“CENGIZ ENERJI SAN. VE TIC A.Ş.”

Construction of combined-cycle power plant with a capacity of 550 MW

Environmental and social impact assessment

Preliminary report

Book 3

125-1105-ESIA

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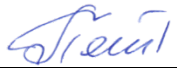
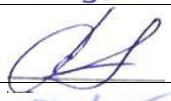
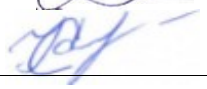
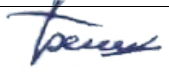
LIST OF PERFORMERS

Head, Project Coordinator	O. Vakhidova-Mordovina	
Chief ecologist	G. Petraeva	
Ecologist	L. Konanyuk	
Chief sociologist	B. Mavlyanov	
Acoustician	S. Kasimkhodjaeva	
Sociologist, communications specialist	M. Rasulmetov	
Ecologist/Atmospheric air specialist	N. Limankina	
Chemist-hydrologist	S. Kim	
Biodiversity specialist	N. Beshko	
Biodiversity specialist	T. Abduraupov	

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8. AREA OF INFLUENCE OF THE PROPOSED ACTIVITY

According to the IFC PS-1 definition, area of influence – an area (territory) that can be affected by:

- the project, activities and facilities of the Customer directly operated or managed by him (including his contractors) and included in the project;
- impacts of unplanned but foreseeable circumstances caused by the project that may occur at a later time or in a different location; or
- indirect impacts of the project on biodiversity or ecosystem services that are a means of livelihood for the affected communities.

The areas of influence of the combined cycle gas turbine power plant project include territories that will be directly and indirectly affected by the main objects of the project and its infrastructure.

The project area of influence on the environment includes:

- a plot of land directly intended for the construction of Project facilities;
- The site of the discharge of treated operational wastewater from a combined-cycle power plant into a water collection ditch.
- zone of permissible impact of the project on atmospheric air;
- municipal territories adjacent to the construction site (makhallas), including municipal territories within the boundaries of the SPZ of the power plant;
- zone of acoustic discomfort, including the zone of acoustic impact of the railway;
- territories where the risk to public health associated with chemical pollution of the atmosphere takes on minimal values (individual carcinogenic risk does not exceed 1.0E-06, hazard coefficients (HC) of substances do not exceed 0.1, hazard indices (HI) of effects on organs/systems are less than 1.0);
- the right-of-way lanes of associated facilities (highway, power lines, gas pipeline and water supply) and associated zones of chemical and acoustic pollution of atmospheric air.

The zone of influence of the project on atmospheric air, this is an area within the conditional boundaries of the total isoline of concentrations equivalent to 0.05 MPC of all pollutants (taking into account measures to reduce emissions), defines the territory beyond which the impact of the projected object becomes absolutely insignificant.

The social impact zone of the project includes territories associated with directly and/or indirectly affected communities, which can be influenced by the project facilities, its infrastructure facilities, which are used in the implementation of the planned activities.

The project area of influence on the social environment includes:

- land plots intended for the construction of power plant facilities
- municipal territories – makhallas adjacent to the power plant, within the boundaries of the SPZ;
- zone of indirect influence of the project (includes Jizzakh city as a whole, Sharaf-Rashidov district of Jizzakh region).
- the right-of-way lanes of associated facilities (highway, power lines, gas pipeline and water supply) and associated farm lands;

The main recipients include components of the social environment: personnel, population, infrastructure, as well as socio-economic factors (living conditions of the population, including employment, demographic shifts, social infrastructure, ethnic characteristics, etc.).

9. ENVIRONMENTAL IMPACT ASSESSMENT

9.1 Impact on atmospheric air quality

The Project is environment-friendly in terms of its impact on air quality, as it will benefit from the supply of state-of-the-art process equipment from leading global manufacturers with the lowest possible and best sectoral process emission rates.

Additional favourable effect of the Project on the airshed on a region-wide scale will be due to the progressive replacement of coal and fuel oil as energy carriers the use of which causes much greater environmental and sanitary-hygienic damage.

However, the Project's air quality impacts have been quantified using two alternative methodological approaches.

9.1.1 Assessment methodology

Two approaches were used to estimate above-ground concentrations of the major pollutants coming from the Project's source in above-ground air of the adjoining area.

1. **OND-86** is a non-Gaussian multiple-source regulatory dispersion model developed in USSR (1986) by the team of specialists of the Main Geophysical Observatory (MGO). It is based on analytical approximations of the numerical solution of the advection-diffusion equation which were obtained initially for point sources and then integrated to provide expressions for line and area sources (ETC/ACC 2004). Rather than actual concentrations corresponding to certain meteorological conditions, the model is intended for calculation of the worst-case concentration fields.

These dispersion fields comprise the values of 98th percentiles of the probability distribution functions (PDFs) of concentrations at a given set of receptor points. The results of calculations of concentrations of noxious pollutants are to be compared with Uzbek short-term ambient air quality standards called Maximum Permissible Concentrations (MPC). They correspond to the averaging time of twenty to thirty minutes (same intervals are also required to take samples or integrate instrumental readings when air quality monitoring is performed.

The use of OND-86 in Uzbekistan is obligatory when applying for emission permits, determining the emission standards ("maximum permissible emissions") when designing new industrial facilities. The outputs from the modelling exercise are used to define a sanitary protection buffer zone (SPZ). The OND-86 model calculates the distance at which pollutant concentrations are predicted to be above the Uzbek regulatory standards and thus, the geographic limit of the SPZ is delineated.

The OND-86 model is implemented by a large number of available software tools, one of which, VARSA-RADUGA, is used in our work to produce dispersion fields.

2. The parallel modelling of pollutant's dispersion was based on the globally recognised **AERMOD Gaussian System** developed by the American Meteorological Society (AMS) and Environmental Protection Agency (EPA) and adopted since 2000 as the EPA's preferred regulatory model for both simple and complex terrain. The software environment in which the application of AERMOD was carried out, is provided Lakes Environmental Software (version 10.2.1). Dispersion maps were generated for a significant number of points (more than 450) and a receptor height of 1.7 m, for all periods of meteorological observations from 01.01.2022 to 01.01.2024. The terrain was taken into account using the AERMAP processor with the Flat & Elevated algorithm based on the SRTM Global DEM database with a resolution of 30 m. Contour maps are provided for both annual mean and hourly mean periods (99.8th percentile). The predicted concentrations for conservatively

assume that emissions from all sources will occur simultaneously and all sources will function 100% of the time.

Each of the above models has its own advantages and limitations. In particular, the OND-86 algorithms provide calculation of maximum possible above-ground concentrations of pollutants under worst-case dispersion conditions, i.e. this model can be considered conservative, and the parameters of the air quality impact zone obtained by it as unlikely and corresponding to the worst-case combination of internal (cumulation of emissions from different sources) and external (meteorological conditions) factors. The advantages of AERMOD are a more detailed consideration of the impact of topography provided by the integration of a digital terrain model, as well as the ability to operate with any set of meteorological data.

Published results of verified application of the Gaussian AERMOD model and the OND-86 model[1] show that for NO_2 the convergence of results is generally satisfactory. Variations of air pollution fields between models reach 50-60 % at maximum with higher values obtained on the basis of OND-86 application.

In view of the above, modelling of pollutant dispersion in the atmosphere for the construction and operation phases has been carried out using the conservative OND-86 methodology.

More specifically, for the construction phase, the contribution of 15 individual emission sources, mostly ground-based, was taken into account, with emissions of 17 individual elements, compounds or substances calculated. The resulting dispersion fields, according to the initial modelling conditions, are isometric in structure with concentric isolines. Of all the listed pollutants, particulate matter (PM) will make the largest contribution to pollution. It is also important to consider he dispersion of compounds whose toxic effects have a threshold-free character - this group of pollutants is represented by benzo[a]pyrene (B[a]P). The calculation for the operational phase incorporates contribution of 14 emission sources, including two 60 m high chimneys, and 20 individual pollutants.

The Gaussian AERMOD model was used in parallel to calculate the dispersion of the two dominant pollutants, CO and NO_2, during the operational phase for the two main emission sources - 60 m high chimneys.

The results of the calculations are presented below, including their comparative analysis and benchmarking against national air quality standards.

9.1.2 Construction phase

The sources of pollutant emissions at the construction stage of the power plant will be construction machinery and vehicles:

- welding and painting works;
- concrete and mortar assembly;
- earth-moving equipment (bulldozers, excavators);
- assembly equipment (truck cranes, caterpillar cranes);
- construction machines and vehicles, forklifts.

Sources related to construction emit 15.435 tons of pollutants of 17 types into the

[1]The examples are: 1) Avaliani, et al. S.L. CALCULATION OF CONCENTRATION AND SHARP RISKS, ASSOCIATED WITH AIR POLLUTION BY REFINERIES USING THE MAXIMUM PERMISSIBLE EMISSION (MPE) AND «AERMOD» DISPERSION MODEL: COMPARISON BY KEYPOINTS AND INDIVIDUAL SOURCES // Environmental Protection in Oil and Gas Complex. 2018. No. 3;

2) Sakhalin Energy Investment Company. EIA Addendum. 0000-S-90-04-P-7069-09-E. Available at https://www.sakhalinenergy.ru/media/user/libraryeng/jap/h9en.pdf

atmosphere per year. The ejection power will be 5,584 g/s.

The calculations were performed on a site of 4200 x 7000 m, covering the territory of the sanitary protection zone of the enterprise and the nearest residential development of Sharaf Rashidov district. The step of the calculated grid on the site is assumed to be equal to 100 meters. Additionally, 19 calculation points were selected in the residential areas of Sharaf Rashidov district, the height of which corresponds to the level of respiration – 2 m.

Figure 9.1 illustrates the dispersion of pollutants, the emissions of which will be the most significant during the construction phase: emissions of particulates for which the greatest spread from sources is predicted will become the most important.

Numerical results of calculations are presented in the table (*Table* 9.1).

The assessment of atmospheric pollution at the construction stage showed that there were no exceedances of the maximum permissible concentrations established in the Republic of Uzbekistan [2] in residential areas of Sharaf-Rashidov district.

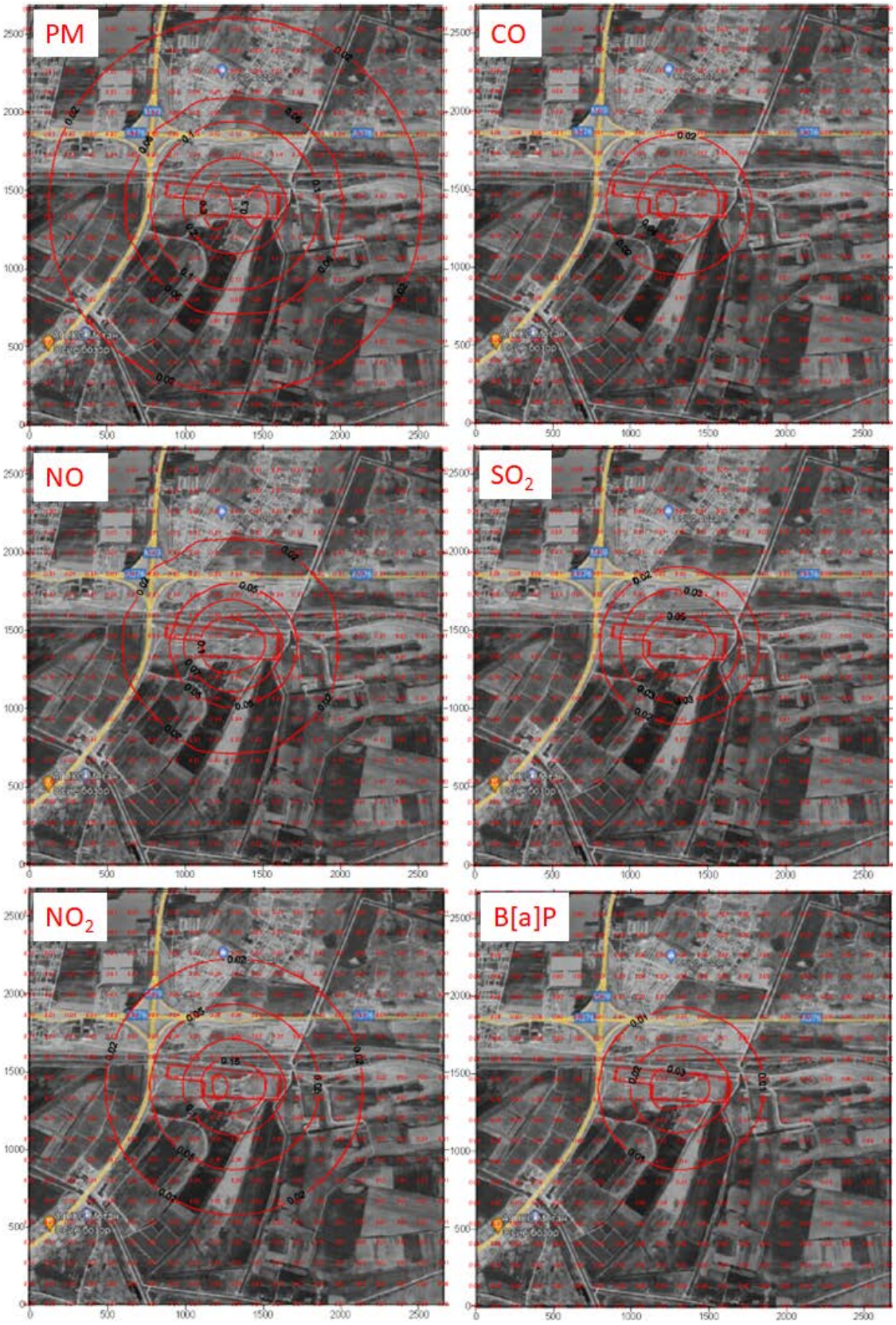


Figure 9.1The OND86-predicted dispersion fields of pollutants which are the most significant for the construction phase (numerical values on the maps are given in shares of relevant MPCs)

