan coil units (parapet, wall or ceiling).

In the space for the boiler room provide the following:

Single-pass CFB steam boiler/s of appropriate capacity, with intermediate steam super heater, equipped with auxiliary systems for:
- Transport, storage, drying and crushing of coal on the boiler side;
- Transmission, transport and heating process (boiler);
- Non - catalytic reduction of nitric oxide in SNCR + SCR system ammonia - water;
- Drainage of flue gases from the boiler to the cooling tower through the flue gas ducts;
- Removal and transport of slag outside the boiler

The boiler/boilers are provided in three parts: furnace, cyclones (3 in total), return heaters and air device (air fan). Each boiler should be equipped with five steel bunkers and with eight electronic coal feeders with weights. For the same, provide a system for desulphurization of the furnace, system for injecting inert material, an air system, an initial system for ignition with light fuel oil, a denitration system.
- SNCR, gas system, start-up system, etc.

Provide ventilation of the premises in a natural way, and where that is not possible, provide for forced ventilation. The type of equipment as well as other conditions for cooling, ventilation and air conditioning should be chosen at the request of the investor. As part of the plant, where it is necessary, provide explosion, fire and corrosion protection.

b) A description, where appropriate, of reasonable alternatives (e.g. location or technological) to the proposed activity as well as an alternative to failure to act

The project holder did not consider other alternatives as there are no relevant facts that another solution could be chosen at the site in question. The decision for the chosen solution was made based on the convenience of the location in terms of built facilities, existing infrastructure and the fact that the location in question has already been used for similar production services.

The choice of location itself arose after many years of extensive research conducted by the investors and was chosen as the most favourable location in geographical and technical-technological terms due to the proximity of raw materials and/or coal mines and the existing thermal power plant for industrial activities.

c) A description of the environment likely to be significantly affected by the proposed activity and its alternatives

The subject location is located on the right side of the main road M-18 (section Stari Ugljevik - Priboj) at a distance of about 2.5 km from the city centre, and next to the complex TPP "Ugljevik 1", which is located on its eastern side.

On the east side of the subject location, there is the complex of the thermal power plant "Ugljevik 1", as well as the metal construction of the TPP "Ugljevik 2", which is connected to the west side of the existing block "Ugljevik 1". The main road M-18 and the river Janja are on the north side. In the wider area on the southwest and east sides of the subject location, there are dispersively distributed individual residential buildings of low density, and the site of the New Cemetery Bogutovo selo, south of the subject site. The surrounding area is partially built.

The terrain at the subject location, which is found next to the existing thermal power plant "Ugljevik 1", is flat while the rest of the terrain towards the west side of the site is sloping and significantly levelled, i.e. the most pronounced slope is in the western and south-western part of the site, in the west-east direction.

During 2012 and 2013, a number of facilities were removed from the site planned for the construction of the thermal power plant and the following works were completed, which had a direct impact on the location of the thermal power plant itself:

- relocation of local roads to the settlements of Bogutovo selo, Mukat and Stankovići, i.e. construction of new ones on the east and west sides and
- construction of a residential part - a campus to accommodate operational staff.

The subject location is mostly undeveloped. Within the scope, there are a few buildings, mostly ground floor buildings of poor quality that form an integral part of the existing complex of the thermal power plant "Ugljevik 1". The rest of the facilities are in poor condition and not in function. Most of the facilities within the scope are of an ancillary nature.

The subject locality for the construction of the new block of the thermal power plant is located in the contact area where agricultural land predominates, which occupies flat and slightly undulating areas. It is mainly arable agricultural land used for agricultural purposes. Smaller areas are under forest vegetation. The existing plots of agricultural land are fragmented, and according to the structure of use, they are mostly arable land, less under orchards. According to the land capability class, the land belongs to the group of good capability class of land with favourable conditions for agricultural purposes. There are no green areas at the location. The entire scope is the future TPP construction site. Therefore, any landscaping activity depends on the functioning of TPP.

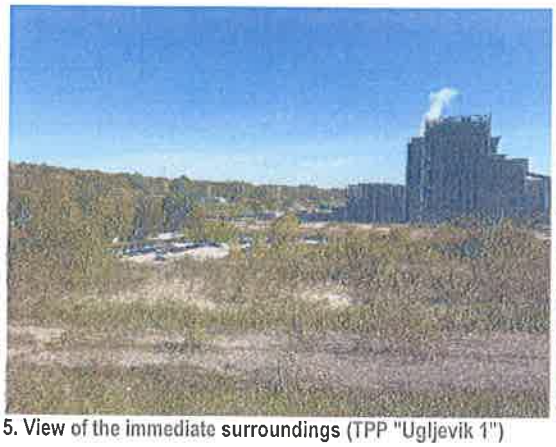
Figure 1. Construction site location

1. View of the central part of the site from the west

2. View of the south-western part of the location from the east

3. View of the southern part of the location from the north side

4. View of existing facilities in the northern part of the site



5. View of the immediate surroundings (TPP "Ugljevik 1")

6. View of the immediate surroundings (TPP "Ugljevik 1")

Figure 2. Locations of the future thermal power plant

Macro location of the area

The area of the municipality of Ugljevik is located in the north-eastern part of the Republic of Srpska, between 44 ° 41′ north latitude and 18 ° 59′ east longitude. It is located on the eastern slopes of the Majevica Mountain, i.e. on the extreme slopes that descend towards the Semberska plain and the Brčko plateau. The territory of the municipality of Ugljevik covers an area of 17,042 ha. In the class of division according to the size of the territory, it belongs to the smaller municipalities of the Republic of Srpska

On the north and east side, it mostly borders with the hilly area of the territory of the city of Bijeljina and to a lesser extent, with its plain area. On the west side, the border stretches through the hilly part of the municipality of Lopare. The southern border stretches along the hilly part of the municipalities of Zvornik and Teočak.

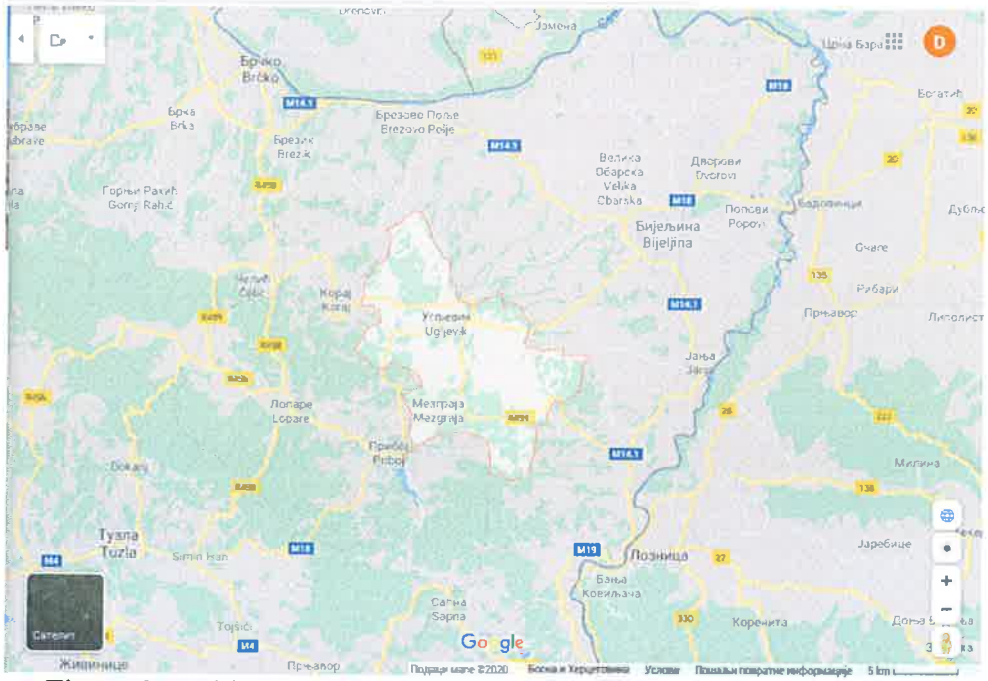


Figure 3. Position of the municipality of Ugljevik (source: Google maps)

According to the planned regionalization of the Republic of Srpska, the municipality of Ugljevik belongs to the Bijeljina mesoregion. Also, it belongs to another development direction, whose natural values of space enable intensive economic development on the basis of agrarian, forest, ore as well as thermal energy potentials.

Based on the Decision on the development phase of local self-government units in the Republic of Srpska for 2012 (the Official Gazette of the Republic of Srpska, No. 109/11), the municipality of Ugljevik is one of the developed local self-government units.

d) A description of the potential environmental impact of the proposed activity and its alternatives and an assessment of its significance

All processes within the elements of a complex environmental system take place on the basis of their inter-dependence, whether organic or inorganic elements, in which sense each plant and technological process, with its specific characteristics in certain circumstances can lead to disruption. The changes range from quite insignificant to so drastic that individual elements can completely lose their basic characteristics. A systematic approach to these relations through the analysis of criteria, i.e. in most cases, gives satisfactory results, but only with their impartial quantification and consistent respect of mutual relations.

When it comes to environmental analysis, the basic criteria are considered by taking into account all the specifics of the analysed content, all the characteristics of the observed location and the characteristics of existing potentials, which led to certain indicators obtained through the quantification procedures, with the main intention to determine the legal nature of the existing relations. Based on specific indicators, it is possible to select adequate environmental protection measures to attain the basic purpose of this analysis. What should be especially emphasized is the fact that the facilities or activities that will be performed within the plot can endanger the environment both in the course of regular work and in the event of accidents.

In general, at coal fired TPPs, potential sources of danger and sources of accidents are:

- Coal supply system,
- GPO,
- Shipping and disposal of ash,
- Chemical preparation of water,
- Storage facilities for chemicals and liquid fuels;
- Hydrogen storage,
- Auxiliary boiler room,
- Wastewater treatment plants,
- Flue gas purification plants,
- Technical gas storages.

The project of individual TPP systems envisages measures to reduce the probability of accidents, as well as measures to reduce the consequences.

- **Supply and storage of coal**: In this part of the technological process (at the crushing plant, transfer tower, coal yard, transport system and coal bunkers) the dangers for the occurrence and development of negative impacts are related to fire hazards and air pollution, and namely:

- the presence of a larger amount of coal, improper storage, and the possibility of its biological decomposition and increase in temperature, i.e. self-heating and self-ignition,
- increased fire hazards are found in all places where during the technological process flammable and in a certain concentration explosive coal dust is released (spills in the area of crushing plants, boiler bunkers, etc.), especially if these places are not equipped with an efficient de-dusting system, and if it is not properly maintained,
- the possibility of a stray metal object hitting the crushing facility, which can create a spark that can cause a fire,
- when transporting coal, the belt on the conveyor may slip, creating static electricity and increasing the temperature of the belt, which may cause a fire,
- manipulation of coal on the crusher, conveyors and their transfer from the bunker can lead to increased concentrations of solid particles in the air in the immediate vicinity,
- coal dust has explosive properties under certain conditions and there are also conditions under which self-ignition of deposited coal dust occurs. The technological line - boiler bunkers, crusher and belt conveyors represent an endangered area, because an explosive mixture of swirling coal dust and air may occur under certain conditions or its deposition,
- Within the mentioned part of the technological process, noise is emitted into the working and living environment.

- **Main building:** Due to its purpose and technological processes that take place in it, this facility is the most important and it has the greatest impact on the environment. Also, the presence of various media dangerous from the point of view of fire hazard is most pronounced in this work. Dangerous media or dangerous places of different degrees and types of danger occur in various technological processes.
- **Boiler plant:** the following hazards are present in this part of the technological process:
  - increased amount of coal dust, especially in the area of boiler bunkers and coal transport systems from bunkers to boilers, can lead to increased fire danger and increased concentration of solid particles in the air.
  - emissions of gases and solid particles into the air during combustion.

- **Turbine and generator plant:** The following hazards are present in this main plant facility:
  - the danger of uncontrolled release of hydrogen, which in the appropriate concentration with air forms explosive mixtures,
  - the possibility of an explosion at the generator is especially obvious in the case of incomplete blowing of the generator with inert gas when changing the colon gas,
  - a failure on the oil sealing system can lead to hydrogen leakage and explosion,
  - hazards in the hydrogen distribution pipeline network are related to hydrogen leakage due to leaks in the reinforcement (valves and joints),
  - particular risk of fire comes from the oil system consisting of tanks, pipelines and pumps where, due to the free leakage of oil on overheated surfaces or by increasing the temperature of bearings, there can occur ignition and fire that could cause an explosion due to the presence of hydrogen.
- **Chemical treatment of water:** The technological process itself is not a fire endangered building because it uses non- flammable chemicals HCl, NaOH, H_2SO_4. In the facility

for chemical treatment of water, the biggest **danger** is the possibility of chemical waste spillage, fire due to faulty electrical installations, etc.