Table 9.1 Levels of air pollution at the construction phase

Pollutant		MPC type	Values of MPC and SRLI mg/m3	Hazard class	Maximum concentration on housing, MPC shares
1	Fe-bearing PM (as Fe_2O_3)	MPC max/one-time	0,200	3	0.03
		MPC av. daily	0.120		
		MPC av. annual	0,040		
2	Mn-bearing PM (as MnO_2)	MPC max/one-time	0.005	2	0.14
		MPC av. daily	0,003		
		MPC av. annual	0.001		
3	Nitrogen (IV) oxide Nitrogen dioxide)	MPC max/one-time	0.085	2	0.15
		MPC av. daily	0,060		
		MPC av. annual	0,040		
4	Nitrogen (II) oxide (Nitrogen monoxide)	MPC max/one-time	0.600	3	0.10
		MPC av. daily	0.250		
		MPC av. annual	0,060		
5	Hydrocarbons (CxHy)	MPC max/one-time	1.000	4	0.07
		MPC av. daily	-		
		MPC av. annual	-		
6	Sulfur dioxide	MPC max/one-time	0.500	3	0.05
		MPC av. daily	0,200		
		MPC av. annual	0.050		
7	CCarbon monoxide	MPC max/one-time	5.000	4	0.05
		MPC av. daily	4.000		
		MPC av. annual	3.000		
8	Carbon black (Soot)	MPC max/one-time	0.150	3	0.10
		MPC av. daily	--		
		MPC av. annual	--		
9	Benzo/a/pyrene	MPC max/one-time	1,00e-06	1	0.03
		MPC av. daily	1,00e-06		
		MPC av. annual	1,00e-06		
10	Formaldehyde	MPC max/one-time	0.035	2	0.07
		MPC av. daily	0.012		
		MPC av. annual	0,003		
11	Silicon oxide	MPC max/one-time	0.150	4	0.06
		MPC av. daily	-		
		MPC av. annual	-		
12	Fluorides (poorly soluble)	SRLI	0,200	2	0.04
13	White Spirit	SRLI	1.000	4	0.08
14	Hydrogen fluoride	MPC max/one-time	0.01	2	0.04
		MPC av. daily	--		
		MPC av. annual	--		
15	Xylene	MPC max/one-time	0.500	3	0.15
		MPC av. daily	0.350		
		MPC av. annual	0.150		
16	PM (total amount of inorganic dust)	MPC max/one-time	0.150	3	0,28
		MPC av. daily	0.100		
		MPC av. annual	0.050		

Pollutant		MPC type	Values of MPC and SRLI mg/m3	Hazard Class	Maximum concentration on housing, MPC shares
17	Cement dust	MPC max/one-time	0.500	2	0.14
		MPC av. daily	0,200		
		MPC av. annual	0.100		

The impact on atmospheric air during the construction period is characterized by a short duration, while the zone of excess pollution is localized outside residential buildings. Thus, exposure to atmospheric air during the construction period is acceptable.

9.1.3 Operational phase

It is planned to install a Siemens SGT5-4000F V10 gas turbine unit (GTU) with a capacity of 365.3 MW (50 Hz), manufactured in Germany (1 unit) on the territory of the combined-cycle power plant. Also, at the planned power plant, electric energy will be generated using a steam turbine (ST) “Siemens SST-700/900”, with a capacity of 185.3 MW, "manufactured in Germany.

In addition to the main equipment, the following equipment, installations and equipment will be used, as a result of which pollutants will also be released into the atmospheric air:

- diesel generator;
- hot water boiler;
- gas welding machines;
- electric welding machines;
- operation of metalworking machines;
- oil storage tanks;
- storage tanks for motor fuel;
- express laboratory;
- battery charging stations.

The main source of emissions of pollutants is the Siemens SGT5-4000F series gas turbine unit, which uses a new generation of technology, providing higher efficiency due to better aerodynamics of the compressor and turbine.

According to the Environmental Impact Statement (EIS project), taking into account the requirements for design solutions of a combined-cycle power plant, 20 pollutants are projected to be released into the atmosphere from the sources of emissions of the projected enterprise. The total emission of pollutants will be:

- the maximum one-time emission is 92.3693 g/s;
- the gross emission is 3046.52 tons/year.

Calculations of atmospheric pollution were carried out on a site of 4200 x 7000 m, covering the territory of the sanitary protection zone of the enterprise and the nearest residential development of the Sharaf Rashidov district. The step of the calculated grid on the site is assumed to be equal to 100 meters. Additionally, 32 design points were selected along the perimeter of the SPZ, with a height corresponding to the breathing layer of 2 m.

To account for the contribution of the facility to atmospheric pollution, calculations were performed for the future, taking into account the commissioning of the enterprise’s facilities (maximum one-time concentrations, average annual concentrations, average daily concentrations).

The OND-86 calculation results are presented in the Table 9.2. The maximum concentrations of pollutants at the border of the SPZ and residential areas will not exceed the established [2] standards for atmospheric air quality, taking into account the requirements [3] for the permissible content of pollutants in the surface layer of the atmosphere.

As distinct from the construction phase, for the most of pollutants in this case the dispersion fields are only marginally outside the footprint of the facility. As an example, Figure 9.2 provides a map of sulphur dioxide concentrations (in shares MPC). The dispersion fields of the two main emission components of the project facility, carbon monoxide and nitrogen dioxide, are shown below in comparison with the results of the AERMOD model.

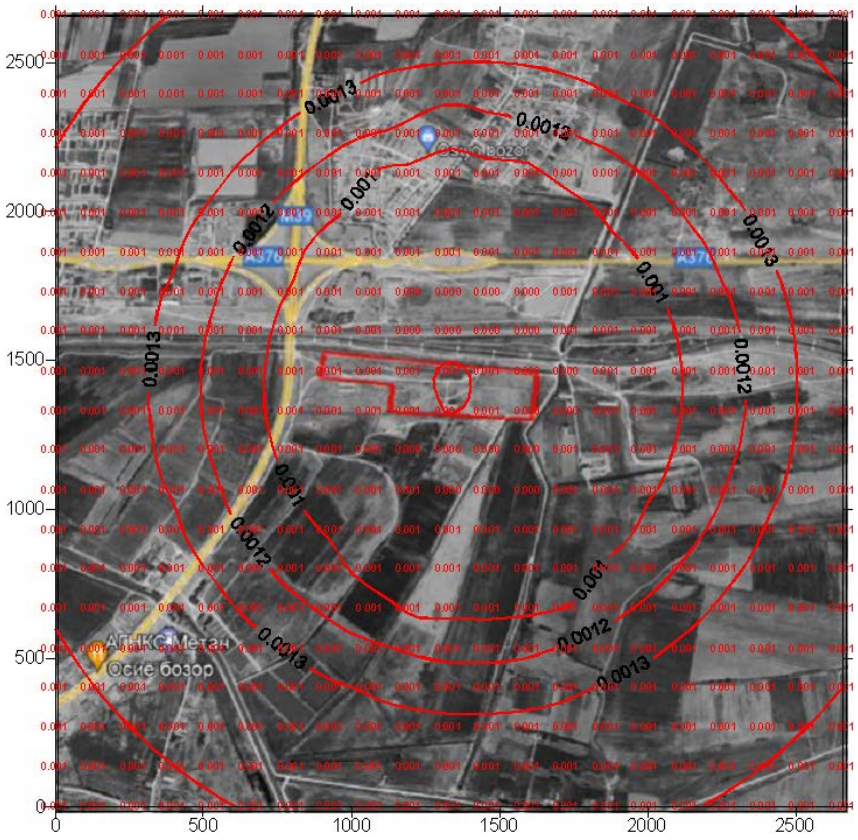


Figure 9.2 The OND86-predicted SO_2 dispersion field around the Project's facility during the operation phase (concentrations are in MPC shares).

As calculations have shown, the commissioning of the projected facility will not lead to a significant (more than 0.1 MPC) increase in atmospheric pollution in the territories adjacent to the combined-cycle power plant.

Table 9.2 Atmospheric pollution levels at the operational phase

Name of the pollutant		MPC or SRLI mg/m3		Hazard class	The established quota (in shares of MPC)	Maximum concentration in fractions of MPC	Compliance with the established quota (+/-)
1	Hydrogen fluoride	MPC av. daily	0.01	2	0,25	0.066	+
		MPC av. annual	0.005			<0,01	+
2	Fe-bearing PM (as Fe_2O_3)	MPC max/one-time	0,2	3	0,33	0,0031	+
		MPC av. daily	0,12			<0,01	+
		MPC av. annual	0.04			<0,01	+
3	Silicon oxide	SRLI	0.15	3	0,33	0,0031	+
4	Mn-bearing PM (as MnO_2)	MPC max/one-time	0.005	2	0,25	0.0035	+
		MPC av. daily	0,003			<0,01	+
		MPC av. annual	0.001			<0,01	+
5	Nitrogen (IV) oxide (Nitrogen dioxide)	MPC max/one-time	0.085	2	0,25	0.206	+
		MPC av. daily	0.06			0.01	+
		MPC av. annual	0.04			0.01	+
6	Nitric acid	MPC max/one-time	0.4	3	0,33	<0,01	+
		MPC av. daily	0.3			<0,01	+
		MPC av. annual	0.15			<0,01	+
7	Nitrogen (II) oxide (Nitrogen monoxide)	MPC max/one-time	0.6	3	0,33	0,006	+
		MPC av. daily	0,25			<0,01	+
		MPC av. annual	0.06			<0,01	+
8	Sodium hydroxide	MPC max/one-time	0.1	3	0,33	<0,01	+
9	Hydrochloric acid	MPC max/one-time	0.02	2	0,25	0.0002	+
		MPC av. daily	0.01			<0,01	+
		MPC av. annual	0.005			<0,01	+
10	Sulfuric acid	MPC max/one-time	0.3	3	0,33	0,0001	+
		MPC av. daily	0.2			0.01	+
		MPC av. annual	0.1			<0,01	+
11	Hydrocarbons	MPC max/one-time	1	4	0.5	<0,01	+
		MPC av. daily	0.5			<0,01	+
		MPC av. annual	0.025			<0,01	+
12	Sulfur dioxide	MPC max/one-time	0.5	3	0,33	0.001	+
		MPC av. daily	0.2			<0,01	+
		MPC av. annual	0.05			<0,01	+
13	Carbon monoxide	MPC max/one-time	5	4	0.5	0.018	+
		MPC av. daily	4			<0,01	+
		MPC av. annual	3			<0,01	+

Name of the pollutant		MPC or SRLI mg/m3		Hazard class	The established quota (in shares of MPC)	Maximum concentration in fractions of MPC	Compliance with the established quota (+/-)
14	Fluorides (poorly soluble)	MPC max/one-time	0,2	2	0,25	0.0044	+
		MPC av. daily	0.1			<0,01	+
		MPC av. annual	0.05			<0,01	+
15	Ammonia	MPC max/one-time	0,2	4	0.5	0,0001	+
16	Ethanol	MPC max/one-time	5	4	0.5	<0,01	+
17	Acetic acid	MPC max/one-time	0,2	3	0,33	0,0003	+
		MPC av. daily	0.012			<0,01	+
		MPC av. annual	0.06			<0,01	+
18	Aerosol emulsifier	MPC max/one-time	0.1	3	0,33	<0,01	+
19	Abrasive dust	SRLI	0,040	3	0,33	0.022	+
20	Metal dust	MPC max/one-time	0,2	3	0,33	0.027	+
		MPC av. daily	0,12			<0,01	+
		MPC av. annual	0.04			<0,01	+

Two dominating sources of pollutant emissions have been included in the AERMOD calculation (Table 9.3), both being 60 m high stacks (chimneys). The significance of the sources was determined by the level of annual emissions.

Table 9.3 Emission sources the contribution of which is taken into account when modelling dispersion of CO and NO_2 using AERMOD algorithms

Emission source according to design documents	Equipment	Height (m)	Diameter (m)	Gas-and-air mixture parameters at the source outlet			Emission Rates	
				Emission intensity (m/s)	Volumetric flow (m^3/s)	Outlet temperature (ºC)	g/s	TPA
NO_2								
1	Stack	60	7.2	11.9	484.3	120	18.87	558
2	Stack	60	7	0.1	4.035	120	0.272	7.654
CO								
1	Stack	60	7.2	11.9	484.3	120	83.6	2347.67
2	Stack	60	7	0.1	4.035	120	0.697	19.564

As initial meteorological data, the data archive of Jizzakh meteorological station in all observation periods for 2 years was used. Air temperature, atmospheric pressure, relative humidity, cloudiness and precipitation during the observation period, height of the lower boundary of clouds, wind direction and speed were considered.

According to its data, the most frequent wind directions are North and East (Table 9.4). The winds of these points are the most powerful in comparison with other directions. However, in general, wind speeds in this area are relatively low (annual average wind speed - 1.25 m/s), and more than 38% of the year there are doldrums (winds of less than 1 m/s).

Table 9.4 Frequency of winds of different directions and speed, % (N – North, E – East, S – South, W – West)

Wind direction	Wind speed, m/s										Total
	1	2	3	4	5	6	7	8	9	10	
E	1.9	2.2	0.9	0.1	0.1	-	-	-	-	-	5.28
ENE	1.3	1.5	0.9	0.1	-	-	-	-	-	-	3.78
ESE	1.3	1.4	0.5	0.2	-	0.1	-	-	-	-	3.40
W	1.5	0.9	0.6	0.3	0.2	0.1	0.1	0.1	0.1	-	3.92
WNW	0.9	0.4	0.3	0.2	0.1	-	0.1	-	-	-	2.15
WSW	0.8	0.6	0.3	0.1	-	0.2	-	-	-	-	1.94
N	2.6	2.2	1.0	0.5	0.3	0.1	-	-	0.1	-	6.67
NE	2.4	2.8	1.7	0.4	0.1	-	-	-	-	-	7.42
NW	1.5	0.8	0.5	0.4	0.2	0.1	0.1	-	-	-	3.64
NNE	2.8	1.9	1.3	0.4	0.1	-	-	-	-	-	6.44
NNW	1.8	1.2	0.5	0.2	0.2	0.1	0.1	-	-	0.1	4.19

Wind direction	Wind speed, m/s										Total
	1	2	3	4	5	6	7	8	9	10	
S	2.0	0.9	0.1	-	-	-	-	-	-	-	3.03
SE	1.7	0.9	0.2	0.1	-	-	-	-	-	-	2.86
SW	1.1	0.6	0.3	0.1	0.1	-	-	-	-	-	2.11
SSE	1.5	0.7	0.2	0.1	-	-	-	-	-	-	2.52
SSW	1.2	0.5	0.1	0.1	-	-	-	-	-	-	1.91
Calm	38.7										

For the air quality impact assessment, estimated points in the borders of residential and public areas were established (Table 9.4).

Table 9.5 List of estimation points and estimated above-ground concentrations of CO and NO_2 (mkg/m^3)

No.	CO_{hour}	CO_{annual}	NO_{2hour}	$NO_{2annual}$	Location	Comment
1	101	10	38	0.7	67°56'36"E 40°5'47"N	Osiyo qurulish mollari bozori
2	<50	<9	18	< 0.5	67°56'46"E 40°5'53"N	South boundary of Olmachi mahallasi
3	<50	<9	16	< 0.5	67°57'8"E 40°5'49"N	Landfill
4	199	18	59	1.9	67°56'14"E 40°5'46"N	Fuel station
5	83	<9	19	< 0.5	67°56'7"E 40°5'13"N	Turkkishlak border
6	<50	<9	19	< 0.5	67°56'12"E 40°5'9"N	
7	334	31	81	5	67°56'13"E 40°5'39"N	
8	<50	<9	16	< 0.5	67°57'1"E 40°5'53"N	South boundary of Olmachi mahallasi

The maximum hourly average 99.8th percentile NO_2 concentration at the receptor site would be 95% of the maximum permissible regulatory limit (MPC_{hour}). Cumulative emissions will not result in a violation of the established air quality standards, therefore there is a reserve for sustainable development. Annual average air quality will also remain largely unchanged outside the Project Area.

The calculated CO content in the surface layer of the atmosphere in the modeling area does not reach the maximum permissible values anywhere. Within other calculation points, the maximum calculated value reaches only 6.8% of the maximum permissible concentration.

For the air quality impact assessment, estimated points in the borders of residential and public areas were established (Table 9.6).

The maximum hourly average 99.8th percentile nitrogen dioxide concentration at the receptor site would be 95% of the maximum permissible regulatory limit (MPC_{hour}). Cumulative emissions will not result in a violation of the established air quality standards; therefore, there is a reserve for sustainable development. Annual average air quality will also remain largely unchanged outside the Project Area.

The calculated CO content in the surface layer of the atmosphere in the modeling area does not reach the maximum permissible value anywhere. Within other calculation points, the maximum calculated value reaches only 6.8% of the maximum permissible concentration.

Table 9.6 List of estimation points and estimated above-ground concentrations of CO and NO_2 (mkg/m^3)

No.	CO_{hour}	CO_{annual}	NO_{2hour}	$NO_{2annual}$	Location	Comment
1	101	10	38	0.7	67°56'36"E 40°5'47"N	Osiyo qurulish mollari bozori
2	<50	<9	18	< 0.5	67°56'46"E 40°5'53"N	South boundary of Olmachi mahallasi
3	<50	<9	16	< 0.5	67°57'8"E 40°5'49"N	Landfill
4	199	18	59	1.9	67°56'14"E 40°5'46"N	Fuel station
5	83	<9	19	< 0.5	67°56'7"E 40°5'13"N	Turkkishlak border
6	<50	<9	19	< 0.5	67°56'12"E 40°5'9"N	
7	334	31	81	5	67°56'13"E 40°5'39"N	
8	<50	<9	16	< 0.5	67°57'1"E 40°5'53"N	South boundary of Olmachi mahallasi

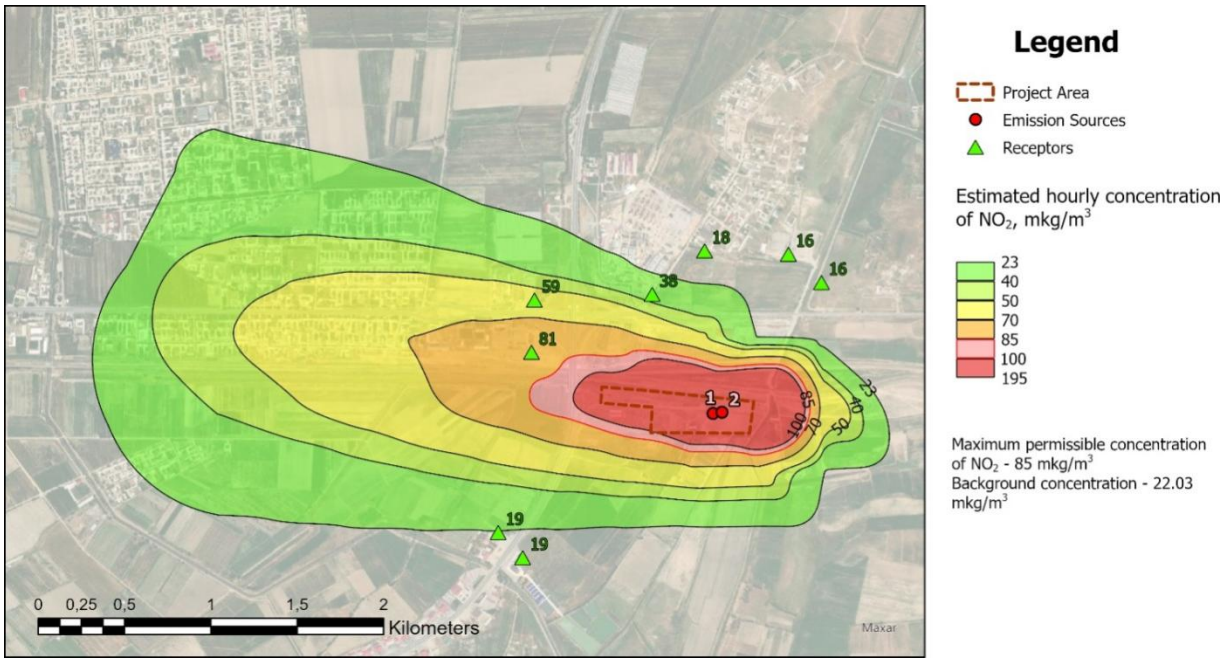
The illustrations below (Figures 9.3, 9.4) combine the nitrogen dioxide and carbon monoxide dispersion charts obtained by the OND-86 (lower boxes, in MPC units) and AERMOD algorithms (upper boxes with coloured scales in concentration units). Whilst there remains some uncertainty in the identification of background concentrations of air pollutants in the Project area[2], the values obtained generally characterise the site's contribution as insignificant and not creating an excessive presence of pollutants at the boundary of the Project's neighbouring land uses.

[2] The calculations in the OND-86 model were carried out without taking into account the background levels of pollutants, i.e. the maps show only the impact of the Project. The Supplemental Background Study (Ref. No. 125-1105-Bio - CENGIZ ENERJI SAN. VE TIC A.Ş., 2024) provides instrumental measurements of nitrogen dioxide concentrations with a 20-day average of 22.03 µg/m3. At the same time, data on carbon monoxide were not provided.

The concentrations obtained by the two models differ in the integration time: in the case of AERMOD it is 1 hour (Figures 9.3, 9.4) or 1 year (Figure 9.5); the OND-86 model operates with 20-minute or so-called maximum short-term pollutant concentrations.

The background value of 22.03 µg /m3 (as the highest of those measured at the stage of background air pollution assessment) was used for calculations of surface NO2 concentrations. The calculated CO concentration is given without a background due to a lack of measurement data.

The dispersion fields obtained by AERMOD modeling have a significant extension in the westward direction. This is due to the terrain features - on the eastern side of the Project Area within 500 m the height difference is 20 m, which is an obstacle for pollutants spreading in the eastern direction.