- **Other facilities in the circle:**
  - **Liquid fuel station** – for storage of liquid fuel used in the technological process,
  - **Hydrogen station** – hydrogen storage for the purpose of cooling the generator rotor in the main production facility,
  - **Workshop** – for maintenance of installations and facilities,
  - **Fire station** – fire extinguishing equipment,
  - **Administrative building and other office space** – administrative affairs.
  - In these facilities, certain hazards depend on the type of hazardous substances found in them, i.e. dangers are greater in those facilities where there are flammable liquids and gases (hydrogen, diesel, oils, flammable gases, paints, varnishes etc.) because they evaporate into the air and create explosive mixtures with the air. Spillage of hazardous substances and liquid fuels may result in soil contamination at the location. Increased dangers are indicated in workshops as they keep larger amounts of oil, lubricants, paints and varnishes as well as bottles used for welding works and for washing greasy parts of machines and the like, when flammable substances (oil, gasoline etc.) are used. No significant negative impacts are expected in the offices of the administrative part of the facilities.

The project holder is obliged to provide solutions through technical documentation that would ensure an acceptable impact of the project on the environment both during the regular work and in case of accidents.

Performing the said activity, regardless of all the technical-technological solutions and/or utilisation of the work operation and equipment, can pose a risk to workers and be a source of environmental pollution.

Environmental impacts caused by the launch of the planned technological process can be expected in two phases:

- environmental impacts that will occur in the phase of the works on preparation and opening of the plant and
- environmental impacts that will occur in the phase of exploitation and/or regular operation of the facilities and the plant.

Emissions during construction

Before establishing the technological process, adjustment and repurposing of the location will be implemented and ancillary and main facilities will be constructed. Construction activities can cause an increase in the current emission of dust. Dust emissions arising from the construction have a potential physical impact, increased harmful effects, dusting of surrounding buildings, vegetation as well as leaching on water and soil and cause negative health consequences when the activities are ongoing for a longer period of time.

The following impacts are analysed in this Environmental Impact Study:

- Impact on soil quality;
- Impact on water quality;
- Impact on air quality and microclimate;

- Impact on the quality of landscape features of the area;
- Impact on the overall noise level;
- Impact on vibration and radiation intensity;
- Impact on the quality of flora and fauna;
- Impact on natural resources of special value, cultural and material heritage;

Emissions during exploitation

All emissions during exploitation are considered partially for each segment of the environment and are given in the next section of the document.

Impact on the air

During construction

The impact of the subject works on the site on air pollution is reflected through emissions of exhaust gases and dust emissions resulting from vehicles, working machines, etc. The main sources of air pollution by dust occur during: transport of construction material, unloading, handling the construction material, excavation works, and the like. Exhaust emissions occur during the operation of machines and transport means that use fossil fuels (oil, gasoline) for propulsion and as a result of their operation CO_2, CO, SO_2, soot and other pollutant are emitted.

Dust formation can occur mainly during the preparation of the construction site and construction works, and namely:

- cleaning the terrain and preparation of the construction site,
- excavation works,
- earthworks and vegetation removal,
- movement of construction vehicles across the area of catchment, including access roads and spillage of construction material during the transport to and from the construction site.

Emissions from traffic during the construction can potentially contribute to increased ground concentrations of carbon monoxide, benzene, NOx, NO_2 and solid particles (PM10). Appropriate mitigation measures will be applied to avoid or reduce these emissions.

During exploitation

Gases

The emission of gaseous products from the chimneys of thermal power plants is directly dependent on the quality and quantity of the burned coal. Thermal power plants that use domestic lignite emit approximately 1.6 Nm3 of flue gases per one megawatt of electricity. Flue gases contain: soot, ash, oxides of carbon, sulphur and some other ingredients. The most harmful is sulphur dioxide (SO2), which converts almost all combustible sulphur from fuel, while only 3% of sulphur is converted into sulphur monoxide (SO). Sulphur oxides have a detrimental effect on humans, flora and fauna, as well as on materials (they accelerate corrosion). Particularly harmful to humans is the combination of sulphur oxides with smoke and moisture known as "London-type" smog, which occurs especially in unsuitable terrain configurations and in specific meteorological situations. The dispersion of these pollutants in the atmosphere depends on meteorological conditions, chimney height and kinetic energy of

the gases at the chimney outlet. Under very unstable meteorological conditions and inversion, the highest concentrations of pollutants occur at a relatively short distance (1-2 km) from the power plant (PhD thesis, Kostolac). One of the most important ways of SO2 oxidation is dissolution in water droplets. In the atmosphere, these are clouds, fog and smoke in which sulphur dioxide (SO2) is oxidized to sulphate in the presence of oxygen. This process is slow, but with incomplete combustion, soot occurs, which is a very effective catalyst in the process of sulphate formation. Nitrogen oxides (NOH) are formed by burning lignite in steam boilers at high temperatures (above 1500 ° C) when the nitrogen contained in lignite does not act as an inert gas but reacts with oxygen. In modern lignite boilers, about 3.4 g / kWh of nitrogen oxides are produced, of which NO_2 is about 1.9 g / KWh. However, in order to survive, they must cool down abruptly. Carbon oxides also occur in flue gases from thermal power plants. Carbon monoxide (CO) is a product of incomplete lignite combustion and amounts of about 0.1 g / kWh can be expected. Carbon dioxide (CO2) is produced in much larger quantities and affects the environment indirectly, through climate change. Emission of carbon dioxide changes its equilibrium content in the atmosphere, and the physical properties of mixtures, CO2 and aerosols, changes the thermal accumulation of the atmosphere, which in the long run will cause an increase in average air temperature and disrupt the balance between atmosphere and hydrosphere with adverse climate change on a larger scale.

Particles

Particulate emissions from the operation of thermal power plants come from the boiler furnace, coal dump and slag and ash dump. While particulate pollutants from the landfill are carried by the wind for limited distances around their locations, those ejected through the chimney can reach much greater distances, depending on the height of the chimney and the diffusion parameters. Combustion of lignite produces larger amounts of ash, which are around 0.3-0.5 kg/kWh. Thus, about 70 g/s of ash per one megawatt of electric power starts with flue gases, which, considering the total amount of flue gases, amounts to about 50 g of ash per Nm^3.

Before being released into the chimney, gases with fly ash enter electrostatic precipitators whose efficiency is around 99%, which significantly reduces the concentration of particles released into the atmosphere. The design of electrostatic precipitators and their application is important from the point of view of environmental protection, which can be caused by outages of individual sections of electrostatic precipitators and can cause an increase in fly ash deposition dozens of times and far exceed the permitted limits. For that reason, the maintenance of electrostatic precipitators is the most important task for preserving the environment.

Some pollutants such as carbon dioxide (CO_2) and methane (CH_4 are mostly inert, so it is sufficient to analyse only their transport during dispersion into the atmosphere, while for others it is necessary to take into account chemical transformations. For example, SO_2 builds sulphur trioxide (SO_3), sulphuric acid (H_2SO_4) as well as sulphates, which has a great impact on a regional and global level. Of greater importance is ozone, the concentration of which is determined by very complex reactions involving various organic substances, NOx and sunlight.

Local modelling of primary pollution

On the local scale of primary pollutants modelling (Bickel and Friedrich, 2005), at a distance of 10 to 50 km from emission source, chemical reactions in the atmosphere have little effect on the concentrations of primary pollutants. Due to the emission from the chimney, the concentration of pollutants near the chimney depends primarily on the vertical mixing of the lower atmosphere. Vertical mixing depends on atmospheric stability and the height of the inverse layers. For these reasons, the estimation of the concentrations of primary pollutants in the air is described with two distributions, one in the vertical direction and the other in the horizontal wind direction as shown in the following figure.

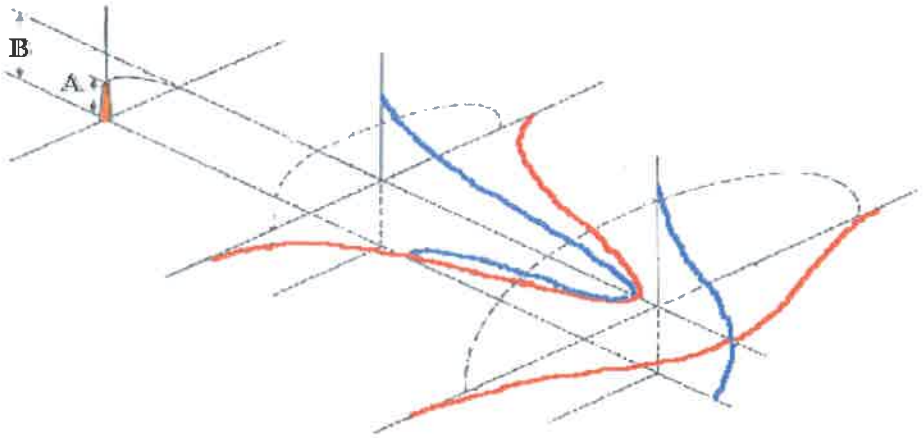


Figure 4. Dispersion of air pollutants by applying the Gaussian model

The concentration distribution during continuous release into the atmosphere has the form of a Gaussian curve:

$$c(x,y,z) = \frac{Q}{u2\pi\sigma_y\sigma_z} \cdot \exp\left[-\frac{y^2}{2\sigma_y^2}\right] \cdot \left(\exp\left[-\frac{(z-h)^2}{2\sigma_z^2}\right] + \exp\left[-\frac{(z+h)^2}{2\sigma_z^2}\right]\right)$$

where:

- c(x,y,z) means concentration of pollutants at the location (x,y,z)
- Q is pollutant emission rate (mass rate per unit time)
- σ1 is standard deviation of the distributed lateral concentration at a distance x
- z is standard deviation of the distributed vertical concentration at a distance x
- h is height above the ground at which the plumage occurs

Gaussian models are simple to apply and provide approximate analytical solutions. They predict the relationship between point source emissions (or point source groups) and pollution concentrations. Disadvantages relate to the limitation of application in the case of a complex configuration of the observed space and to first-order reactions. The model includes ideal terrain and meteorological conditions so that the plume travels in a straight line in the direction of the wind. Dynamic properties such as dispersion, i.e. vertical wind shear, are neglected. Such

assumptions are therefore limited to an area of 50 km from the emission source. Atmospheric mixing processes are functions of vertical stability, i.e. changes in air density with height. Unstable conditions include pronounced mixing of the air layers in the vertical direction, and stable conditions include lower mixing speeds of the air layers. Solar radiation, surface radiation and wind-induced turbulence are the main processes that control atmospheric stability. Extremely stable atmosphere without any vertical mixing contributes the most to poorer air quality.
There are a number of factors that affect the spread of pollutants in the atmosphere. The most important are:

- chimney geometry (height and cross section),
- climate
- terrain
- surrounding buildings.

Impacts on land

The impact of the power plant operation on land use and quality is observed in principle through several aspects:

1. direct impacts on the purpose of the land where the facilities and systems of the power plant are located or will be built and the auxiliary infrastructure facilities required for the operation of the power plant,
2. indirect impact of the power plant operation on the change of land use and/or its quality as possible consequences of emissions from the power plant (e.g. slag and ash disposal, excessive power plant noise, etc.), i.e. implementation of projects, usually in the immediate vicinity, that alter the existing manner of land use and are related to the operation of the power plant.

Soil pollution from thermal power plants is related to ash emissions and its deposition in the environment. After burning coal, up to 25% of the ash remains. That is, from 1.12 to 0.25 t of ash remains per 1 ton of coal. Ash consists of inorganic compounds, minerals of silicon, calcium and magnesium. High concentrations of emissions of gases and aerosols from the thermal power plant can pollute arable land in their immediate vicinity. Plants absorb them from the soil and they enter the food chains of various consumers, thus having a greater negative impact on the health of the population and the quality of agricultural products.