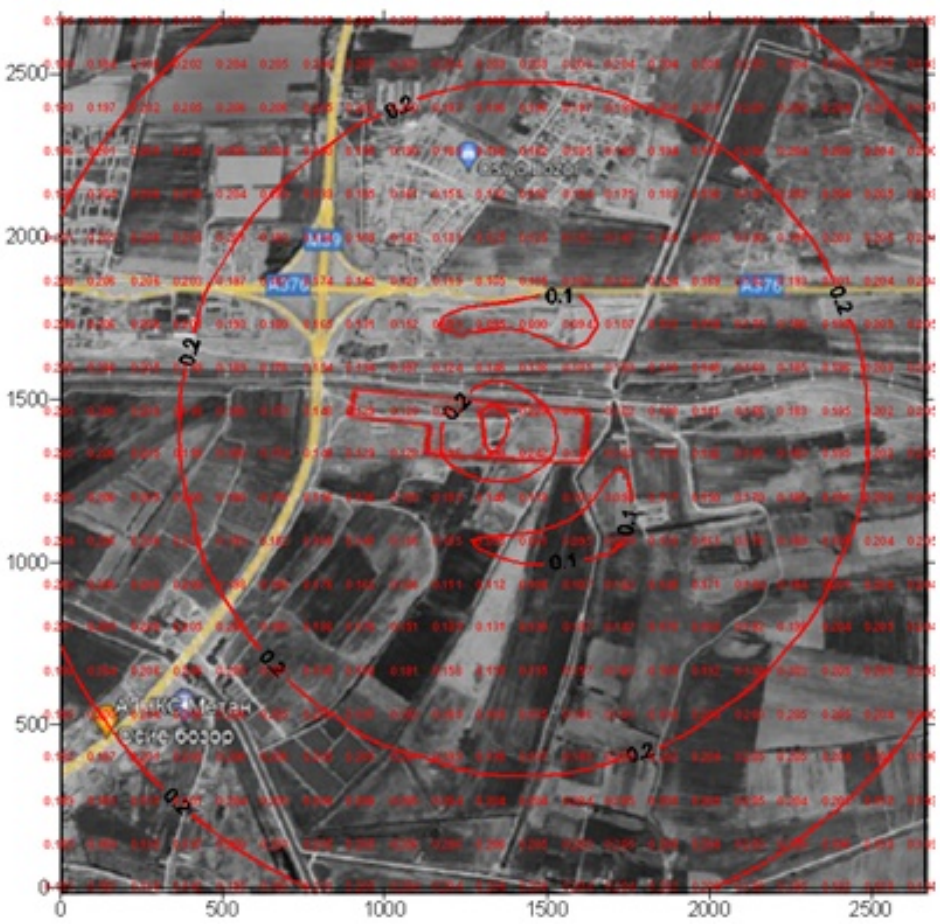
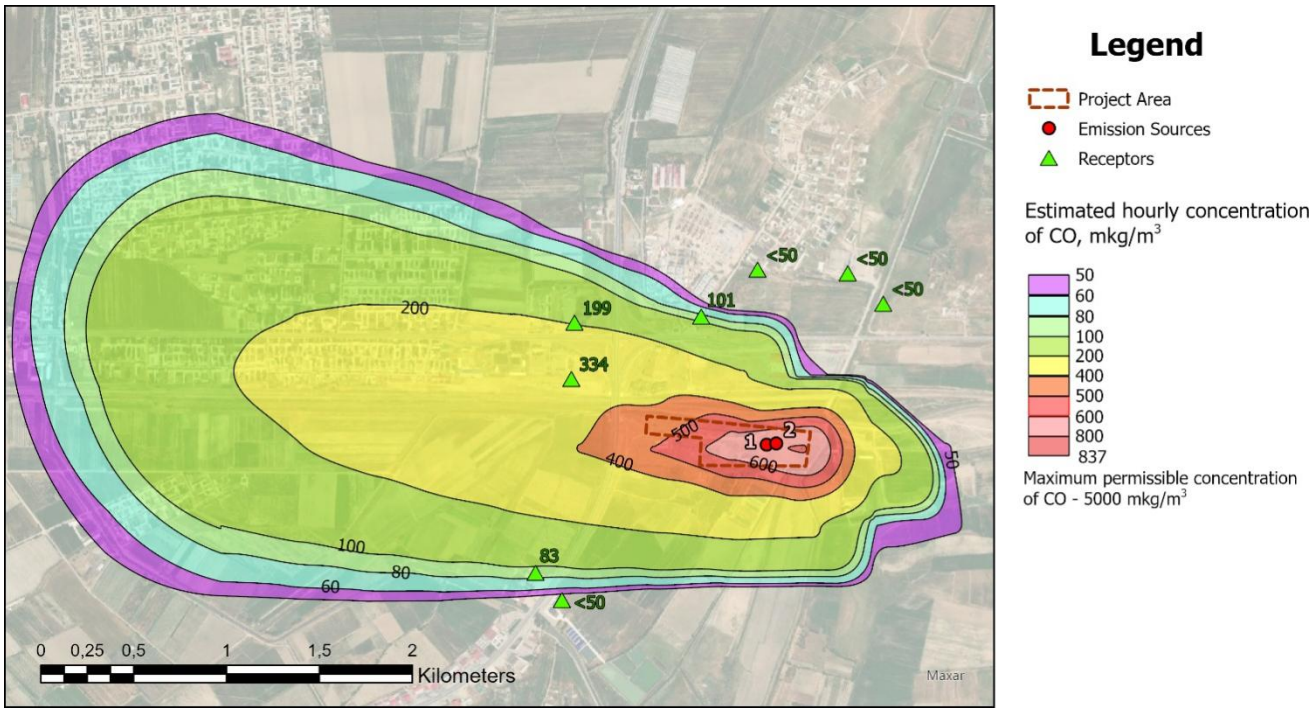


Figure 9.3 AERMOD- and OND86-predicted short-term concentrations of NO2 for the operation phase (concentrations on the bottom map are given in MPC shares)



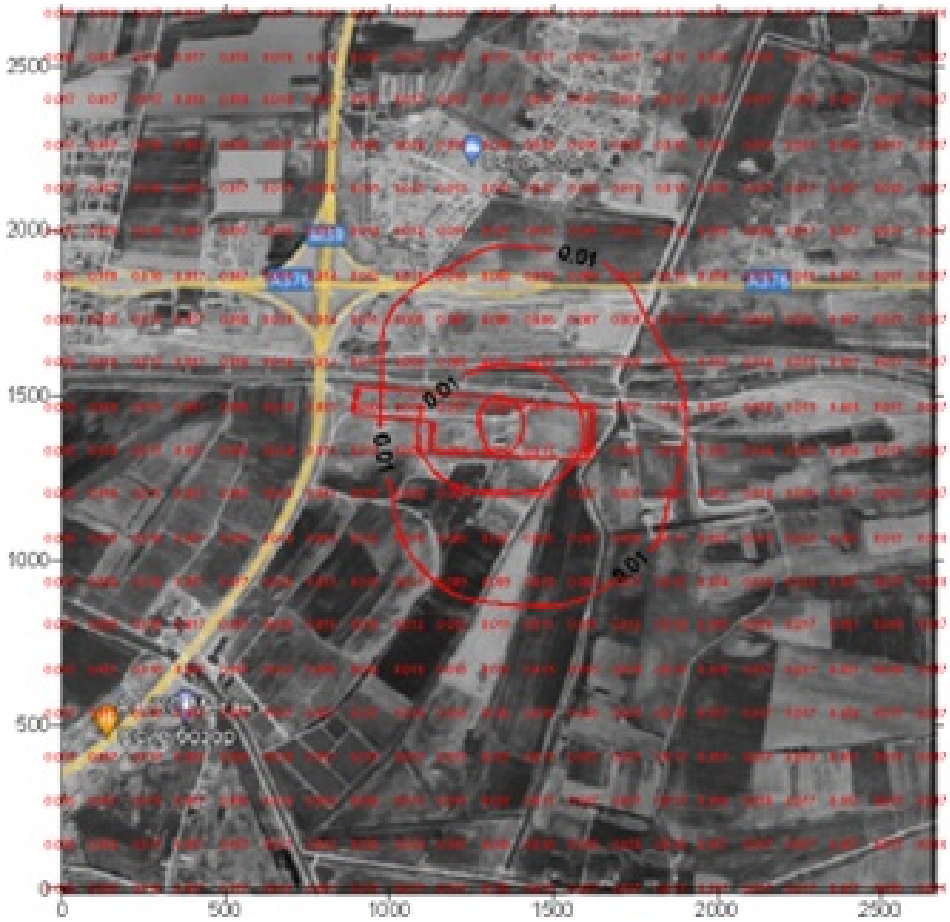


Figure 9.4 AERMOD- and OND86-predicted short-term concentrations of CO for the operation phase

The calculations performed appear to be sufficient as OND-86 modelled the integral contribution of all existing emission sources for a worst-case dispersion situation and the Gaussian AERMOD model showed the configuration and extent of the plume produced by the two dominant sources - 60 m high chimneys - for the two main pollutants, carbon monoxide and carbon dioxide.

Neither at the moment of exposure (20 mins, 1 hour) nor under long-term exposure conditions (1 year) would the Project impact generate above-normal concentrations of these and other elements and compounds, including taking into account their background presence and the impact of neighbouring sources of atmospheric pollution.

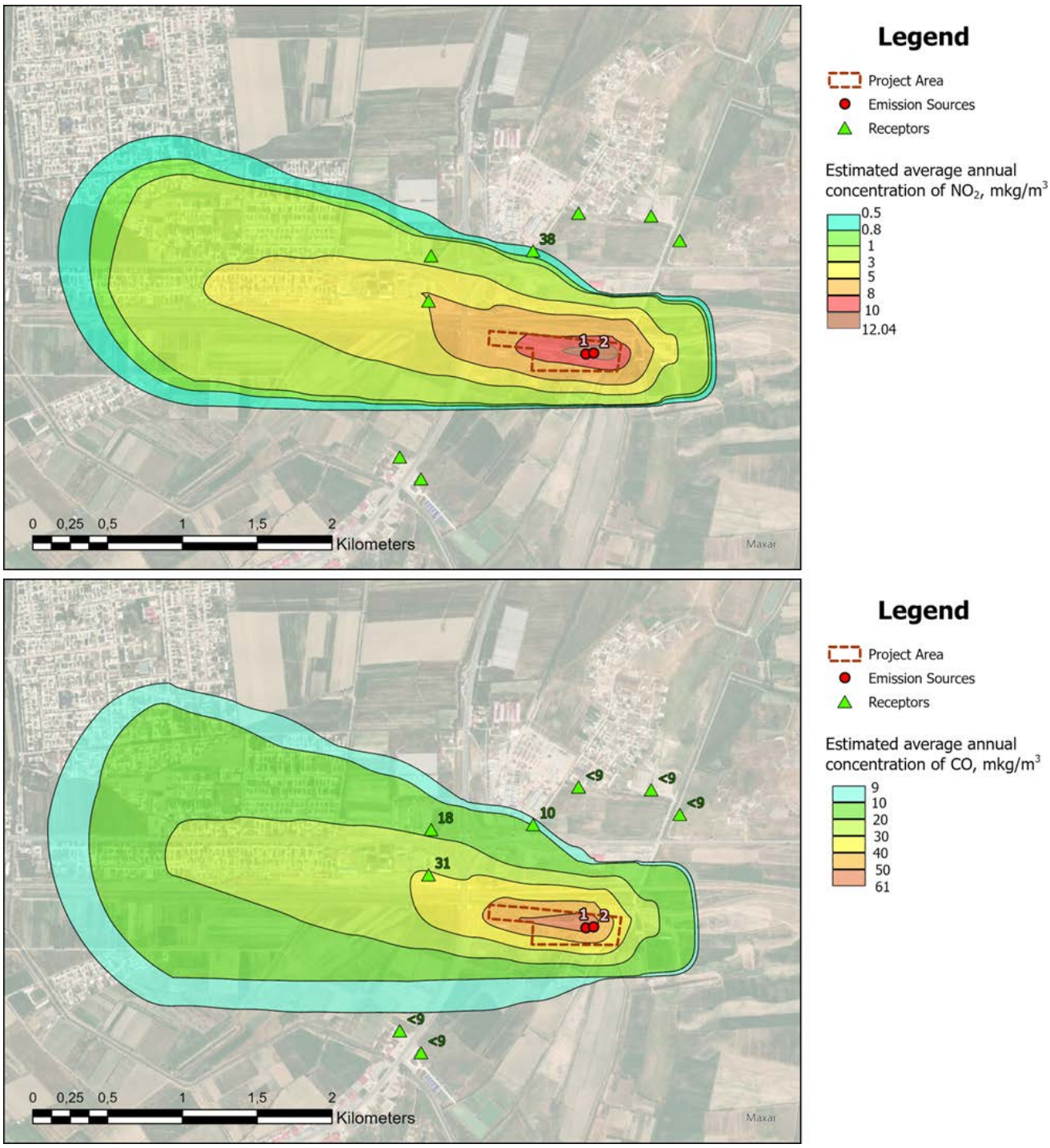


Figure 9.5 AERMOD-predicted average annual concentrations of NO_2 and CO for the operation phase

Thus, the associated exposure risk assessments showed that:

- the maximum level of the total individual carcinogenic risk of SPZ throughout life at the border and outside the boundaries of the design SPZ of the enterprise does not exceed the value of 1.0 E-04, which corresponds to a low/acceptable risk level.
- The values of non-carcinogenic risk at the border of the SPZ of the enterprise and in the residential area are characterized by a low level. The coefficients (HQ) and indices (HI) of the danger of acute and chronic exposure do not exceed the permissible values (1.0 and 3.0, respectively).

- It has been established that at the border and outside the limits of the design SPZ of the enterprise, in the residential development zone, there are no exceedances of the reference (RfC) concentrations of acute and chronic exposure to all priority pollutants. Thus, atmospheric air pollution outside the boundaries of the SPZ of a combined-cycle power plant does not exceed acceptable levels for any risk indicator, and exposure is permissible based on the risk to public health created.

9.1.4 Recommendations

9.1.4.1 Measures to prevent and mitigate impacts

Construction stage

To prevent chemical pollution of the atmosphere at the construction stage, planning solutions are used: the construction site is as far away from residential areas as possible.

The following organizational and technical measures are recommended to mitigate the effects of pollutants on the atmospheric air:

- organization of construction in strict accordance with the planning, technological and technical solutions of the project;
- carrying out work in accordance with good practice, compliance with the rules of work, the involvement of personnel with the necessary qualifications for the production of work;
- monitoring of the technical condition of engines and exhaust systems of vehicles, machinery (bulldozers, excavators, cranes) to exclude the operation of machinery with increased emissions of pollutants;
- exclusion of the operation of car engines and construction equipment at a time when work is not being carried out.

Operational stage

To prevent chemical pollution of the atmosphere at the operational stage, the designed facility uses:

- Organization of the production process using a combined cycle gas plant. The connection of gas turbine units and steam turbines into a single unit allows to reduce the loss of heat from the exhaust gases of gas turbine units, it is useful to use gases in a recovery boiler, get additional power and increase efficiency compared with steam turbine and gas turbine power plants, reduce emissions of pollutants, in particular nitrogen oxides into the atmosphere.
- organization of a sanitary protection zone, planting of trees.

9.1.4.2 Monitoring and reporting

Measures to monitor the impact of the Power Plant on the atmospheric air quality consist of three components:

- Continuous monitoring of exhaust gas in automatic mode,
- Annual monitoring of exhaust gas at stacks with sampling and analysis, and
- Monitoring of air quality in the working and sanitary protection zones, as well as at the border of the nearest territories with standardised atmospheric air quality.

According to the Project Design Documentation[3], the delivery package of the gas turbine includes a continuous emission monitoring system (CEMS), which is to be integrated into the exhaust gas system of the Power Plant. The CEMS meets the requirements of the EN 14181 QAL1 standard for automated measuring systems of stationary emission sources.

The CEMS will measure NOx presence in exhaust gases by extractive sampling (or using mobile equipment). In order to detect both nitrogen oxides (NO and NO_2), either the measurement gas passes a NO_2/NO converter upstream of the analyzer's NO channel, or separate analyzers are used for NO and NO_2.

The mean emission value for each test period shall be calculated from valid single readings based on plausible CEMS signals (e.g. no re-calibration procedure active, no failure on measuring equipment) only.

The CEMS will be installed prior to the first fire of the gas turbine. It has an auto-calibration procedure for cyclic calibration of zero and/or span calibration according to the analyzer's requirements. Span calibration of the analyzers shall be done using certified calibration gas with a maximum uncertainty of 1 %.

In addition to the continuous automated monitoring of NOx presence in exhaust gas, the stack emissions will be tested annually for the same compounds to make sure that the CEMS works properly and provides the Plant's operator with correct data on emissions. To perform this testing, both stacks will be equipped with a sampling system.

To control chemical pollution of atmospheric air, it is proposed to measure the level of pollution at points that simultaneously meet the following conditions:

- maximum proximity to the SPZ of the facility;
- minimum distance to territories (sites, facilities) with normalized habitat quality;
- the closest approximation to the zones of maximum levels of chemical pollution and maximum values of the risk criteria for public health associated with the facility.

The following points of instrumental control of atmospheric air quality (PCA) correspond to the specified criteria:

Table 9.7 List and description of points of sanitary and hygienic control of atmospheric air quality

Point No	**Address / spatial reference**	**Geographical coordinates of the point**	
PCA-1	Residential development near the construction site	40° 5'25.18"N	67°56'45.57"W
PCA-2	Gas distribution station near the construction site	40° 5'25.99"N	67°56'25.02"W
PCA-3	Cemetery behind the railway line	40° 5'38.85"N	67°56'27.38"W

The research (measurement) program includes harmful (polluting) substances for which, according to the results of dispersion calculations at the border of the sanitary protection zone and at the border of the nearest residential development and/or other

[3] Jizzakh. SGT5-PAC 4000F. Technical Proposal. Rev. 2. – Siemens Energy, 2023

territories with normalized indicators of habitat quality:

- specific substances characteristic of industrial emissions of the facility;
- substances that form the main risk to public health at the border of the sanitary protection zone and residential development in the area of influence of the enterprise of more than 1.0 HQ (hazard coefficient) and/or individual carcinogenic risk of more than $1 * 10^{-4}$ (control is carried out by average daily surface concentrations).

Based on the criteria of risk to public health, in order to control the average daily concentrations, the following substances should be included in the research (measurement) program:

- nitrogen dioxide;
- sulfur dioxide;
- nitrogen oxide;
- carbon monoxide; and
- dust (particulate matter with separated identification of PM10 and PM2.5 fractions).

Chemical sampling is carried out for at least 10 days for each substance at each point, once every 6 months.

The results of all measurements shall be documented in protocols (in case of separate sampling and analysis of samples – by sampling logs/reports, laboratory requests, and testing certificates).

According to the monitoring results, corrective actions are taken when determining the excess impact of sources of pollutants of the facility on residential areas:

- identification of sources that make the greatest contribution to air pollution;
- development and implementation of additional air protection measures.

Proposals for ambient air monitoring and reporting are presented in Table 9.4.

The above-described monitoring regime for the Power Plant's impact on air quality complies with the requirements of the legislation of the Republic of Uzbekistan, as well as the IFC Environmental, Health, and Safety Guidelines for Thermal Power Plants (for gas turbines with a capacity of more than 50 MWth, with predicted incremental impact on the ambient air quality less than 25 per cent[4]).

9.1.5 Assessment results

The matrix of atmospheric air assessment results is shown in Table 9.8

It is established that the significance of the impact of the planned activity on the state of the atmosphere is estimated as negligible at the construction stage and low at the operation stage, taking into account the proposed measures to minimize it.

[4] According to the results of background air quality monitoring in the station area cited above, NO_2 concentrations at the observation points varied in the range from 17 to 78 µg/m^3 with an average value of about 40 µg/m^3 (22 µg/m^3 was taken as a local reference level) and a maximum permissible value of 85 µg/m3 for a 20-minute averaging interval. Modelling of the emitted NO_2 dispersion has shown that the contribution of the Power Plant at the border of the nearest regulated areas will not significantly affect air quality even under the worst atmospheric conditions.

Table 9.8: Measures to prevent and mitigate exposure to atmospheric air

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Implementation method/ reporting
I.	**Construction stage**					
1.	Construction works (excavation, general construction, welding, painting) Transport and logistics (delivery of raw materials, fuels and lubricants, other transportation)	Prevention of excess atmospheric pollution Mitigation of the impact of pollutants on the atmospheric air Compensation for excess atmospheric pollution	Planning solutions (removal of the construction site from residential areas) organization of construction in strict accordance with the planning, technological and technical solutions of the project carrying out work in accordance with good practice, compliance with the rules of work, the involvement of personnel with the necessary qualifications for the production of work monitoring of the technical condition of engines and exhaust gases of cars, bulldozers, excavators, and other equipment to exclude the operation of equipment with increased emissions of pollutants exclusion of the operation of car engines and construction equipment at a time when work is not being done	SanR&N RUz N 0293-11 IFC General EHS Guidelines sections 1.1 and 4.1. The interstate standard GOST 31967- 2012. GD 52.04.186-89 “Atmospheric Pollution Control Guidelines”	Measurement of atmospheric pollution levels in adjacent residential areas in accordance with the proposed schedule inspections at the construction site	Implementation of environmental management measures in accordance with the project documentation and the construction organization project compliance with the requirements of national legislation in the field of environmental protection training of construction contractor’s personnel and maintaining their awareness reporting on the results of measuring atmospheric pollution levels, reporting on inspection results

II.	Operational stage					
2.	The main production process Provision of basic production activities Transport and logistics (delivery of raw materials, fuels and lubricants, other transportation)	Prevention of excess atmospheric pollution Mitigation of the impact of pollutants on the atmospheric air Compensation for excess atmospheric pollution	organization of a sanitary protection zone, planting of trees. organization of the production process using the latest combined cycle gas plant.	SanR&N RUz N 0293-11 IFC General EHS Guidelines, section 1.1 IFC Guidelines on EHS for Metallurgical Plants, sections 1.1 and 2.1 IFC Guidelines on EHS for cement and lime production, sections 1.1 and 2.1 IFC Guidelines on EHS for Thermal Power Plants, sections 1.1 and 2.1 GD 52.04.186-89 “Guidelines on atmospheric pollution control”	Measurement of atmospheric pollution levels in adjacent residential areas in accordance with the proposed schedule control of pollutant emissions at sources in accordance with the schedule developed in the draft environmental regulations	Implementation of environmental management measures in accordance with the project documentation of the enterprise and the List of measures for the technical modernization of sources of pollutants into the atmosphere compliance with the requirements of national legislation in the field of environmental protection training of the company’s personnel and maintaining their awareness reporting on the results of measurements of atmospheric pollution levels reporting on the results of monitoring the emission values at the sources

Table 9.9 Air Impact Assessment Results Matrix,

Stage of the life cycle: construction
Recipient: population
Recipient sensitivity: average
Characteristics of impacts

Impact	Chemical pollution of the atmosphere on the territory of residential buildings and territories with standardized quality indicators of the environment		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low
Consequences	Violation of the living conditions of the population (influence on the respiratory organs), indirect effects on flora and fauna, soils				
Measures	Planning solutions (removal of the construction site from residential areas) organization of construction in strict accordance with the planning, technological and technical solutions of the project carrying out work in accordance with good practice, compliance with the rules of work, and the involvement of personnel with the necessary qualifications for the production of work monitoring of the technical condition of engines and exhaust systems of cars, bulldozers, excavators, and cranes to exclude the operation of equipment with increased emissions of pollutants exclusion of the operation of car engines and construction equipment at a time when work is not being done implementation of measures for technical modernization of existing sources of emissions of pollutants into the atmosphere				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Negligible

Life cycle stage: operation
Recipient: population
Recipient sensitivity: average
Characteristics of impacts

Impact	Chemical pollution of the atmosphere on the territory of residential buildings and territories with normalized environmental quality indicators		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate
Consequences	Violation of the living conditions of the population (influence on the respiratory organs), indirect effects on flora and fauna, soils				
Measures	organization of a sanitary protection zone. Organization of the production process using the latest combined cycle gas plant and other equipment.				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Domestic	Long-term	Reversible	Small	Low

Sources

1. The Law of the Republic of Uzbekistan “On the Protection of Atmospheric Air”, 1996
2. SanR&N of the Republic of Uzbekistan No. 0293-11 Hygienic standards. List of maximum permissible concentrations (MPC) of pollutants in the atmospheric air of populated areas on the territory of the Republic of Uzbekistan.
3. Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the Regulations on the procedure for the development and approval of draft environmental standards” No. 14 dated on 22/11/2018.
4. IFC. General Environment, Health and Safety Guidelines. General EHS Guidelines.
5. IFC. General Environment, Health and Safety Guidelines. Thermal power plants.

9.2 Assessment of climate change

The adoption of systemic measures to mitigate the effects of climate change is of paramount importance for the Republic of Uzbekistan, as they have a decisive impact on agriculture and water resources, with hydropower being the most important sector of the country’s economy.

9.2.1 Greenhouse gas emissions

9.2.1.1 The national context

Uzbekistan is a party to the following international treaties in the field of combating climate change:

- United Nations Framework Convention on Climate Change (1992) – since 1994;
- Paris Agreement on Climate Change (2015) – from 2017

In accordance with the Paris Agreement, Uzbekistan undertakes to:

- formulate and publish a long-term development strategy that ensures low greenhouse gas emissions based on national conditions;
- prepare and implement national climate adaptation plans;
- encourage innovation – the development and transfer of appropriate technologies;
- carry out the preparation of reports, including the preparation of National communications, biennial reports, etc.;
- ensure international cooperation on climate change issues, including the development of early warning systems; emergency preparedness, assessment and management of climate risks, etc.

In order to fulfill the obligations under the Paris Agreement, Presidential Decree PP-4477 dated 04.10.2019 developed and adopted a “Strategy for the transition of Uzbekistan to a “green” Economy for the period 2019-2030”.[5]

In recent years, together with development partners (UNDP, the World Bank, FAO,

[5] The implementation of an ambitious plan, comparable in terms of set goals with plans for the transition to “green” energy in economically developed countries, first of all, depends on government policy and financial capabilities, since such projects are carried out using state regulatory mechanisms (subsidies, control over electricity tariffs for different consumer groups).