Soil pollution by polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons are a large group of cyclic hydrocarbons containing one or more benzene rings. For the calculation of emissions, according to the recommendation of the Protocol on Persistent Organic Pollutants, the following four PAHs are taken into consideration: benzo(a)pyrene, benzo(b)fluorate, benzo(k)fluorate and indeno (1,2,3-cd) pyrene. Benzo(a) pyrene is very often used as an indicator of the presence of PAHs in soil, water, air and food. The plant grown in the ground can be contaminated with PAH deposition from the air and from the soil, provided that an increased content of PAHs is found in the soil.
The increased content of PAHs in the environment may be the result of various industrial activities: mining, iron ore processing, aluminium production, galvanizing plants, thermal power plants, etc. Water and soil pollution by PAHs is considered secondary pollution because PAHs from the air are deposited on the soil or in water. Food contamination with PAHs depends on certain physicochemical parameters of PAHs, such as relative solubility in water and organic solvents, volatility, chemical reactivity and abiotic degradability. PAHs are lipophilic compounds

that are poorly soluble in water, and solubility decreases with increasing molecular weight. Therefore, PAHs will not accumulate in plants that have a high water content or the migration of PAHs from the soil to the plant root will be limited. PAHs have a very high tendency to adsorb to organic matter, so the concentration of PAHs is higher on the plant surface than in the inner tissue of the plant.

Distribution of heavy metals

The concentration of heavy metals in the soil depends on several different factors, namely:
- lithological composition of the substrate (natural concentration in the parent rock),
- the manner of physical and chemical wear of the parent substrate (climatic factor – release of the element and its migration),
- paedogenetic processes (migration and concentration in certain pedohorizons),
- anthropogenic input (air, water, waste disposal, tailings, etc.).

The anthropogenic share of intake is estimated by eliminating the natural concentration of an element in the observed medium.

Impacts on water:

Wastewaters that will be generated at the TPP site are:

- **hot wastewater** (from the boiler and spillage due to various processes) is cooled to a temperature of less than 50 ° C before being discharged into the wastewater collection basin,
- **oily wastewater** from the floor drains of the building and the area of the transformer,
- **chemically polluted wastewater**, such as drains from chemical water treatment and chemical condensate treatment plants,
- **sanitary wastewater** is treated in a sanitary wastewater treatment plant before clean water reaches the wastewater collection basin,
- **rainwater**,
- **wastewater** from coal management systems and open coal storage.

The possibility of water pollution at the TPP site may occur due to:
- inadequate disposal of ash from the thermal power plant,
- inadequate disposal of solid waste, - inadequate wastewater management.
- inadequate handling of waste oils, lubricants, greases, as well as liquid fuels and other liquid substances (adhesives, solvents, pipe dyes, installations, etc.) that will be used for the construction of the thermal power plant.

- Disposal of ash in a landfill can potentially, both directly and indirectly, endanger surface waters from the immediate environment. The water that transports ash, although purified, can still contain various heavy metals and pollutants from coal combustion residues. In order for this not to happen, it is necessary to take technical measures for water management within the limits where it is important.
- Inadequate disposal and disposal of solid waste: municipal, industrial waste, septic tank sludge, oily rags and other types of waste that will be generated during the operation of the thermal power plant can be one of the sources of endangering the quality of surface water.
- Chemicals that will be stored in tanks above the collection basins within a special warehouse with an opening can also be a potential source of water endangerment.

Chemical storage tanks are also located in the collection basin - but they will not be in direct connection with the wastewater system. There is a possibility of chemicals leaking from the tanks, which can pose a danger if they are not neutralized locally, and then disposed of in agreement with a specialized company.

The impact on surface and groundwater can be reflected as follows:

- Due to insufficient and inappropriate maintenance of the drainage system and treatment of oily water from manipulative surfaces.
- Due to the lack of a solution for disposal of sanitary-faecal water.
- Rainwater at the site should be collected by a peripheral canal or atmospheric sewer and taken to the final recipient.
- If there is a spill of oil and oil derivatives within the location, they partially penetrate into the ground and continue the gravitational movement into the depths. Oil penetration mainly depends on the viscosity of the oil and the permeability of the soil at the spill site. When penetration occurs, the movement of oil in the depth of the rock will continue until it is completely absorbed by the soil, then until it encounters impermeable layers or until it reaches the surface of groundwater. Oil that has penetrated to groundwater expands creating a specific sediment on the surface of the water and the expansion has an identical direction with the direction of groundwater flow. The process of oil expansion can take a very long time, until the saturation capacity of the soil is reached. With this in mind, it is necessary to apply certain protection measures in order to protect the quality of groundwater and surface water at the site.
- Refuelling should be performed at a designated location on a concrete or solid surface around which special channels should be arranged and the collected water should be introduced with an appropriate grease and oil separator. Water treated in this way could be discharged into the final recipient.
- Sanitary-faecal wastewater can affect water quality if it is disposed of uncontrolled and not treated according to sanitary-hygienic and environmental regulations.
- According to the data from the technological project for the facility in question, no technological wastewater will be generated at the location. Cooling water circulates in a closed system and losses due to evaporation in the ventilation system of cooling towers are supplemented. The coolant undergoes a demineralization process. In order to neutralize the acid reactions occurring in the plant, sodium carbonate is added in the amount of 0.25 - 0.5 kg/t of filling. Excess water from the closed circular system will be used for wetting the ash so that direct discharge of technological wastewater into surface waters is not envisaged.

Groundwater pollution at the TPP site may arise due to:

- inadequate disposal of products of solid combustion residues - ash,
- inadequate disposal of various categories of solid waste (waste that will be generated during the construction of TPPs and waste that will be generated during the operation of TPPs),
- inadequate wastewater management (oily, chemically polluted, sanitary, etc.),
- inadequate handling of oils, lubricants, greases, as well as liquid fuels (especially during the construction of the thermal power plant),
- waste of various chemical preparations that will be used during the construction of TPPs (adhesives, solvents, dyes, etc.),

- waste of oil, oil derivatives and various chemicals during the exploitation of TPP.

The impact on the overall level of noise

Noise and vibrations are accompanying phenomena during the construction and operation of thermal power plants. The most important sources of noise in a coal-fired power plant are:

- transport and handling of coal, slag or by-products;
- operation of large pumps and fans;
- operation of safety valves;
- cooling techniques;
- boiler, steam turbine and generator.

The impact of noise emissions from thermal power plants is limited by the relative closure of the area around the thermal power plant. The most common problem, especially during the night, can be noise, which causes discomfort for people who live near the location of the thermal power plant. Noise control requirements depend on the distance of the nearest receptor, i.e. the nearest houses. The negative effects of noise and vibration that may occur during the construction and operation of TPP Ugljevik 3 are:

- Increased noise and vibration levels during the construction of the thermal power plant due to the operation of construction machinery and traffic;
- Increased noise and vibration levels due to the operation of the thermal power plant, the largest sources of which are the cooling tower, boiler, steam turbine, fans and pumps.

Noise and vibration are also a phenomenon during construction works and during the exploitation of coal from mines. Mechanization used on construction sites and in mines can have a significant impact on increasing the intensity of noise and vibration on the environment. Therefore, special attention should be paid to measures to reduce these impacts, both during the construction of the future thermal power plant and during the operation of the coal mine when the thermal power plant is in operation.

The impact of total noise depends on the size and duration:

- Volumes,
- Sound spectrum,
- Sound frequencies,
- Sound power,
- Sound pressure,
- The direction and strength of the wind in relation to settlements in the wider area.

Within the production plant, noise can affect:

- Interference with voice and device communication (noise above 65 dB reduces the possibility of speech communication at a distance of less than one meter, and makes background communication difficult),
- Reduced working capacity, productivity and concentration due to prolonged exposure to louder noise,
- Hearing impairment.

In the contact area, the action of noise can affect the psychological fatigue with a decrease in attention and a feeling of discomfort. Noise exposure outside the site boundary must not exceed the permitted noise level limit of 80 dB (A) during the day and 80 dB (A) at night, which refers

to zone VI defined by the Rulebook on Permitted Sound and Forest Limits (the Official Gazette of SRBiH No. 46/89).

Impacts of radioactivity and radiation

- In the context of radioecology and radiation protection, and considering the existing regulations and international regulations and recommendations related to the operation of TPP, there are possibilities of increased radiation doses in the area of slag and ash disposal. Accordingly, regular control of coal used in thermal power plant facilities is necessary. The content of radioactive contamination present as well as the amount of heavy metals must be known for all coal entering the thermal power plant.
- In the immediate vicinity of parts of the plant for production and transmission of electricity: generator, transformers, switchyards, cable conductors for power supply of all devices in the thermal power plant circuit and high voltage conductors for connection to the transmission network to consumers will emit electromagnetic radiation. These radiations fall sharply by distance from the radiation source. Most of the radiation has an impact on employees, and only high-voltage wires for connection to the transmission network have an impact outside the circuit of the thermal power plant.

Impacts on vegetation, flora and fauna:

The impacts of the operation of a thermal power plant can primarily be reflected in the long term on the flora of the surrounding area through emissions into the air and the presence of pollutants in the air. Negative impacts on the fauna can be reflected primarily through the pollution of surface and groundwater, i.e. the discharge of wastewater. Such pollution can be incidental, short-term or long-term due to deteriorating water quality and the presence of pollutants in water that can have fatal consequences for aquatic ecosystems.

Due to emissions into the air, at concentrations of sulphur oxides higher than 1 ppm, it was determined that leaf necrosis occurs in higher plants as a sign of acute damage, and in the most severe cases, defoliation. The colour of necrotic changes depends on the type of plant. In maple, for example, the shape changes and the leaves twist. The intensity of necrosis is directly proportional to the concentration, and with long-term exposure to concentrations lower than acutely toxic, chlorosis, red pigmentation, as well as growth retardation occur.

Signs of chlorosis and poor development are shown by young needles in conifers. Older needles change colour from yellow, over red and brown and eventually decay. Necrosis usually starts from the tip of the needle. Exposure of the buds leads to colour loss. Literature data indicate that there are no negative effects on plants at long-term nitrogen dioxide concentration of 0.03 mg/m3 and short-term 0.10 mg/m3. Sensitivity to sulphur oxides is even lower, no negative effects are observed even in particularly sensitive plants at short-term concentrations of 0.25 mg/m3, while normal vegetation tolerates well up to 0.6 mg/m3. In the case of cultivated plants (cereals, fodder plants, vegetable crops and fruit trees), the yield decreases with an increased degree of air pollution. Increased concentrations of solid particles can cause the deposition of particles on the leaves of plants, which leads to a decrease in photosynthesis and a consequent slowing of growth, if the exposure is chronic. There is also a decrease in transpiration, because there is a blockage of the stoma. In the case of very small particles, penetration into the leaf and inglobing can occur. When solid particles are carriers of heavy metals, their bioaccumulation also occurs. Heavy metals especially accumulate in lettuce, spinach, cabbage,

onion, celery and other plants that man uses in his diet. Of course, wind and precipitation reduce sedimentation, i.e. remove already precipitated particles, and thus reduce the negative effects. Such negative effects are not expected in the area of the planned TPP and the environment, because the envisaged protection measures guarantee that the concentrations of sulphur oxides and nitrogen will be several tens of times lower than those that cause the damage described above.

The negative impact on the fauna during the regular operation of TPP is reduced to a minimum, considering that wastewater treatment is planned as well as its reuse in the operational activities of TPP so that technological wastewater would not be discharged into surface on the site. Due to the existence of the thermal power plant, road traffic will be more intensive, which, along with the operation of the thermal power plant itself, is accompanied by an increased noise level. This phenomenon will have a lasting character. Its importance is determined by the sensitivity of certain species of animals as receptors and the intensity of the noise itself and depends on the measures envisaged by the Project to minimize this negative impact on wildlife, resulting in population migration, which should be accompanied by planned monitoring. Bearing in mind that these are not specially protected species, the impact of noise is of medium importance. Adequate quantities of coal reserves must be provided for the operation of the thermal power plant and it is likely that in appropriate meteorological conditions (high temperature, wind) coal dust particles from the landfill reach the immediate environment and endanger the surrounding vegetation. This phenomenon will have a lasting character, but it will take place in discontinuity, depending on meteorological conditions. Its significance is determined by the sensitivity of certain plant species as receptors and the intensity of particle deposition from the air and depends on the measures envisaged by the Project to minimize this negative impact on living life that results in possible plant damage. The space of the thermal power plant with the immediate environment will also represent habitat for a number of animal species to which the newly created conditions, newly built green areas around the thermal power plant, after horticultural grips, respond as well as for those who will adapt to them (insects, birds and rodents). Given the acceptable concentrations of the emission of sulphur dioxide, nitrogen oxides and particles, the new units of the thermal power plant Ugljevik 3 will not have any significant adverse effect on the ecosystem of the catchment area of the thermal power plant Ugljevik 3.

Lower emissions of sulphur dioxide, and especially the products of its transformation of sulphuric acid that appear as phytotoxicants, will not adversely affect the flora and fauna of the area, which is especially important for the area of Semberija being a significant agricultural region. On the other hand, water systems such as the rivers Mezgraja, Janja, Drina and Sava will receive precipitation that will be less acidic, due to reduced emissions of sulphur dioxide, which will have a positive impact on the entire aquatic wildlife in these natural aquatic systems.

Population health

Emissions of gases, dust and noise can have the greatest impact on the health of the population in the area, all depending on meteorological conditions - wind, humidity, etc. as well as dust that can be generated during the transport of raw materials (supply and removal of materials). Negative impacts on the health of the surrounding population can occur in the case of water pollution (surface or groundwater), as well as environmental pollution in the case of improper waste disposal.

According to the WHO (World Health Organization), respiratory diseases are one of the basic indicators of air quality. The probability of adverse health effects is, like any other probability, a stochastic magnitude used as the basic element of risk assessment. When determining the permitted values of certain toxic substances in the environment (air, water, food), the

assumption is taken that the intake of a standardized dose excludes the probability of consequences for the general population (especially vulnerable groups) during the average lifespan, at 24h exposure.
At the same time, the safety factor is taken into account, which, depending on the type of harmful substance, the available data, ranges from 10-1000. Therefore, the values obtained during any tests are compared with the standardised values. Cumulative effects are characteristic of substances labelled as POPs (persistent organic pollutants) in the case of environmental substrates but also heavy metals when it comes to living organisms.
Based on the identification of hazardous substances, but also the concentrations found, the cumulative effects of individual pollutants are not relevant for the observed area.
Additive effects must always be considered when it comes to emitters that release a large number of pollutants. The problem is that they are most often observed through pollution indices that can only be obtained by measurements over a longer period of time so that the data can be statistically observed. For example, in order to obtain an air quality index, data obtained by measurements throughout the year are required. Therefore, additive effects must be calculated only after the environmental monitoring in the observed area. The construction of the thermal power plant Ugljevik 3 is expected to have a minimal negative impact on the health of the population living in nearby places, because attention has been paid in the design phase to reducing the negative impact on the quality of environmental parameters. This Environmental Impact Study of the thermal power plant Ugljevik 3 envisages adequate protection measures, which reduce adverse effects and maximize the positive effects on the environment.

Meteorological parameters and climate characteristics

Possible negative impact on the air and microclimate characteristics can be the result of the following activities:

- use of mobile machinery (supply and removal of raw materials, loading, unloading, transport etc.),
- emissions of gases from the technical process.

During the construction, there may be an increase in temperature in micro-locations that are covered with greenery, which will be cleared during the construction, or these areas will be free of greenery, which reduces the heating of surfaces. However, given the size of the coverage and the fact that it is already an industrial zone, such areas will be small.

Thermal power plants affect meteorological parameters and climatic conditions through emissions of solid particles and flue gases into the air as well as by emitting waste heat into the environment. Unlike the impact of waste heat and particulate matter emissions, which are mostly local in nature, the impact of flue gas emissions has local and global character.

The emission of solid particles increases their concentration in the air, which affects the weather conditions near the ground, reduces the intensity of solar radiation that reaches the ground, which can result in the formation of an air layer in which the temperature rises with height (inversion layer), especially in colder parts of the year. This layer can be formed at different heights (from a few tens of meters to 1000 meters). Particles scatter sunlight in different wavelengths, and depending on the size of the particles, their concentration, nature, etc., they often absorb part of the sun's radiation. Intensive cooling of the substrate leads to such a strong cooling of the ground layer. One of the most important characteristics of inversion that affects the type of weather is the extremely stable stratification of the air in the layer below

the inversion. As the consequence of strong stability, turbulent movements and air exchange processes, both within the sub-inversion layer and between that layer and the layers above the inversion, are very weak. High relative humidity at the inversion level and below the inversion level is also typical for all inversion types.

Air stability below the inversion layer and poor air exchange between the layers inside and above the inversion layer result in an increase in the concentration of pollutants. However, given that filters will be applied in TPP Ugljevik 3, the emission of solid particles will be below 10 mg/m3 hence reducing the impact to the least possible level. The impacts of the global character of thermal power plants on fossil fuels are related to climate change caused by the emission of greenhouse gases, primarily CO_2. Measures to reduce this impact are confined to increasing the efficiency of energy production and use. Every combustion process, burning fossil fuels that contain carbon, produces carbon dioxide depending on the carbon content in the fuel. Carbon dioxide is the main gaseous product of combustion. It is not toxic, but it contributes to the undesirable effect of the greenhouse, which very likely leads to an increase in the average temperature and other harmful disturbances of the global climate. There is no practical way to dispose of large amounts of carbon dioxide other than its release into the atmosphere. The only measures that can be taken to limit CO_2 emissions are to use fuels with low specific CO_2 emissions and to increase the efficiency of the plant in order to keep carbon dioxide emissions per unit of electricity generated as low as possible. The impact of air cooling on the environment, and thus on the climate, is significantly lower compared to the classic cooling system, there is no wet plumage and all its influences characteristic of wet towers (fog, ice, impact on flue gases). Given that the air cooling system was chosen because of the lack of water and lower impact on the environment, it can be stated that this impact has been reduced to the minimum.

After leaving the emission source, pollutants spread, whereby concentrations and chemical transformations are diluted. There are two basic concentration dilution mechanism: (i) convection and (ii) diffusion. Convection is dilution due to blowing fresh air (wind), and diffusion is mixing of polluted and fresh air due to the appearance of vortices in the atmosphere. In general, both types of spreading are always present, but there are possible cases where there is no wind (silence), i.e. the turbulence is quite weak.

The method of emission is also important for spreading. With a well-designed chimney, there is an overshoot of smoke streams due to dynamic (flue gas velocity) and static (flue gas temperature) buoyancy.

There are ground and elevated temperature inversions. Ground inversion is the case when the air temperature rises with height starting from the ground itself. It's usually in the winter, and in the summer at night. It is most often the result of cold air coming into the valley from the mountains. Elevated inversion is the case when the air temperature rises with height but starting from a certain height. By increasing the fictitious height of the chimney due to the buoyancy and the speed of the flue gases at the outlet of the chimney, the effective height of the chimney (the point from which the expansion begins) becomes higher than the construction for the cant value. All the chemical energy of brown coal that is not converted into electricity, as well as its own consumption in a thermal power plant, is emitted as waste heat to the environment. This amount of energy, however, cannot lead to a significant increase in ambient temperature. In this regard, it can be stated that this heat will not have a significant impact on the local, and particularly not on regional climatic situation.

Ecosystem

The subject facilities are located within the industrial zone and will not have any direct negative physical impact on the vegetation in the vicinity of the site. Possible negative indirect effects could occur due to negative effects on microclimatic characteristics and emissions of gases into the air. Such impacts are not expected during the regular operation but may occur due to accidental situations at the site.
Future changes in the location, in the areas that will be under the facilities, in the phases of preparation for construction and construction are permanent or irreversible. The space on which the thermal power plant will be built will be permanently lost as a habitat for indigenous plant and animal species.
Earthworks that would be performed on the site for the construction of the TPP and exhaust gases from heavy machinery and vehicles would have an impact on the space of the TPP and the immediate environment in terms of dust particles and those from the exhaust gases on the transpiration surfaces of plant leaves that make up the surrounding vegetation.

Population, concentration and migration of the population

During the construction of the thermal power plant, an influx of labour force is expected to work on the construction, but this phenomenon is temporary. During the construction, it is necessary to provide accommodation and other conditions and facilities required for the normal life of workers. The construction will certainly have a positive impact on the economic development of the municipality through many ancillary activities, but could also increase the cost of accommodation, food and other services, which can further affect the most vulnerable families and categories of the population.

The constructed plant for the production of electricity at the thermal power plant Ugljevik 3 will lead to the creation of 303 new jobs, which will not significantly affect the increase in population or migration of the population in Ugljevik and its surroundings. Since the provision of professional staff in this area is difficult, the staff will come from more developed and larger urban industrial centres, which requires greater investments in the facilities of social standards that are an indicator of the development of the municipality.
On the other hand, the construction of the thermal power plant will significantly enhance the economic development of the area, as well as the supply of trade network and the development of small businesses, so that effects on the overall economic and socio-economic development of the area are not negligible.

Possible impacts in the border area

Acid gases, SO2 and NOx, leave the atmosphere relatively slowly, so long-distance transport, followed by soil and water pollution by deposition from the atmosphere is a significant problem. It has been significant in Europe for over 100 years and has been monitored under the Convention on Long-Range Transboundary Air Pollution for over 20 years. The goal is to get information on how much a country causes to deposit in another European country, that is, how much it receives from a particular country. BiH does not participate in the exchange of data, so the UNECE uses only data on BiH emissions for 1990. From the data, it was concluded that thermal power plants in BiH (which accounted for 75% of SO2 emissions in BiH in 1990 (today more) have significant transboundary pollution. Here, the most important are TPP Kakanj and TPP Ugljevik with chimneys over 300 m high). According to these calculations, BiH exports most of its emissions outside its borders. It also receives emissions from other

countries, but since 1990, BiH has been a net exporter of acid gases, i.e. it exports more than it imports. Given the annual SO2 emissions from TPP Stanari, which account for less than 1% of SO2 emissions from the BiH energy sector, transboundary SO2 transport can be considered negligible. The distance of the subject location from the border with the Republic of Serbia, measured by air, is about 23 km.

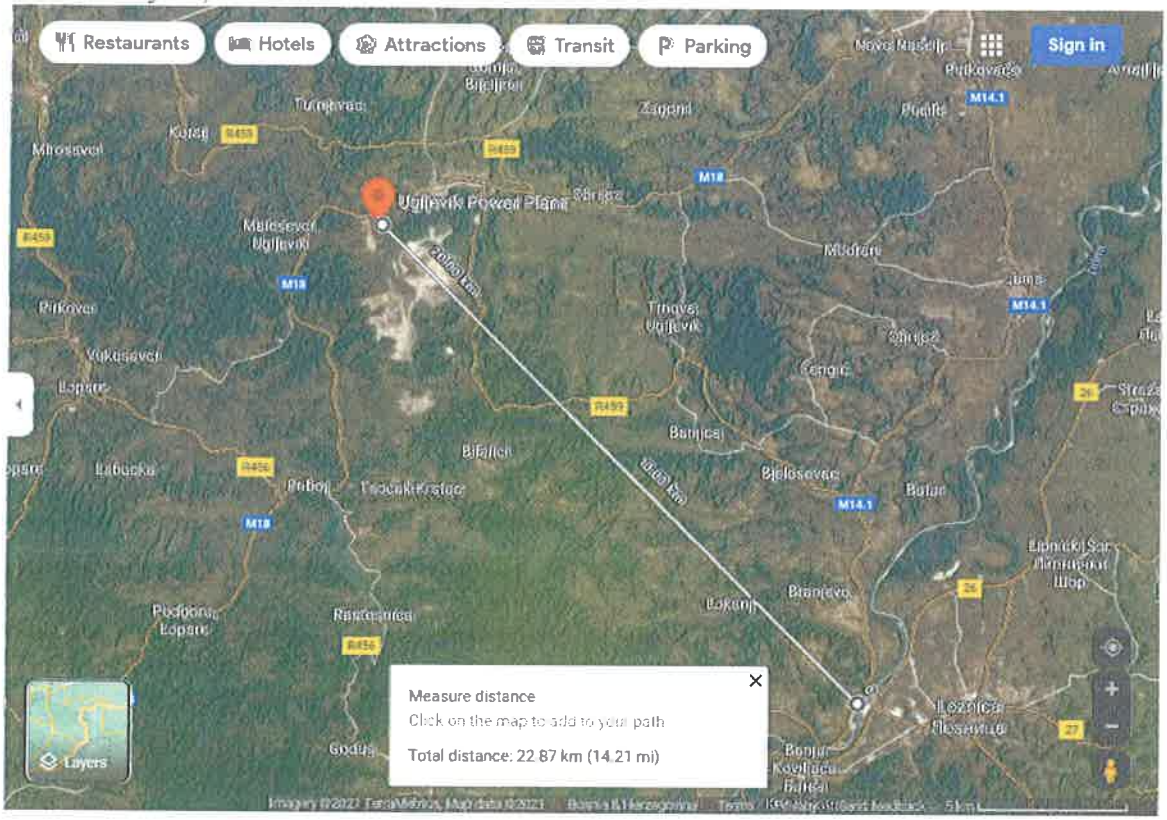


Figure 5. The distance between the planned TPP and the border with the Republic of Serbia

Conducting an environmental impact analysis aims to identify, remove or mitigate all negative environmental impacts, including possible transboundary impacts, through additional activities. The construction of the thermal power plant system Ugljevik 3 is entirely on the territory of the Republic of Srpska. The southern part of the scope is located at the shortest distance from the entity border with the Federation of Bosnia and Herzegovina, which is about 6 km. By respecting international environmental standards and legal regulations in ecology and environmental protection of the Republic of Srpska and Bosnia and Herzegovina and the proposed project solution, the negative impacts of the thermal power plant will be mitigated on the territory of the Federation of Bosnia and Herzegovina and other countries.