ADB, etc.), efforts have been made in the republic to promote the “green” agenda.

Uzbekistan implements the provisions of the Strategy through the implementation of the activities of the “roadmap” until 2030. Immediate tasks:

- twofold increase in energy efficiency indicators;
- reducing the “carbon intensity” of gross domestic product;
- development of renewable energy sources (hereinafter referred to as RES), bringing their share to 25% of the total volume of electric energy generation;
- ensuring access to modern, inexpensive and reliable energy supply for 100% of the population and all sectors of the economy;
- modernization of the infrastructure of industrial enterprises, ensuring their sustainability by increasing energy efficiency by at least 20%;
- expansion of production and use of motor fuels and motor vehicles with improved energy efficiency and environmental friendliness characteristics;
- development of electric transport;
- improving the efficiency of water use in all sectors of the economy.

The Republic of Uzbekistan has also adopted regulatory legal acts that promote the introduction of technologies and industries that reduce greenhouse gas (GHG) emissions.

The Law “On the Use of Renewable Energy Sources” and the law “On Public-Private Partnership” (2019) create a regulatory framework for the implementation of renewable energy projects:

- It is planned to increase the share of electricity production using renewable energy sources to the level of 25% by 2030.
- It is planned to build new renewable energy facilities with a total capacity of 10 GW (5 GW solar, 3 GW wind and 1.9 GW hydroelectric power plants).

For the first time in Uzbekistan, a solar power plant with a capacity of 100 MW has been launched, which will save up to 80 million cubic meters of natural gas annually and prevent about 160 thousand tons of greenhouse gas emissions.[6]

Energy-saving measures will reduce the consumption of primary energy, mainly natural gas. The planned investments in energy-efficient solutions and renewable energy sources have a high priority, first of all, in terms of reducing GHG emissions.

Mitigation and adaptation measures to the effects of climate change are also reflected in the country’s sectoral strategies, plans and development programs, in particular, in the following documents:

- Innovative Development Strategy for 2019-2021;
- Solid Waste Management Strategy for the period 2019-2028,
- Agricultural Development Strategy for 2020-2030,
- The concept of environmental protection until 2030,

[6] Due to the dependence of wind and solar power plants on the season of the year, time of day and weather conditions, the average (daily annual) production of renewable energy of this type is significantly lower than the production of thermal and nuclear power plants with equal installed capacity of generating equipment.

- The concept of providing electric energy for 2020-2030, etc.

To mitigate the effects of climate change, 15 Clean Development Mechanism (CDM) projects have been implemented under the Kyoto Protocol. During the period of the CDM projects in Uzbekistan, 15.3 thousand tons of certified CO2 emission reductions were put into circulation and foreign private investments in the amount of 24.4 million US dollars were attracted. Measures and actions aimed at saving energy resources have allowed Uzbekistan to stabilize the level of greenhouse gas emissions and reduce the country's contribution to global emissions.

According to the Paris Climate Agreement, Uzbekistan has committed to reduce by 2030 the specific emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide) per unit of GDP by 10% from the base 2010 level. The reduction is planned to be achieved through measures to develop alternative energy, increase energy efficiency and other measures announced in the Strategy for the Transition to a "green" economy.

In 2021, Uzbekistan's first biennial updated data report containing information on greenhouse gas emissions for 1990-2017 was published on the website of the United Nations Framework Convention on Climate (UNFCCC). The total greenhouse gas emissions in 2017 amounted to 189.2 million tons of CO2-eq. (excluding acquisitions). In 1990-2017, the volume of GHG emissions increased by 6.7%, and in 2013-2017, on the contrary, a decrease in this volume by 0.6% was noted [1].

The main contribution to greenhouse gas emissions is accounted for by the energy sector – 76.3% and agriculture – 17.8%.

The current goal in the republic provides for a reduction in specific greenhouse gas emissions per unit of GDP by 35% by 2030 from the level of 2010 (instead of the previously envisaged 10%).

By 2030, it is planned to generate 25% of the country's electricity from renewable energy sources, double the energy efficiency of GDP, modernize the infrastructure of industrial enterprises, ensuring an increase in their energy efficiency by at least 20% and the widespread use of "clean" technologies, and achieve a neutral balance of land degradation [2].

Thus, it can be concluded that Uzbekistan's accession to the Paris Agreement initiated the development and adoption of strategic-level documents, analysis and assessment of climate change, including those related to greenhouse gas emissions, at the national level.

The strategy for the transition to a "green" economy for the period up to 2030 sets the main goal of achieving sustainable economic growth that promotes social development and reduces greenhouse gas emissions, and increases the climate and environmental sustainability of the economy. The strategy provides for the creation of a monitoring, reporting and verification system (MRV) on greenhouse gas emissions, taking into account national circumstances, to continuously monitor the fulfillment of the country's quantitative obligations under the Paris Agreement and ensure reporting on greenhouse gas emissions.

However, currently there are no national regulatory legal acts and methodological documents applicable by business entities at the operational level in relation to:

- GHG emission estimates;
- requirements for the relevant reporting and its verification;
- defining measurable goals and setting targets for GHG emissions management;
- development of a set of appropriate measures and/or Action Plans;
- GHG monitoring and/or climate indicators.

Accordingly, the GHG emissions assessment for the project corresponds to the national agenda and trends, but its nature is largely determined by the requirements of the investment project.

Sources

1. The first biennial report on updated data of the Republic of Uzbekistan, 2021
2. The Republic of Uzbekistan updated nationally determined contribution. Report on Decisions of the Conference of the Parties to the Framework Convention on Climate Change 4/CMA.1, 1/CP.21, 9/CMA.1 and 18/CMA.1, 2021

9.2.1.2 *Assessment of greenhouse gas emissions at the stage of operation of a combined-cycle power plant*

The impact is determined by emissions of greenhouse gases into the atmosphere. In accordance with the global standard for accounting for greenhouse gas (GHG) emissions, the Greenhouse Gas Protocol, [7]GHG emissions of the following "levels" can be accounted for/scope:

- Level 1 (Scope 1) – direct GHG emissions produced by an organization: as applied to an enterprise. – emissions associated with fuel combustion, with freon emissions.
- Level 2 (Scope 2) – indirect GHG emissions associated with electricity purchased from third-party producers.
- Level 3 (Scope 3) [8]– indirect emissions associated with the extraction and production of purchased materials, fuel and services, including transportation on vehicles not owned by the enterprise. Emissions of this category are the result of the company's activities but originate from sources that do not belong to it, and, accordingly, are not controlled by the enterprise. Scope 3 is optional for accounting and reporting[9], but it allows the company to become one of the leaders in the field of GHG management.

The quantitative determination of GHG emissions is carried out by the calculation method for individual sources, groups of sources or the organization as a whole using the formula:

Eghg = EF * FC, where:

- E_{ghg} - emissions of CO_2 (and other GHGs), t CO_2;
- FC - fuel consumption, thousand m^3, (for level 1), volume of consumed (purchased) electricity, MWh (for level 2);
- EF is the coefficient of CO2 emissions from fuel combustion, tons of CO2/thousand m3 of gas (for level 1), from purchased electricity, tons of CO2/MWh.

The calculation uses data provided by the Customer: consumption of natural gas, motor fuels, freons, electricity consumption, and other design data.

[8] It was not considered in the framework of this study. In the future, it is advisable to assess level 3 emissions based on an analysis of the procurement and supply chains, a set of activities (based on the impact on the business and the amount of reliable information).

[9] A joint project of the World Resources Institute and the World Business Council for Sustainable Development. https://ghgprotocol.org/

The results of the assessment of greenhouse gas emissions as a result of the plant's activities are presented in Table 9.10.

Table 9.10: Greenhouse gas emissions from the company's activities, thousand tons of CO2 equivalent/year [2, 3]

Characteristics	Emissions of 1st and 2ng coverage
Emissions related to the combined cycle power plant construction project	1430

Greenhouse gas emissions generated as a result of the company's activities are significantly lower than the industry average due to the use of the latest combined cycle gas plant for electricity generation. The construction time of a combined-cycle gas power plant is much shorter than the construction time of traditional thermal power plants of other types. At the same time, the transition to a combined-cycle gas cycle makes it possible to improve the environmental performance of the plant and significantly reduce the level of harmful emissions into the atmosphere.

The total electrical efficiency of the proposed CCGT is 61%. The CCGT in question belongs to a relatively new type of power plant powered by natural gas. Combined-cycle gas units are designed to produce the maximum amount of electricity (primary and secondary from hot exhaust gases).

Since the estimated emissions of coverage 1 and 2 exceed 100,000 tons of CO2 equivalent per year, the ways to further reduce the formation of greenhouse gases generated from the company's activities are discussed below.

9.2.1.3 *Ways to reduce the amount of greenhouse gas generation*

9.2.1.3.1 Conceptual approach

When planning measures, it is advisable to proceed not only from the prevention/minimization of emissions but also to consider the possibilities of compensatory measures.

GHG emission management includes a set of solutions, the main ones are:

- implementation of economically sound measures to prevent and/or reduce GHG emissions, including the introduction of energy and resource conservation measures at the enterprise itself;
- monitoring and reporting.

It should be noted that GHG emissions management, in addition to the obvious contribution to achieving carbon neutrality of the economy of the Republic of Uzbekistan, is ultimately aimed at minimizing climate change.

Switching to renewable energy sources

The power supply of the power plant is planned at the expense of the electricity produced at the enterprise.

The company will also produce thermal energy in its own boilers using natural gas.

Natural gas is a non-renewable energy source, the extraction and subsequent combustion of which is associated with the release of greenhouse gases into the atmosphere. To reduce greenhouse gas emissions, it is advisable to consider the possibilities of using renewable energy sources for economic and administrative purposes.

A promising source of renewable energy in the Republic of Uzbekistan is solar energy. The gross potential of solar radiation is estimated in the range from 525 billion kWh to 760

billion kWh, while more than 70% of the country's territory is suitable for the construction and installation of solar power plants.

Thus, the installation of solar panels at the enterprise will reduce the amount of GHG, when using this energy for economic purposes and the operation of the enterprise.

Greenhouse gas absorption

Along with prevention/By reducing GHG emissions, the absorption (runoff) of greenhouse gases from the atmosphere can make a certain contribution to the prevention of climate change. Currently, only one effective way is actually available to increase the volume of biogenic greenhouse gas runoff – the absorption of carbon dioxide by forests/green spaces of young age.

It is advisable for Cenergo LLC to implement a greening program for the territory of the power plant and adjacent territories after the completion of the construction of the power plant. Along with GHG absorption, the creation of green spaces can improve the microclimate.

9.2.1.4 Assessment results

Proposals for activities, monitoring and reporting are presented in Table 9.11

The matrix of the results of the assessment of environmental impacts associated with GHG emissions is shown in. Table 9.12

It was found that the significance of the impacts of the planned activities related to GHG emissions is estimated as moderate; the significance of the residual effects, taking into account the proposed measures to prevent, minimize and compensate GHG emissions, is also estimated as low[10].

[10] Assessment for the operational stage.

Table 9.11 Measures to prevent and mitigate impacts related to greenhouse gas emissions

Item	Activity/ process	Task	Measures	Applicable requirements[11]	Monitoring	Implementation method/ reporting
I.	**Operational stage**					
1.	• The main production process • Provision of basic production activities • Transport and logistics (delivery of raw materials, fuels and lubricants, shipment of products, other transportation)	• Prevention and minimization of GHG emissions • Compensation of the company's contribution to the formation of "carbon footprint"	• Development of GHG emission management systems (policy, procedures, • resources, monitoring, reporting) • Using renewable energy resources • Improving the energy efficiency of production and heat recovery • Implementation of GHG absorption projects (landscaping of the plant's territory and adjacent territories)	• IFC General EHS Guidelines, section 1.1 • IFC Guidelines on EHS for Metallurgical plants, section 1.1 • ISO 14064-1:2018 Greenhouse Gases – Part 1: Specification with Guidance at the Organization. Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals • ISO 14064-2:2019 Greenhouse Gases – Part 2: Specification with Guidance at the Project Level for Quantification, Monitoring and Reporting of Greenhouse Gas Emission Reductions or Removal Enhancement • ISO 14064-3:2019 Greenhouse Gases – Part 3: Specification with Guidance for the Verification and Validation of Greenhouse Gas Statements • ISO 14067:2018 "Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification"	• Monitoring the implementation of measures to reduce GHG emissions (monitoring procedures may include schedules, roles and responsibilities, equipment, resources and methods for providing, evaluating, measuring, calculating, summarizing and analyzing relevant data)	• Inventory of sources and quantification of GHG emissions of the enterprise (Scope 1,2,3) • Assessment of the carbon footprint of products and measures to reduce GHG emissions: assessment of the effects of software because of the implementation of measures • Preparation of the "carbon reporting" of the enterprise

[11] The main guidance documents are presented. As a rule, other documents are used during the GHG inventory, for example, GHG Protocol Corporate, GHG Protocol Scope 3, GHG Calculation Tools, IPCC Guidelines for National Greenhouse Gas Inventories, etc.