By respecting the planned project solution and the envisaged environmental protection measures, it will be ensured that the possible impact of the thermal power plant Ugljevik 3 on the border area is minimal in relation to the current state of the environment.

c) Description of mitigation measures in order to keep adverse environmental impacts to a minimum

Measures for air protection

During the construction

During construction, the organization of transport should be planned so as to avoid seasonal, weekly and daily rush hours, especially when transporting large loads. Access roads must be cleaned regularly, and all vehicles must wash the wheels before entering public roads. Loads that are loose and dusty should be moistened before entering a public road. The burning of any material is not allowed on the site. When handling loose material (removing surface vegetation, drilling, excavation, leveling the terrain), minimize dusting by spraying with water. Avoid unnecessary operation of construction machines (switch off machines).

During exploitation

- Use low-sulfur fuels as fuels for propulsion vehicles.
- If for any reason there is a change in the type of coal for the operation of the thermal power plant, the responsible person is obliged to notify the Ministry of Spatial Planning, Construction and Ecology, pursuant to Article 96 of the Law on Environmental Protection.
- Drain the flue gases from the boiler through the air heater and the filter plant and the desulphurization system into the chimney. Regularly check the efficiency of the electrostatic precipitator plant, bag filters and gas desulphurization systems.
- Emissions of nitrogen oxides must be controlled and their emissions into the air must be below the limit values set by the Rulebook on measures to prevent and reduce air pollution and improve air quality (the Official Gazette of the Republic of Srpska, No. 3/15, 51/15, and 47/16).
- Reduce SO2 emissions below the limit values from the Rulebook on measures to prevent and reduce air pollution and improve air quality, with the addition of powdered limestone to the boiler furnace with a circulating fluidized bed.
- Use electrostatic and bag filters to reduce particulate emissions below 30 mg/Nm3, in accordance with the Rulebook on measures to prevent and reduce air pollution and improve air quality.
- The coal landfill must have an installed system of protection against dust spread, combining mechanical compaction of the pile surface and placing water sprayers along the length of the piles, i.e. performing regular wetting of the material on the landfill.
- The coal landfill must be protected by a drainage system installed around the complete landfill, including a system for draining the collected water.
- Provide a fire protection system for extinguishing at the coal storage, in case of self-ignition and fire.
- Technical gas storages must be designed and built in accordance with the legal regulations for such facilities.
- Clean the asphalted handling surfaces and roads on the site regularly, in order to reduce the emissions of diffuse dust.
- Maintain free areas on the site by landscaping.
- During the trial operation of the plant, perform daily air monitoring in order to determine the quality of the emitted gases, i.e. to confirm all the parameters that are stated in the tests on their testing, i.e. which is guaranteed by the equipment

manufacturer, ie on determining below the limit values of the parameters of the purchased plant,
- Carry out constant supervision over the correctness and maintenance of filters for purification of waste gas through which the purified gas is released into the atmosphere,
- If the continuous measurements determined by this Study and the Air Quality Regulation show that any of the limit values have been exceeded due to disturbances and malfunctions of the gas purification equipment, the operation of the plant should be suspended until the problems are eliminated.
- In accordance with the planned project solution, the following limit emissions of gases are envisaged:

Gas	Unit	Limit value
Sulphur dioxide (SO_2)	mg/m^3	≤50
Nitrogen oxides (NO_X)	mg/m^3	≤80
Dust	mg/m^3	≤10

- Raise the natural barrier of evergreen trees around the complete location (in one row);
- Carry out landscaping of free areas within the plot by planting clover-grass mixtures.
- Desulphurization of flue gases should be performed using limestone in the furnace and applying the wet FGD method using limestone as a sorbent.
- The TPP will use a low emission combustion system, with selective non-catalytic reduction + selective catalytic reduction for each boiler, using ammonia as a reagent.
- Provide a continuous emission monitoring system (CEMS) for the concentration of gases from the combustion plant.

Water protection measures

Water management in the area of the planned TPP should be reflected through the following aspects:
- utilization of water for water supply (drinking water supply, for sanitary, fire, technological and other needs of TPP facilities);
- protection of both surface and ground waters,
- wastewater treatment activities (collection and disposal of all wastewater from the TPP site and their adequate neutralization and utilization),
- regular control of wastewater quality parameters (establish a system for mitigation of negative impacts on water and water monitoring),
    - improving the socio-economic aspects of the area,
    - integrating the water aspect into the planning of development activities and thus promoting the integrated use of space, i.e. resources.

During the construction

Organizational measures during planning and construction works include:
- planning of an appropriate water supply system
- planning of an appropriate drainage and wastewater treatment system, which includes: arranged impermeable surfaces, controlled drainage system and appropriate wastewater treatment,

- Organizational measures on the site during the construction of the TPP in order to prevent pollution of water resources.

By removing vegetation from the soil, conditions are created for increased soil erosion. In this particular case, during the preparation of the terrain and construction of facilities, protection measures are aimed at reducing the spread of soil from the construction site, so that it does not reach roads and road gutters, and after precipitation was washed into the river Radnja, as well as preventing direct contact with polluted atmospheric and drainage water into the river Radnja.

- The investor and the contractor will monitor the preparation of the terrain and construction of facilities and must stop them if archaeological remains or natural resources/findings are discovered and inform the Institute for the Protection of Cultural Monuments or the Institute for Nature Protection of the Republic of Srpska, depending on the type of findings.
- Before the start of works, special metal nets will be installed at the exit from the location of the TPP and connected to the local road in order to prevent the removal of earth and mud on the road and their washing into the road channel from where the water flows into the watercourse.
- The contractor is obliged to ensure that the tires are washed before the vehicle leaves the construction site, in order to reduce soil deposits, and to prevent water from spilling from the washing onto the road.
- Raising the classic protective fence of metal boards on the part of the construction site towards the existing road will reduce the spread of dust particles from the construction site.
- Trucks that will export excess excavated material from the construction site will be covered with plastic foil in order to reduce spillage on the road.
- In the winter months, at low temperatures and snowfall, use gravel instead of industrial salt to sprinkle access roads, which reduces salinization of the surrounding land and the impact on surface waters after heavy rainfall or sudden snowmelt.
- Protection of foundation excavations will be provided by supporting structures with adequate drainage protection and water pumping.
- Sanitary wastewater from the temporary assembly facility for accommodation of workers will be collected in the wastewater treatment system, after which it will be collected in the pool with other treated water, and used to moisten the ash.
- It is forbidden to pour oil from construction machines and trucks or their repair at the site during the preparatory works and construction of facilities.
- It is forbidden to wash trucks or construction machines on the banks of the river Radnja.
- The transfer of fuel from the tanker to the tanks of construction machines will be done in a specially arranged area, with provided means/tools for the collection and disposal of any spilled derivatives and contaminated land.
- The Rulebook on the obligatory procedure and the manner of acting during the refueling will be developed and the workers will be trained to apply the planned processes and procedures.
- The Rulebook on the actions of the staff when spilling small amounts of fuel will be made and the workers will be trained to follow the planned procedures.
- Inspection supervision over the implementation of all the above-mentioned measures and possible imposition of additional ones will be carried out, depending on the situation.

During exploitation

- It is forbidden to pour wastewater into the recipient without proper pre-treatment.
- Drainage of sanitary wastewater should be performed in accordance with the planned project where conservation or bio treatment of sanitary wastewater and their reuse for spraying green areas and internal roads of the TPP circuit is envisaged.
- Discharge atmospheric water from the roof of the buildings to the surrounding terrain or to a separate rain sewer, depending on the possibilities provided on the site;
- The use of water from the city water supply is recommended as a source of water supply;
- The investor is obliged to apply all measures that will be ordered in the Water Consent;
- The investor is obliged to request the issuance of the Water Consent after the construction of the facilities in question and before their commissioning in accordance with the Law on Waters.
- In accordance with the Rulebook on the discharge of wastewater into the public sewerage system, regular monitoring of the quality of wastewater that occurs on manipulative surfaces and during the cleaning of the plant will be established. Such waters will be regularly monitored for the required quality parameters after the grease and oil separator and before discharge into the public sewer. It is not planned to discharge industrial wastewater into a natural recipient because it will be treated through a centralized system and then reused for the needs of technical water on site. The only discharge of water into the natural recipient will be the discharge of water from the planned cooling tower into the Janja River.
- Store liquid fuels on site in closed containers, located in a safe place, preferably in a concrete pool. In the event of a fuel leak, remediation of the contaminated area should be started immediately.
- In case of incidents, urgent intervention is required in accordance with the operational plans of intervention measures in various incident situations.

Obtain a water management permit before putting the facilities into operation and respect the measures ordered in the decision.

- Compliance with the limit emissions in the wastewater discharged into the public sewerage system should be harmonized with the relevant regulations. –
- In order to reduce the negative impact on water, it is necessary to take the following measures:

  - ✓ The internal sewerage system should be made entirely of waterproof material,
  - ✓ Make all catchment areas that are exposed to pollution waterproof,
  - ✓ Before entering the sewage system, make sure the atmospheric waters from traffic areas and parking lots are treated in a purification device, grease and oil separator,
  - ✓ The quality of wastewater from the site should meet the criteria for discharge into the public drainage system,
  - ✓ Ensure curbs in all traffic areas and reduce in slopes towards watertight drains for collecting atmospheric precipitation,
  - ✓ Act in line with water guidelines,
  - ✓ Regular emptying is mandatory, and at least once a year check the efficiency and functionality of the parts of the separator, i.e. clean and check the separator every six months, especially after heavy rainfall.

- ✓ Separate atmospheric, sanitary and technological wastewater. Before putting the facility into operation, carry out technical and water tightness testing of the internal drainage system.
- ✓ Ensure adequate disposal of waste sludge from the separator (signing a contract with a company authorized to collect hazardous waste),
- ✓ Maintain clean drainage channels of atmospheric and sanitary wastewater,
- ✓ Leave inspection openings on the outlet pipelines of atmospheric, sanitary and technological wastewater in order to perform sampling and measure the flow.
- ✓ Provide adequate storage of oils and lubricants used in the process,
- ✓ Ensure adequate disposal of waste oils, lubricants and packaging (sign a contract with an authorized company for the disposal of hazardous waste); in the very process, smaller amounts of oils and lubricants are found, but they are in closed systems.
- ✓ All wastewater drainage and storage systems must have a water tightness certificate with mandatory testing every five years by an authorized institution.

- A centralized system for wastewater treatment of TPP is planned. The purification effect should be between 80-90%. Regular controls and cleaning of the drainage and wastewater treatment system (drainage channels, sedimentation tanks and oil separators) are needed, as well as extraordinary cleaning of the precipitation drainage system after heavy rainfall. Proper control, cleaning and recording of maintenance of wastewater treatment plants will provide an appropriate degree of water purification and satisfactory quality of the effluent.
- For the needs of the TPP, it is necessary to develop an "Operational plan for the implementation of measures in case of emergency situation of water pollution".

Wastewater drainage: During the operation of the TPP, wastewater of different origins will occur that require different types of treatment, either by pH neutralization or through an oil separator. Wastewater is collected and treated in special categories, in order to enable the necessary treatment as close as possible to the source of wastewater. The planned solutions are:

- Oily wastewater from the floor drains of the facility and the area of the transformer will be treated on an oil separator that guarantees an oil content of less than 10 mg/l. The treated water is directed to a centralized wastewater collection system.
- Chemically polluted wastewater, such as drains from chemical water treatment plants and chemical condensate treatment, will be neutralized to pH 6 - 9, before being discharged into a centralized wastewater treatment system.
- Sanitary wastewater will be treated in the sanitary wastewater treatment plant and then used for spraying internal roads and watering green areas.
- Coal containing wastewater from the system for coal handling and open coal storage is treated in a coal treatment plant containing wastewater. Coal water is also directed to the centralized wastewater treatment system, and all the treated water is used as technical water for the thermal power plant. It is not planned to discharge wastewater into surface waters.
- Drain the atmospheric water from the manipulation plateau and internal roads and other possibly oil-contaminated surfaces towards the grease-oil separator before entering the centralized wastewater treatment system.

- The treated water system is for the distribution of wastewater stored in the wastewater collection basin to consumers who have lower water quality requirements, such as water for wetting the ash / residue mixture, water for spraying open coal storage, water for

washing overflow buildings for coal, technical water needs, etc. The purified water system includes a wastewater collection basin, a purified water pressure pump, a backwash pump for the coal water purification unit, and associated valves, pipes, and the like. As all these quantities of wastewater are required for these purposes, the wastewater will not be discharged.

All generated wastewater in the TPP plant will be used for moistening of the remains of the combustion process, washing of coal overflow buildings, as technical water required for the TPP for technical etc. so there will be no discharge of wastewater into the environment. The water reuse system is used to distribute wastewater from the wastewater collection system to those consumers who have lower requirements in terms of water quality, such as water for wetting the ash/residue mixture, water for spraying coal landfills, water for washing the transport tower coal, etc.

- Wastewater generated during the overhaul of the plant (when the TPP is not in operation) should be treated in the same way as wastewater generated during the operation of the plant.
- Maintain the drainage system around the coal storage area in functional mode.
- Transformer oil must not contain polychlorinated biphenyls or other persistent organic pollutants.
- To store liquid fuel on site, use above-ground tanks with a canopy, located in a concrete tub designed to accept the volume of the tank in the event of an accident.
- Maintain in functional condition the circumferential channels at the boundaries of the complex to protect against flooding by surface waters.
- Only purified water should be introduced into the final recipient in accordance with the Rulebook on conditions for discharge of wastewater into surface waters (the Official Gazette of RS No. 44/01) and other regulations governing water protection.

Groundwater protection measures

- For the purpose of regular inspection and for ensuring acceptable water quality of the recipient, and in accordance with the Rulebook on discharge of wastewater into surface waters, ensure regular monitoring of the quality of atmospheric water that will be discharged into the natural recipient, the quality of the recipient.
- Carry out activities that will prevent pollution of surface streams. In this way, any possibility of transporting possible pollutants to the sand layers and its infiltration in the zones where the recharge is carried out will be avoided.
- Plan regular monitoring on 4 piezometers at the TPP site, which would enable monitoring of groundwater quality both at the TPP site and beyond. Groundwater parameters to be analyzed are: Cl, F, B, nitrites, nitrates, phosphates, sulfates, Na, NH4, Mg, Ca, Pb, Cd, Zn, Ni, Mn, Fe2 +, Fe3 +, Hg, As, Cr6 +, mineral oils, phenols, total hardness, pH value, vapor residue-unfiltered, vapor residue-filtered, electrical conductivity, total and β radioactivity. Sampling should be performed by the competent institution.
- Future wet ash storage cassettes should be designed to meet water tightness conditions. The insulating layer must have a water permeability coefficient of less than K = 1x10-8- 1x10-9 cm/s, both in the bottom of the cassettes and in the sides.

Land protection measures

During the construction

- All packaging for oil and other oil derivatives must be collected and referred to the controlled landfills of the contractor wherefrom it will be managed by an authorized utility company.

Machines must be parked only at designated area. Special measures shall be undertaken at such parking places to protect the soil from petroleum, oil and oil derivatives. If the soil is contaminated with oil or the similar, removal of that layer of soil to the landfill shall be required.

- It shall be prohibited to wash the machines, vehicles and concrete mixers in the work zone. Wash them at a place to be determined for the purpose.
- Maintenance, refueling, and cleaning of construction machinery should be performed at locations that are far from surface waters, locations shall be defined before the commencement of works. When defining these locations, take into account the results of the study on engineering-geological and geotechnical exploration works and the spatial planning documentation of the area (purpose of the location).

During exploitation

- Store liquid fuels in closed containers, located in a safe place, preferably in a concrete pool. In the event of a fuel leak, remediation of the contaminated area should be started immediately.
- In the event of a fuel spill, immediately start remediation of the contaminated area;
- For all types of waste that will be generated during the performance of activities, ensure compliance with laws and bylaws that cover waste management.
- Provide a sufficient number of containers for the collection of solid waste as well as their regular emptying by the competent authorized company.

- Fuel, oils and grease:

- ✓ Determine and strictly implement measures of protection against uncontrolled discharge of motor fuel and lubricants and/or in case of accidents.
- ✓ All mobile facilities with self-propelled system using oil derivates must have a concrete surface under the drive part for possible pollution of the place of work.
- ✓ Fuel supply must be provided in a closed system and not by overflow or refuelling.

- In order to reduce the risk of possible pollution of groundwater and soil by petroleum products at the location of the TPP, it is necessary to provide suitable conditions for their storage. Storage space locations must be well secured. Two storage spaces are required, which should be located as close as possible to the access road to ensure the shortest possible handling of these derivatives.
- At the places of landfills of humus material that will be formed during the construction of cassettes for disposal of solid residues, the level of groundwater should be such that it does not affect the additional wetting of the humus material.
- If the cassette manufacturing technology does not exclude the risk against the excavated loose or solid mass when disposing ash and material, then before the commencement of works - especially in frost, south wind, after showers and when resuming suspended

works - a competent manager or an expert must be engaged to control the working levels of the slope for cracks, leaching, irruption and separation from the mass of loose mass.

- Place containers for light oil and chemicals in watertight concrete tanks of appropriate volume to collect any leaks.
- In order to prevent the distribution of solid waste, which normally occurs during the construction and stay of workers in the construction site zone (food packaging, other solid waste), it must be systematically collected in special containers and disposed of in agreement with the competent utility company;
- Procure containers for selective disposal of appropriate types of waste.
- During the operation of the TPP, ensure regular land monitoring. Land quality monitoring will be performed at four locations that are defined to cover both the TPP site itself and a somewhat wider area. Sampling should be performed in a way that ensures the determination of accurate parameters. Sampling should be performed at vertical profile levels by taking three samples to a depth of 0.6 m (every 0.2 m). The frequency of sampling is defined once a year, and the parameters that will be determined are: Pb, Cd, Zn, Ni, Mn, Fe2 +, Fe3 +, Hg, As, Cr6 +, mineral oils, phenols.
- For disposal of combustion products, an Instruction and technological scheme must be prepared, which must contain the following elements: technology of work on the landfill, basic geometry of disposal, dimensions and capacity of the landfill (cassette), position of the truck in relation to the edge of the landfill floor plan must be harmonized with the geotechnical characteristics of the working environment.
- When depositing, care must be taken that the parts of the site where the disposal was completed are successively covered with either a final ground cover or a temporary one not thinner than 10 cm.
- Treat oily wastewater from the floor drains of the building and the area of the transformer through an oil separator. Route the treated water to a wastewater collection basin.
- Purify rainwater from roads and other possibly oil-contaminated areas via an oil separator before entering the rainwater collection basin.

Noise and vibration protection measures

- Use equipment and devices with attenuators that must be certified, i.e. constructed or insulated so that they do not emit noise into the external environment above the permitted level.
- Given the adverse effects of noise, it is necessary to implement measures to reduce or completely eliminate noise.
- Construction works that would produce high noise should be performed at certain time intervals and according to appropriate regulations and standards.
- Respect the planned working hours for the delivery of materials and raw materials.
- Maintain the used mechanization technically faultless by regular technical inspections;
- Plant and regularly maintain evergreen plants around the waste treatment facility which will, among other things, serve as a sound barrier;
- In case some machines exceed the allowed levels of noise, it is necessary to prohibit their use, i.e. to use modern and technically faultless mechanization.
- The investor is obliged to require the equipment manufacturer, or his representative, to submit all relevant documentation on the applied design solutions and protective equipment against noise and vibration, in accordance with the provisions of the Law on

Occupational Safety (the Official Gazette of the Republic of Srpska, No. 01/08 and 10/13).

- Protection against the harmful effects of noise can be provided by technical protection measures and means of protection at work.
- In order to protect the hearing from excessive noise at the workplaces of the operators of driving and working machines, appropriate protective equipment must be used, and namely:
    - cotton wool to protect hearing from noise up to 75 dB;
    - earplugs to protect hearing from noise up to 85 dB;
    - ear protectors to protect hearing from noise up to 105 dB.
- The noisiest works in terms of emission levels should be carried out between 08:00 and 18:00.
- Carry out works during the night exceptionally, taking into account the provisions of the Rulebook on permitted limits of sound and noise intensity (the Official Gazette of SR BiH, No. 46/89) and mandatory prior notice to the local population.
- Park heavy vehicles at places away from potentially endangered residential buildings.
- Switch off the engines of vehicles when not in motion.
- It is recommended to perform works with equipment in the so-called "Low noise" version with declared sound power of the equipment.
- The contractor must use equipment that meets the requirements of the European Directive EC/2000/14 regarding the emission of noise produced by equipment for outdoor use.

Measures to prevent and reduce the solid waste

During the construction

- Containers for disposal of all types of waste must be of the closed type, watertight and placed on a solid surface in the circle of the construction site during construction, i.e. inside the circle during the use of the object in question.
- Along with the access drive-walking road, form an arranged space for placing the containers for solid municipal waste, at least three containers, with a volume of 1100 liters each.
- The waste collection/disposal contract must define: scope of services of the responsible person, time period for which the contract is valid, types of waste and disposal-treatment procedure, quantity or volume of waste, method of delivery or collection of waste, obligations and responsibilities of both parties, responsibility of the person responsible for waste management in terms of its reuse, recycling, treatment or final disposal in an environmentally sound manner.
- Certain types of waste should be managed as follows:
- Treatment of construction waste (may be hazardous) generated during the construction or rehabilitation of facilities will be carried out in accordance with the Construction Waste Management Plan, which is the responsibility of the contractor in accordance with the contract. Workers or the Supervisory Body are obliged to control and supervise the execution of works.
- Non-hazardous waste (metal and paper) that can be used due to its properties, will be collected separately and disposed of in labelled metal or plastic containers, after which it will be handed over to the competent entity authorized to collect this type of waste. The Investor will sign a contract with an authorized company to manage this type of waste.

- Municipal waste (can be hazardous) will be disposed of in special containers at the location, then it will be disposed of in a municipal landfill by a public utility company with which the Investor must sign a contract. Other types of waste that are collected separately shall not be dumped in municipal waste containers.
- Packaging waste (can be hazardous) shall be disposed of in containers marked "NON-HAZARDOUS PACKAGING" and "HAZARDOUS PACKAGING", (plastic and other boxes, packaging of oils and grease, packaging containing chemicals, etc.) and be handed over to an authorized company for disposal. A contract with an authorized company will be signed for disposal of this type of waste. The waste producer should also have documentation on waste transport returned to him by the authorized operator with whom he signed the contract on disposing of hazardous waste.
- If there is an uncontrolled discharge of hazardous substances (fuel, oil), provide sufficient quantities of adsorbents and adequate containers for fuel reception, and leave their further treatment to an authorized institution that should remove hazardous substances and clean up the terrain in accordance with the Law on Waste Management (the Official Gazette of the Republic of Srpska, No. 111/13, 106/15, 16/18),
- The investor is obliged to make a Waste Management Plan for the construction phase and the phase of the use of the facility, according to Article 22 of the Law on Waste Management (the Official Gazette of the Republic of Srpska, No. 111/13, 106/15, 16/18).

During exploitation

- Waste collection and storage must be in accordance with the basic principles of waste management on which the Law on Waste Management is based:
- Prevention - avoiding the generation of waste or reducing the amount and harmfulness of waste generated in order to reduce the risk to human health and the environment and avoid environmental degradation,
- Precautions - prevention of danger or damage to the environment caused by waste, taking measures, even if a complete scientific basis is not available,
- Responsibility of the waste producer - the producer is responsible for selecting the most acceptable solution according to the product characteristics and production technology, including the product life cycle and the use of the most adequate available technology,
- - The "polluter pays" principle - the producer or owner of the waste bears all the costs of waste prevention, treatment and disposal, including post-use care and monitoring. He is financially responsible for preventive and remedial measures due to environmental damage that he has caused or will most likely cause,
- Proximity - waste treatment or disposal should be carried out in the nearest appropriate plant or location, taking into account environmental and economic profitability,
- Regionality - the development of waste management and the construction of facilities for its disposal should be done in line with the needs of the region and enable the self-sustainability of the constructed facilities. Waste generated on the construction site must be collected selectively, i.e. in separate containers in accordance with the waste classification.
- The area for temporary disposal of hazardous waste shall be marked with the label "PLACE FOR DISPOSAL OF HAZARDOUS WASTE" and located within the plant area in a place where it least interferes with the work process and where workers are least retained.