Table 9.12: Matrix of environmental impact assessment results related to GHG emissions

Life cycle: operating
Recipient: Atmospheric air (climatic conditions)
Recipient sensitivity: medium
Characteristics of impacts

Impact	Climate impacts related to GHG emissions		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Regional	Long-term	Reversible	Medium	Moderate
Consequences	Violation of the living conditions of the population (through environmental factors affecting physiological processes), effects on flora and fauna, soils, indirect effects on the economy (industry and agriculture)				
Activities	• Development of a GHG emission management system (policies, procedures, resources, monitoring, reporting) • Implementation of GHG absorption projects (landscaping of the territory of the plant and adjacent territories) • Using renewable energy resources				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

9.2.2 Climate risk assessment

In terms of the probability of occurrence and the expected number of losses, climate risks (CD) are among the most significant, threatening the global economy both now and in the coming decades [11].

The CD includes the risks of extreme weather events, as well as the risks that the economy will not be able to effectively minimize the effects of climate change and/or adapt to them, and the risks of natural disasters.

The sectors of the economy most affected by extreme weather events and natural disasters usually include agriculture, fishing, food industry, construction, trade, energy, tourism and transport.

The efforts of the world community to combat climate change have led to the emergence of problems that are not related to extreme events and/or long-term dynamics of climatic characteristics, but have become a consequence of the adoption of the "green agenda" in the economy. Examples of such risks include banning or restricting investments in carbon-intensive industries that have an impact on climate change.

Thus, taking into account the above, as well as taking into account the results of the assessment of GHG emissions (see Section 9.2.1) there are obvious prerequisites that the project may face climate risks. It is advisable to consider exactly how the “climate agenda” may affect the planned activities.

9.2.2.1 *Regional context*

9.2.2.1.1 General Information

According to the Global Climate Risk Index (2022), Uzbekistan is not among the countries most affected by climate change, however, the geographical location and dependence of the country’s economy on agriculture makes the country vulnerable to the effects of global warming [10].

The estimated rate of warming in Uzbekistan exceeds the projected global average temperature increase. According to the country’s Climate Risk Profile prepared by the World Bank and the Asian Development Bank, it is assumed that average temperatures in Uzbekistan will increase by 5.6°C by 2090 compared to temperatures in 1986-2005 [4].

In the period from 1950 to 2013, the temperature in Uzbekistan increased by an average of 0.27 °C per decade. The range of average annual temperatures in Uzbekistan decreased over the same period, while the average minimum air temperature increased by 2.0 °C, the average maximum temperature increased by 1.6 °C between 1950 and 2013, the number of hot days and nights is increasing, the daily temperature in summer can exceed 48°C.

Uzbekistan is one of the twenty most drought-prone countries in the world [4]. Uzbekistan’s arid climate and high temperatures make drought an increasingly regular occurrence: on average, one drought was observed every five years in the 1980s and 1990s and four droughts have already occurred between 2000 and 2012.

The rivers of Uzbekistan, the Jizzakh reservoir and the Sanzar River (the power source of this reservoir), on which, ultimately, the water supply of the enterprise depends, suffer from unstable nutrition: climate warming leads to a reduction in snow cover and an increase in water evaporation in catchment areas in the mountains.

A significant increase in the duration and extent of droughts in Central Asia is predicted by the end of this century at a global warming level of 1.5°C, 2.0°C and 3.0°C [4].

Droughts of this magnitude, which are currently extremely rare in Central Asia (100-year droughts), are projected to become 4-10 times more frequent under the same warming scenarios.

The drought in Uzbekistan in 2000 and 2001 led to severe economic and social consequences due to the loss of agricultural products and the impact on the health of residents.

In general, settlements and important infrastructure can be affected by abnormal heat in summer and floods in spring.

The analysis of changes in the average monthly air temperature over a thirty-year observation period (1988-2018) according to the Jizzakh weather station shows a tendency for its increase (Figure 9.6).

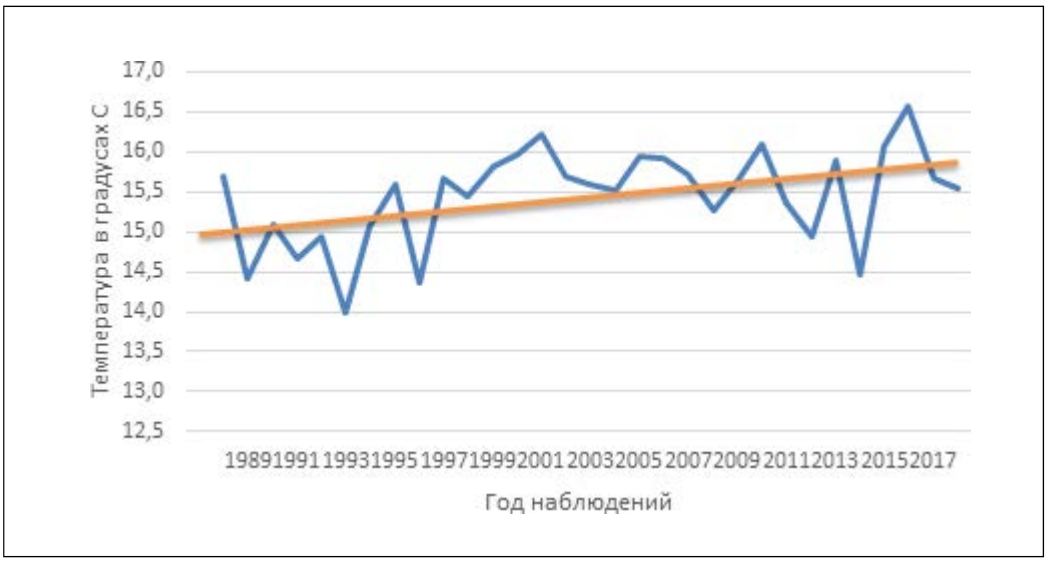


Figure 9.6: Average monthly air temperature (°C) for the period 1988-2018 according to the Jizzakh weather station [7]

9.2.2.1.2 CCKP Climate Change Forecast

Most of the current climate risks are determined mainly by the trend of global warming.

For the environmental and social assessment of the planned activities, the World Bank has created and maintains a special website on the Internet – a Portal of knowledge about climate change. [12]The portal uses CMIP5 (Coupled Model Inter-comparison Project Phase 5) models of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC/AR5 IPCC) as initial data.

These models provide an assessment of changes in temperature and precipitation. The forecast includes four main representative concentration trajectories (RCP/RTK) – RTK2.6, RTK4.5, RTK6.0 and RTK8.5, determined according to the level of total radiation exposure (cumulative GHG emissions from all sources) by 2100. The main focus is usually on RTK2.6 and RTK8.5 – variants of the “lowest” and “highest” GHG emissions, where RTK2.6 represents an effective scenario for mitigating the negative effects of GHG emissions, and RTK8.5 assumes a “business as usual” scenario. Other scenarios are also being considered, for example RTK1.9 is an option that limits global warming to below

[12] World Bank Group’s Climate Change Knowledge Portal (CCKP), https://climateknowledgeportal.worldbank.org/

1.5°C, the target parameter of the Paris Agreement.

Climate forecasts based on CCKP materials for the Republic of Uzbekistan are presented in [14]. These datasets are the results of simulations performed using various General Circulation (GCM) models.

Due to differences in how GMCS represent key physical processes and interactions in the climate system, the results can vary greatly, especially with regard to precipitation forecasts on a national and local scale.

For the Republic of Uzbekistan, CMIP5 models show a trend of steady warming, regardless of GHG emission scenarios, while precipitation forecast varies greatly, despite the absence of statistically significant changes over the past decades [14].

An increase in the intensity of extreme precipitation seems very likely.

The tables Table 9.13 and Table 9.14 provide information on the temperature forecast for four RTCs and two time intervals in relation to the base period 1986-2005 [14, 15].

Table 9.13 Forecast of changes in the maximum, minimum and average daily temperature in Uzbekistan compared to the period 1986-2005.

RTC	Average daily maximum temperature		Average daily minimum temperature		Average daily temperature	
	2040-2059 yy.	2080-2099	2040-2059 yy.	2080-2099 yy.	2040-2059 yy.	2080-2099 yy.
RTC 2.6	1.5 (−0.5, 3.8)	1.5 (−0.5, 3.6)	1.4 (−0.2, 3.4)	1.3 (−0.3, 3.3)	1.4 (−0.4, 3.3)	1.3 (−0.5, 3.2)
RTC 4.5	1.9 (0.1, 4.1)	2.7 (0.7, 4.9)	1.8 (0.2, 3.7)	2,6 (0.7, 4.6)	1.9 (0.0, 3.9)	2.5 (0.4, 4.7)
RTC 6.0	1.8 (0.0, 3.7)	3.4 (1.4, 5.7)	1.6 (0.0, 3.5)	3.2 (1.5, 5.3)	1.6 (−0.2, 3.4)	3.0 (1.2, 5.2)
RTC 8.5	2.5 (0.5, 4.8)	5.4 (3.2, 7.8)	2.5 (0.7, 4.5)	5.3 (3.3, 7.4)	2.5 (0.6, 4.6)	5.2 (3.1, 7.5)

Note: The median of CCKP models and the 10th-90th percentile are shown in parentheses.

Table 9.14 Forecast of changes in the average temperature in Uzbekistan by season compared to the period 1986-2005 for various RTCs

RTC	2040-2059 yy.		2080-2099 yy.	
	June-August	December-February	June-August	December-February
RTC 2.6	1.6 (−0.2, 3.6)	1.6 (−0.2, 3.9)	1.5 (−0.6, 3.5)	1.5 (−0.2, 3.7)
RTC 4.5	2.1 (0.2, 2.4)	4.9 (0.2, 3.8)	2.9 (0.9, 5.2)	2.7 (1.1, 4.7)

RTC	2040-2059 yy.		2080-2099 yy.	
	June-August	December -February	June-August	December -February
RTC 6.0	1.8 (0.3, 3.5)	1.8 (0.0, 4.0)	3.7 (1.7, 5.7)	3.3 (1.5, 5.4)
RTC 8.5	2.9 (0.9, 4.9)	2.3 (0.4, 4.3)	6.0 (3.7, 8.4)	4.9 (3.3, 6.4)

Note: the median results of the evaluation of the CCKP model complex, and 10-90 percentiles (in parentheses) are given

The forecast of changes in average temperature and annual precipitation in Uzbekistan for RTC8.5, generalized by 16 GCM, is shown in Figure 9.7

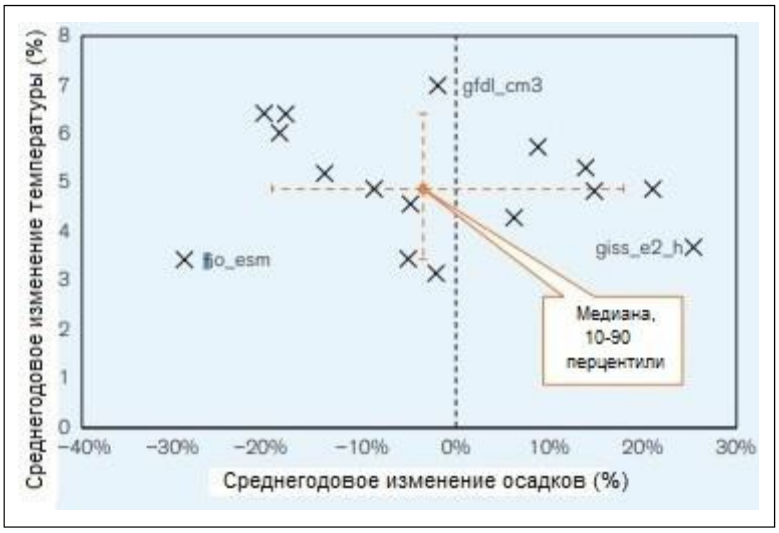


Figure 9.7: Forecast of changes in average temperature and annual precipitation in Uzbekistan. Three models are indicated by labels [13]

As shown in Figure 9.7, the forecasts of individual models can range from a reduction in annual precipitation by almost 30% to an increase of 20%.