- The space for temporary disposal of hazardous waste should be secured from access by unauthorized persons, it is also covered with an impermeable tank in case of leakage of containers, tanks or other packaging.
- Based on the records on the required quantities of oils and lubricants, workers from the Maintenance Service are obliged to keep a record of waste oils. - In a visible place within the space for temporary disposal of hazardous waste, the contingency plan will be displayed, while the appropriate type and amount of fire extinguishing means will be located in its immediate vicinity. A contract will be concluded with an authorized company for the collection and disposal of hazardous waste.
- The basic principle of selective collection is the separation of hazardous from non-hazardous waste, separation of construction waste from other categories, separation of waste plant tissue (trees, shrubs, stumps, shrubs), as well as special separation of recyclable waste. During the construction works, it is necessary to apply all preventive measures to prevent the spillage of waste oils, or substances containing mineral or synthetic oils, spilling into surface and groundwater, sewage or soil. Waste oils should be collected and stored separately. Separately collected waste must be stored or kept in specially designated, arranged and marked places, equipped with a set of containers for selective disposal: Container for selective disposal of hazardous waste, Container for non-hazardous waste - mixed municipal waste, Container for non-hazardous waste - mixed packaging waste recyclable Non-hazardous waste container - mixed recyclable metal waste. Each container must be marked accordingly.
- Monitoring of waste quantities in the construction and operation phase of the plant, as well as the dynamics of waste generation, should be done on special forms where the name of the material, quantity, date of entry and exit and notes are entered. After the construction of the facilities, the forms with pooled quantities shall be submitted to the competent ministry to enable the insight and records of the generated waste. Also, the subject forms related to the waste generated in the operation phase must be regularly submitted to the said ministry.

Measures to protect the vegetation, flora, fauna and ecosystem

- Adhere to all prescribed measures for air protection related to the reduction of dust and exhaust gases due to the possible negative physical impact on the vegetation in the immediate vicinity, given that dusting plant leaves disrupts their physiological functions (photosynthesis process), which to a certain extent results in a reduction in the amount of synthesized organic matter and a reduced increase in biomass and trees and ground vegetation.
- Comply with all prescribed noise protection measures.
- Prevent any pollution of land, groundwater and surface water that may adversely affect the flora and fauna of the surrounding area;
- Plant green areas inside the plot and do the mowing regularly;
- Plant evergreen plants around the entire complex and maintain them neatly;

Landscape protection measures

- Regularly maintain and arrange work surfaces and internal roads on the site,
- Perform works exclusively in the spatial scope determined by the Main Design;
- Limit clearing and vegetation removal only on areas where it is necessary;
- Anticipate the complete arrangement of the space after the completion of construction and rehabilitation of all facilities;

- Horticulturally arrange the areas used for storage of waste construction materials in a way that visually enhances the space for the most harmonious fit of buildings into the environment;
- Final design of the plant and reclamation of the project area should be carried out on the basis of the Reclamation and Landscaping Project;
- Landscaping should be carried out simultaneously with the construction of facilities;
- As part of reclamation, plant perennial and multi-layered vegetation;
- After the completion of construction and rehabilitation, all facilities that are no longer needed at the location in question must be removed.

Measures for the protection of natural and cultural-historical heritage

- If during the execution of works the investor encounters an archaeological site or objects of geological-paleontological or mineralogical-petrographic origin, which are presumed to have the status of natural heritage, he undertakes to inform the Republic Institute for Protection cultural-historical and natural heritage of the Republic of Srpska and take all measures so that the cultural and/or natural heritage would not be damaged until the arrival of an authorized person (Article 79 of the Law on Cultural Heritage, Article 47 of the Law on Nature Protection).
- Pursuant to Article 82 of the Law on Cultural Heritage, in case he encounters archaeological sites or archaeological objects during the construction and other works, the contractor shall immediately terminate the works and notify the Institute, and take measures not to destroy but to preserve the findings in the place and in the position in which it was discovered. - In case of discovery of archaeological findings, it is necessary that the competent service for the protection of cultural and historical heritage manages or under its supervision conducts the procedure of research and documentation of sites. Depending on the nature of the finding, the possibilities and methods of its protection and preservation will be determined by applying the following measures:
    - conservation of findings by backfilling,
    - relocating of the findings,
    - relocation of part of the site with conservation of the remaining part of the site by re-burial.
- Carry out construction works only on plots intended for construction so that the envisaged project would not have an impact on the natural and cultural resources located in the wider vicinity of the site in question,
- Use only autochthonous tree species for reclamation, landscaping and raising the green belt around the complex.

Measures to protect people's health

- With the aim of reducing the impact of dust on workers' health in the process of construction and the health of the population living in the surrounding, all the necessary measures to minimise the dispersion of flying particles in the air are to be taken, in the course of execution of construction works, and attenuation is to be achieved by taking protection measures that reduce the emission of flying particles to the limit values (optimal material moisture, wetting and dewing of roads),
- Regularly maintain and wet access roads as well as manipulation plateaux,
- Envisage measures to protect workers' health from increased noise (e.g. by using 'antiphon' noise protection or ear protectors),

- Investor's obligation is to write reports in case of occurrence of any negative impact on the health of the people and the environment in the course of implementing the planned project in accordance with the legal provisions of the Law on Environment Protection and the competencies of the Ministry of Health and Social Welfare of the Republic of Srpska.
- During the execution of works, entrance for unemployed persons is to be strictly prohibited. The construction site is to be fenced. In case of workers' injuries, action is to be taken in accordance with the Rulebook on the Content and Manner of Issuing Reports on Injuries at Work, Professional Illness and Illness Related to Work (the Official Gazette of the Republic of Srpska no. 66/08). And in everything else one is to adhere to the Law on Protection at Work (the Official Gazette of the Republic of Srpska, no. 01/08, 13/10) and bylaw legislative related to the area of protection at work.
    - All the measures of environment protection, which are at the same time measures for the people's health protection, are to be adhered to.

Measures to protect the infrastructure

- Access roads are to be defined beforehand, whereas, for the sake of space protection, all the existing roads are to be maximally used and kept in condition in which the safety of all the participants in traffic is provided for.
- After the completion of construction works, all the eventual damage on the existing traffic network is to be compensated for, at least to the state in which it had been before the works.

f) Express indication of prediction methods used and accompanying assumptions, as well as relevant environmental data

In the domain of analysing the state of the environment, paying respect to all the specificities that characterise the analysed contents, all the characteristics of the observed location and the characteristics of existing potentials, the fundamental criteria have been considered, which have been brought to certain indicators through the quantification procedures, with the primary intention to define their legal nature in the existing relations. On the basis of concrete indicators, it is possible to make the selection of adequate measures to protect the environment, which at the same time fulfils the main purpose of this analysis. What should be particularly emphasised is the fact that the facilities, that is, activities that will be performed within the lot can endanger the environment both in the course of regular work and in case of accidents.

The project holder is obligated to provide solutions through technical documentation, which would ensure acceptable impact of the subject project on the environment in the course of regular work, cease of work and in case of accidents alike.

Environmental impact due to establishing the TPP on the planned location can be expected in two phases:

- Environmental impact that will occur in the phase of TPP preparation and construction, and
- Environmental impact that will occur in the phase of exploitation, that is, use of the very TPP.

In the course of executing planned works on the subject location, it is possible that there shall occur accidental situations in terms of oil and lubricant leaks, dispersion of dangerous

substances, occurrence of fire due to negligence or unprofessional handling of machines, faults on electrical installations etc. One of the most significant kinds of impact on the environment caused by activities following the TPP construction are certainly emissions into the air coming from the process of coal combustion.

The realisation of project activities will take place on the territory of one local self-governance, but the impact on air might occur in a wider surrounding as well, depending on the meteorological conditions.

The following table shows the criteria for an evaluation of spatial proportions of possible negative impact.

Table 1. Criteria for assessing spatial proportions of impact

Impact proportions	Denotation	Description
Global	G	**Possible global impact**
State	S	**Possible impact at the national level**
Regional	R	**Possible impact within the space – region**
Municipal	M	**Possible impact within the space of municipality**
Local	L	Possible impact in a certain zone or part of the municipality

Cross-border impact on another state or entity can also be expected in the course of project realisation.

The probability that certain assessed impact will occur in reality represents a very important criterion for making decisions on protection measures. The probability of impact is determined according to the scale shown in the following table:

Table. 2. The scale for impact probability assessment

Probability	**Denotation**	**Description**
100%	HL	Impact certain – highly likely
Greater than 50%	**L**	**Impact likely**
Less than 50%	P	Impact possible
Less than 1%	U	Impact unlikely

Given the ecologically acceptable process technology selected, no impact denoted as certain-highly likely (HL) has been recognised. Dust, noise, vibrations, increased quantities of refuse water discharged into the public sewage system, the location of implementation of planned activities recognises impact whose probability is greater than 50% and we define them as probably (likely) impact. The intensity of this impact is high, but the complexity if not huge, while the recurrence of impact depends on the works dynamics and it is possible to correct it. The impact denoted as increased emission of exhaust fumes, production of various kinds of waste, discharge of refuse water, have been denoted as P impact and they are very easily

controlled by an adequate organisation, control measurements, supervision of installed equipment and similar.

The time dimension of the impact is also a significant criterion when we define the impact of a certain project on the environment. It is determined according to the scale presented in the following table.

Table 3. The impact time dimension assessment scale

Impact time dimension	Time dimension, that is, duration of impact in relation to the plan time horizon	**Impact duration**	Short-term (s) Mid-term (m) **Long-term (l)**
		Impact frequency	Occasional (o) **Permanent (P)**

According to the data of the planned technological process and the degree of location development from the point of view of the impact time dimension, we can say that the impact on air has been denoted as long-term impact of a permanent character, that is, that it continually lasts without interruptions for as long as the plant is in operation.
For the impact of: emission into the air, noise, refuse water discharge, from the point of view of time dimension, we can say that the subject impact is long-term, and shall last for as long as the exploitation works last, and that they are of an occasional character in accordance with the dynamics of the technological process.

g) Identification of knowledge gaps and uncertainty faced in the process of collecting the necessary information

There were no difficulties in the course of collecting data for the development of the Environmental Impact Study, apart from the lack of certain documentation of local and republic character.

In the course of development of the study, use was made of the available strategic documents such as the RS Nature Protection Strategy, RS Air Protection Strategy, RS Waste Management Strategy, Changes and Amendments to the Republic of Srpska Spatial Plan until 2025, as well as documents provided for by the local community.

h) If necessary, draft programme for monitoring, managing and eventual plans for post-project analysis

After the possible environmental impact has been defined and protection measures have been suggested, a monitoring plan/programme is made. This programme shall control the environmental impact of the process technology on the location, as well as the functioning of the proposed protection measures. The environment monitoring programme should be implemented for all the aspects of the environment where a certain degree of impact is expected.

On the basis of the monitoring experience so far, the following general criteria have been laid down:

- Monitoring must be understood as a long-term process,
- Monitoring must be a continuous process,
- Monitoring should be rational and optimal in every phase,
- Monitoring must be current,
- Monitoring must be entrusted with qualified staff, from the phase of project development to the installation of instruments and equipment; measurements, processing of data obtained by measurements and interpretation have their own specificities and require specialised staff.

The above stated criteria gave rise to the following characteristics that have to be fulfilled by the monitoring system:

- Such methods, instruments and equipment as can ensure data reliability for a long-term period have to be chosen for the monitoring (selected methods and equipment have to function properly in rather harsh time conditions);
- Application of methods that enable fast and easy processing of data (automation of measurement, transmission, archiving, data processing).

Main tasks:

- To provide reliable data in the process of construction, which will enable control of impact effect manifested, as well as control of regularity of work of installed instruments and equipment;
- To provide a sufficient quantity of reliable data during the trial work phase, so that the state of facilities can be controlled to the level of determining their immediate safety;
- To provide reliable data in the exploitation phase via conducting the monitoring plan instructed through the decision on ecological licence,
- To ensure reliable information in the exploitation phase and to enable timely detection of negative phenomena and anomalies which do jeopardise safety directly, yet their timely removal is very important for the purpose of preventing greater damage.

The envisaged measurements planned for the monitoring plan in the phases of construction and exploitation, by identified environmental aspects, are shown in the continuation of the Study.

Table 4. Monitoring plan

- **Air monitoring**

Monitoring subject	Monitored parameter	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
AIR QUALITY	Monitoring fundamental parameters for determining air quality in the subject region according to the Provision on the Values of Air Quality and the Provision on the Requirements for Air Quality Monitoring (the Official Gazette of RS, number 124/12): Sulphur dioxide SO_2, Nitrogen oxides: NO, NO_2, NO_X, Ozone O_3, Carbon monoxide CO, Suspended particles PM10, Total flying particles TFP Hydro meteorological parameters: temperature, relative moisture atmospheric pressure, wind direction and speed	Outside the subject location and in the immediate vicinity of the location towards the closest residential facilities	Installed complete station with auxiliary equipment for monitoring air quality and ancillary equipment necessary for an undisturbed automatic work of the station	Seven days continuously every month	Monitoring the air quality parameter and the degree of increased pollution in relation to the existing state of the environment
AIR QUALITY	Measurement of emissions into the air	After the instalment of the emission control system	Authorised institution	Once a year	Measurements of emissions into the air from flue duct

- **Water monitoring**

Monitoring subject	Parameter analysed	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
REFUSE WATER QUALITY	pH – value; temperature, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, phosphorus, precipitate after 0,5 hour of precipitation, electric conductivity, BOC5 at 20°C, COC, total dissolved oxygen, total	On the spot of water discharge into the river Janja and downstream from the discharge spot	Authorised institution	Four times a year (seasonal)	Monitoring refuse water discharge

UNDERGROUND WATERS	solid matter (exhaust residue), fat and oil The fundamental physical-chemical indicators: o temperature o Pн o Electrolytic conductivity o Suspended solid matter o Biological oxygen consumption BOC5 o Chemical oxygen consumption COC o Ammonia nitrogen, o Nitrate nitrogen and other As well as sanitary microbiological parameters: o The number of aerobic organotrophs at 22^0C, o Total coliforms, o Faecal coliforms, o Faecal streptococci, o Pantle-Buck saprobity index.	4 piezometers.	Accredited institution services	Four times a year (seasonal)	Monitoring the impact of TPP on the underground waters' quality

- **Waste monitoring**

Monitoring subject	Observed parameter	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
MONITORING WASTE FLOWS	Make a record of waste production, types, quantity, collection and final management	On the location	Person appointed for waste monitoring, records through the Waste Management Plan	Continuous	Proper waste management
ASH ANALYSES	Cr, Cu, Hg, Ni, Pb, Zn	From the ash landfill body	Accredited institution services	Twice a year	Determining heavy metal load

- **Noise monitoring**

Monitoring subject	Observed parameter	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
NOISE LEVEL	Equivalent noise level	Four measurement spots in the vicinity of the subject location, towards the closest residential facilities	Equipment for measuring equivalent noise level	Twice a year	Monitoring noise level in relation to the existing state of the environment

- **Land monitoring**

Monitoring subject	Analysed parameter	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
Land quality	Pb, Cu, TPH, Hg and other	- the first sampling location to the north of TPP circa 300-400 m from the TPP circle, - the second location to the west of TPP cca 300-400 m from the TPP circle, - the third location to the east of TPP cca 300-400 m from the TPP radius - the fourth location to the south of TPP, cca 300-400 m from the TPP circle	Authorised institution	Four times a year	Determining the degree of pollution in relation to the initial state of the environment

- **Non-ionizing radiation monitoring:**

Monitoring subject	Analysed parameter	Monitoring place	Monitoring method	Monitoring time	Reason for monitoring
RADIATION MONITORING	Measuring radiation level in accordance with the Law on Protection from Non-Ionizing Radiation, the Official Gazette of RS, no. 36/19	In the vicinity of the substation, generators or other sources of radiation that is subject to the stated measurements	Licenced institution	Every third year	Determining the degree of radiation

i) Non-technical summary including visual presentation (maps, graphs, etc.)

Outline and assessment of the existing state of the environment

The subject location is found on the right side of the main road M-18 (section Stari Ugljevik – Priboj) at a distance of about 2,5 km from the city centre, and next to the complex TPP "Ugljevik 1", which is located on its eastern side.

On the east side of the subject location, there is the complex of the thermal power plant "Ugljevik 1", as well as the metal construction of the TPP "Ugljevik 2", which is connected to the west side of the existing block "Ugljevik 1". On the north side there is the main road M-18 and the river Janja. In the wider area on the southwest and east sides of the subject location, there are dispersively distributed individual residential buildings of low density, and the site of the New Cemetery Bogutovo selo, south of the subject site. The surrounding area is partially built.

The terrain at the subject location, which is found next to the existing thermal power plant "Ugljevik 1", is flat while the rest of the terrain towards the west side of the site is sloping and significantly levelled, i.e. the most pronounced slope is in the western and south-western part of the site, in the west-east direction.

During 2012 and 2013, a number of facilities were removed from the site planned for the construction of the thermal power plant and the following works were completed, which had a direct impact on the location of the thermal power plant itself:

- relocation of local roads to the settlements of Bogutovo selo, Mukat and Stankovići, i.e. construction of new ones on the east and west sides and
- construction of a residential part - a campus to accommodate operational staff.

The subject location is mostly undeveloped. Within the scope, there are a small number of buildings, most of which are ground floor buildings, poor quality and form an integral part of the existing complex of the thermal power plant "Ugljevik 1". The rest of the facilities are in poor condition and not in function. Most of the facilities within the scope are of an ancillary nature.

The subject locality where the construction of the new block of the thermal power plant is planned is located in the contact area where agricultural land predominates, which occupies flat and slightly undulating areas.

It is mainly arable agricultural land used for agricultural purposes. Smaller areas are under forest vegetation. The existing plots of agricultural land are fragmented, and according to the structure of use, they are mostly arable land, less under orchards. According to the land capability class, the land belongs to the group of good capability class of land with favourable conditions for use for agricultural purposes.

Within the subject location, there are no landscaped green spaces. The entire scope is the location of the future construction site of the power plant. In this regard, any activity related to landscaping is subordinated to the needs, organization and functioning of the thermal power plant.

Short description of the project with the data on its purpose and scope

The planned Thermal Power Plant "Ugljevik 3" will consist of two blocks, each with a capacity of 350 MW. Each unit will consist of one boiler, one turbine, and one generator.
It is envisaged that both blocks have a common system for water supply, fuel, limestone etc.
It is envisaged that the new block is divided in several fields, which presumes the construction of:

- main electric power building,
- coal supply system,
- cooling system,
- supporting facilities (central control building, transformer space, combined ash handling system, slag silo, fire powder silo, auxiliary boiler room, desulphurisation plant etc.).

For the cooling system, in accordance with the submitted Preliminary design, a technology that integrates the chimney and the cooling tower is provided. A coal transport system (coal dump, bunkers, etc.) is planned in the southern part of the plant.

The auxiliary system of the thermal power plant is provided in three parts:

- the first part is planned near the main area for electricity production, which includes the construction of an administrative building, service building, industrial wastewater treatment plant, pumping station and the like (planned in the northern part of the catchment);
- the second part is planned next to the secondary entrance located approximately 250 m west of the main electricity generation area. This part includes the construction of a water purification plant, (raw water), a pre-treatment station, combined pumping stations for water supply, etc. .;
- the third part is planned south of the coal dump. In this part, an ash silo, limestone, fuel tank, ammonium water storage space, maintenance building, warehouses, etc. .;
- an entrance is planned in the southern part which will ensure easier access to trucks.

The technical section of the new unit should consist of installation systems designed to work with supercritical steam parameters, and of primary facilities, including:

- Construction of the main building and control room - units - general construction and assembly works;
- Installation of CFB steam boiler / s with SNCR + SCR system;
- Installation of condensing turbine unit with planned gross production up to 350MWe;
- Auxiliary process equipment and systems in the main building;
- Equipment and systems for electricity supply for auxiliary facilities of the block;
- Water cooling system, including wet cooling tower, pumping station, water cooling pipelines, cooling water treatment plants;
- Auxiliary facilities (outside the main building), such as electrostatic precipitator and bag filter (ESP + FF), ammonia water system, external slag transport system, limestone crushing and separation system;
- Flue gas desulphurization unit with sorbent and gypsum handling systems;
- Power of electricity on generator voltage, by means of auxiliary and common transformers;
- Visualization, instrumentation and control system for equipment and auxiliary devices, etc.

For the needs of the technological process to provide the following:

- Turbine generator set - one-way two-cylinder condensing steam turbine with supercritical parameters, medium heating, rated power 350 MW;
- Generator of estimated power of 350MW;
- Generator cooling system;
- Cooling circuit;
- Separator and pumps for water recirculation;
- Air coolers;
- Lubricating system;
- Oil purification system (oil maintenance system);
- Sealing system;
- Drainage system;
- Units to supply control fluids;
- Condensing plant;

For auxiliary units provide:
- Stator water system;
- Compressed air system;
- Steam system;
- Auxiliary steam system;
- Condensate system;
- Condensate pump system;
- Supply water system;
- Sewage disposal station;
- Water cooling system;

For auxiliary systems and installation units provide:
- Steam and water sampling and analysis system:
- Condensing polishing system;
- Chemical dosing system;
- Ammonia storage and transport system;
- Absorption and flue gas system;
- Water process system;
- FGD wastewater treatment system;
- Slag removal system;
- Chemical water system;
- Industrial wastewater treatment system;
- Chemical laboratory with instruments for analysis and equipment;

For the hydraulic structure provide:
- Construction of a pump for water circulation;
- Construction of water circulation channels;
- Construction of a plant for coal wastewater treatment;
- Construction of a foamy fire room.

Heating, ventilation and air conditioning of spaces that require heating, ventilation and air conditioning (HVAC system) to provide from their own boiler room – heating station.
HVAC system shall include the central control building, the coal handling building, the chemical building, the laundry handling building, the ash handling building, the hydraulic building and other associated ancillary production facilities where required.

The heating steam comes from the steam for turbine deduction, which will produce heating water of 110/70°C.

Envisage the temperature mode of the network 110/70 ° C. Assume that the heating station is used for heating, ventilation and air conditioning systems of the entire plant, and its capacity is about 20 MW. Lay the pipe network for heating/cooling from the boiler room to the heated/cooled buildings underground or above ground. For heating and/or heating/cooling bodies in the heated/cooled areas, provide heaters and fan coil units (parapet, wall or ceiling).

In the space for the boiler room provide the following:

Single-pass CFB steam boiler/s of appropriate capacity, with interfacial steam super heater, equipped with auxiliary systems for:
- Transport, storage, drying and crushing of coal on the boiler side;
- Transmission, transport and heating process (boiler);
- Non - catalytic reduction of nitric oxide in SCAR + SCAR system ammonia - water;
- Drainage of flue gases from the boiler to the cooling tower through the flue gas ducts;
- Removal and transport of slag outside the boiler

The boiler / boilers are provided in three parts: furnace, cyclones (3 in total), return heaters and air device (air fan). Each boiler should be equipped with five steel bunkers and with eight electronic coal feeders with weights. For the same, provide a system for desulphurization of the furnace, a system for injecting inert material, an air system, an initial system for ignition with light fuel oil, a denitration system.
- SNCR, gas system, start-up system, etc.

Provide ventilation of the premises in a natural way, and where that is not possible, provide for forced ventilation. The type of equipment as well as other conditions for cooling, ventilation and air conditioning should be chosen at the request of the investor. As part of the plant where it is necessary, provide explosion, fire and corrosion protection.

Description of measures to prevent, reduce or attenuate harmful impact on the environment

In the course of developing the Environmental Impact Study, measures to prevent, reduce or attenuate the impact have been defined by analysing each of the possible kinds of impact.

The protection measures include the following:

- Air protection measures;
- Water protection measures;
- Land protection measures;
- Measures for noise protection;
- Measures to prevent and reduce the emergence of solid waste;
- Measures to protect vegetation, flora, fauna and ecosystem;
- Landscape protection measures;
- Measures to protect the natural and cultural/historical heritage;
- Measures to protect people's health;
- Infrastructure protection measures;

- Measures to be taken in case of greater proportion accidents;
- Plans and technical solutions for environment protection;
- Other measures that may affect the prevention or reduction of negative environmental impact.