Although significant uncertainty characterizes long-term precipitation forecasts, some trends are obvious.

Cartographic interpretation of the mid- to late-21st-century mean annual temperature and precipitation forecasts for RCP8.5 is shown in Figure 9.8

[13] The results of 16 models as part of a complex simulating RCP8.5 for the period 2080-2099.

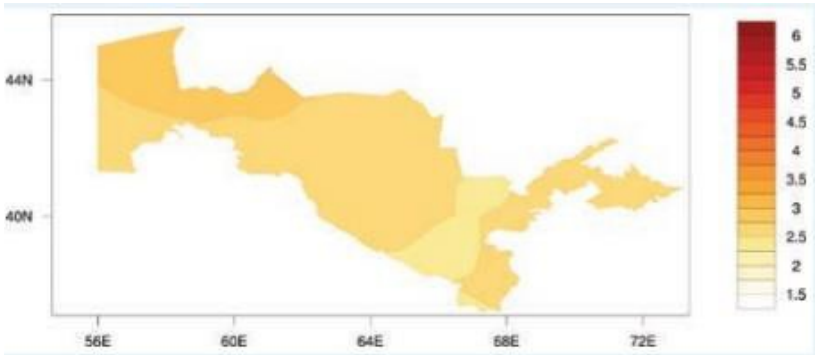
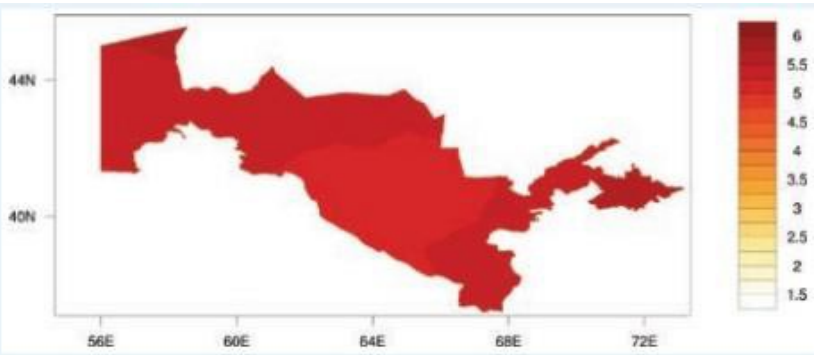
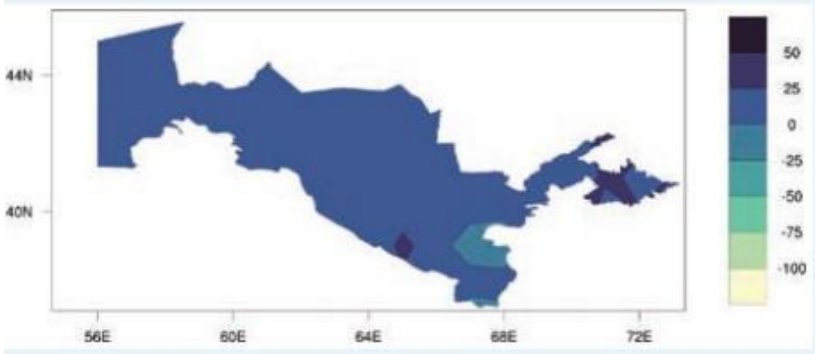
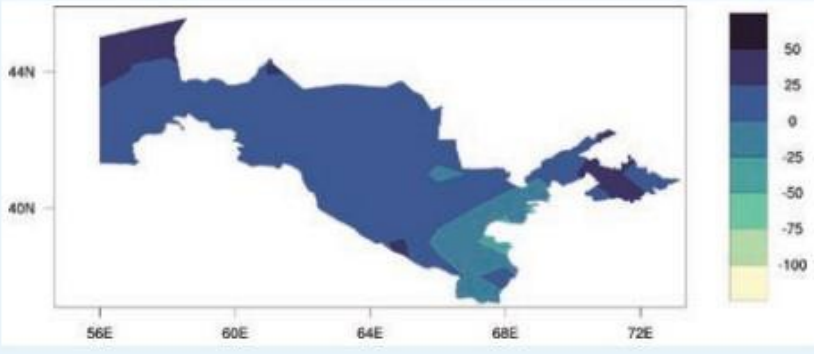
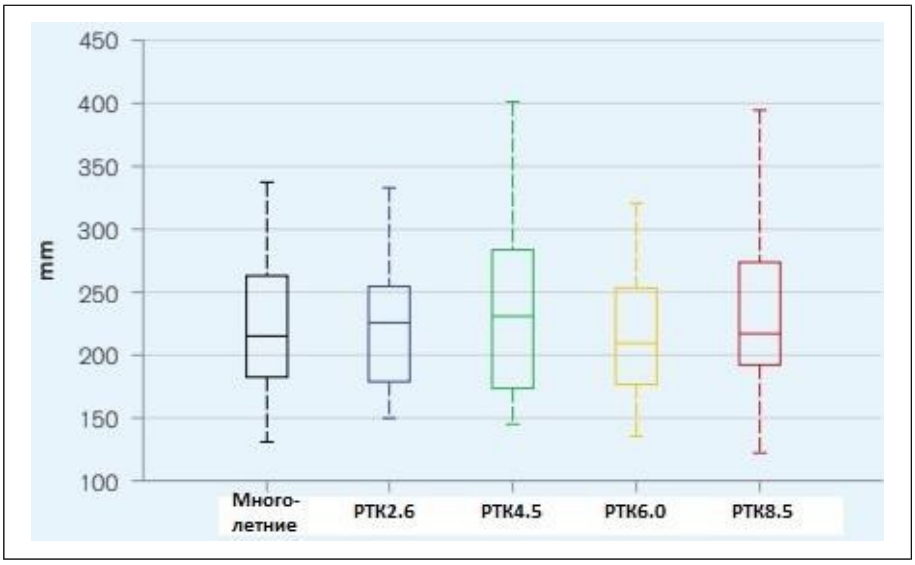
	2040–2059	2080–2090
Changes in the average annual temperature		
Changing the amount of precipitation		

Figure 9.8 CMIP5-forecast of changes in average temperature and precipitation compared to the baseline level of 1986-2005 for RTC/RCP8.5 [15]

It was noted above that CCKP models do not reflect an unambiguous trend in the average annual precipitation in the republic, – there is uncertainty even in the direction of changes, – this is typical for all four RTCs and different time intervals (Figure 9.9).

Figure 9.9 Projected average annual precipitation for Uzbekistan in the period 2080-2099



for various RTCs [16]

The intensity of extreme rains falling in less than a day seems to increase with increasing temperatures.

CCKP models suggest that in Uzbekistan, the total amount of precipitation falling during an extreme 5-day downpour may increase slightly (0-20% depending on the RTC). However, it is assumed that the probability of intense precipitation is largely determined by the local features of the underlying surface [14].

In addition to the general climate changes associated with greenhouse gas emissions discussed above, it is necessary to take into account natural risks depending on climatic conditions.

In general, Uzbekistan has an average global disaster risk rating, ranking 112th out of 191 countries according to the INFORM rating. The country's risk assessment is increasing due to its very high earthquake susceptibility: with an estimate of 9.9 out of 10, Uzbekistan ranks second in the world. However, this factor has no connection with the climate.

The country is also among the top 20 countries in the world in terms of exposure to drought. Uzbekistan faces a high risk of forest fires. The flood hazard level in Uzbekistan is above average. These estimates are offset by relatively low Vulnerability levels and moderate levels of preparedness to respond (Lack of Coping Capacity) (Table 9.15).

Table 9.15: Selected indicators of the Natural Risk Management Index for Uzbekistan (INFORM 2019)

Floods (0-10)	Tropical cyclones (0–10)	Droughts (0-10)	Vulnerability (0-10)	Readiness to respond (0–10)	Overall rating (0–10)	Place in the ranking (1–191)
6.3 (4.5)	0.0 (1.7)	6.6 (3.2)	1.9 (3.6)	4.0 (4.5)	3.1 (3.8)	112

Note: For certain risk categories, higher scores represent higher risks, and conversely, the country with the highest risk ranks 1st. Global average scores are shown in parentheses.

the purposes of for this assessment, the World Bank's electronic resource ThinkHazard! was also used (see https://thinkhazard.org/en/).

This resource provides information about the natural hazards of the region, which should be taken into account when evaluating and implementing planned activities to increase resilience to natural disasters and climate change [17].

The tool contains an assessment of the probability of various natural disasters in the region under consideration (very low, low, medium and high) and provides recommendations on reducing the corresponding risks. The assessment of hazard levels is based on published hazard data, as well as data provided by a number of private, academic and public organizations.

For the city of Jizzakh, the ThinkHazard resource! provides the following estimates of phenomena caused directly or indirectly by climatic processes:

- floods are a high risk;
- earthquake is a high risk;
- landslides are a high risk;
- fires are a high risk;
- water shortage is an average risk;
- flooding in the city is an average risk;
- extreme heat is an average risk.

9.2.2.2 Assessment methodology

Climate risks are systematically identified in the documents of the Task Force on Climate Related Financial Disclosures (TCFD), the Group of 20 Financial Stability Board (FSB), as well as through the work of various associations and regulators. Since 2017 The TCFD recommendations have essentially become the international standard for disclosing information about climate-related financial risks.

In 2021, The Working Group updated the 2017 Disclosure Guidelines, the structure of the recommendations has been preserved, but now organizations will have to disclose relevant information regardless of the assessment of the materiality of GHG emissions [1].

TCFD notes that more and more countries recommend or oblige the use of the organization's standards for the disclosure of ESG information. In 2021, 2,600 companies worldwide adhere to the TCFD recommendations (compared to 1,500 a year earlier).

The purpose of implementing the TCFD recommendations is to develop tools (measures) to disclose information about corporate risks that arise in connection with global climate change in order to improve awareness

stakeholders and increase the transparency of investments, loans and insurance.

The TCFD recommendations help to develop an effective and unified reporting system for disclosing information on the impact of climate change risks on an organization's business and suggest using the following categorization of climate risks:

- physical risks are risks associated with natural phenomena arising from climate change. Physical risks are divided into:
  - emergency/acute risks (acute risk) associated with sudden events;
  - systematic risks (chronic risk) associated with long-term climate change;
- transition risks – the risks associated with the transition to a "low-carbon" economy, which are divided into:
  - regulatory – political and legal (policy and legal risks);
  - technology risk;
  - market risk;
  - reputation risk.

Physical risks arising from damage and/or other losses from physical natural phenomena are associated with both long-term climatic trends (for example, changes in weather conditions) and sudden, emergency events (natural disasters, extreme weather conditions).

For the conditions of the area of the planned activity, the physical risk may be associated with abnormal heat, to a lesser extent with floods.

Uninsured losses resulting from physical risks can put an additional financial burden on the enterprise and potentially lead to negative consequences in the supply chain and even have an impact on insurers and banks financing projects (in particular, the project for the construction of a combined–cycle power plant).

The risks of transition are associated with the movement of economies towards a "low-carbon" economy, determined by a decrease in the level of use of hydrocarbons and/or other natural resources, as well as an increase in the share of renewable energy sources.

The transition to a "green" economy generates political, legal, technological and market changes due to the emergence of requirements for the prevention/minimization of climate change and adaptation to them.

Examples of transition risks recognized by regulators and the banking community are policy and regulatory reforms in relation to "carbon-intensive" industries. It is obvious that the activity of the power plant is characterized as significant in relation to the carbon footprint, as shown in Section 9.2.1.

Such changes can significantly affect investment processes and insurance. At the same time, civil and public activity aimed at refusing to support the relevant industries can cause reputational damage.

The risk of transition can be realized for the enterprise in relation to the appearance of new taxes and fees related to hydrocarbon emissions, restrictions on cooperation with companies that do not take into account ESG factors, for banks and insurance companies.

It is important to note that the process of transition to a "green" economy has a long–term character - negative consequences are unlikely to affect the company's activities in a significant way in the short term (especially given the lack of developed regulation of this area at the national level). Nevertheless, banks, investment companies, and the insurance business are taking measures to adjust the requirements for borrowers accordingly, which may have an impact on the company's investment plans.

It should be noted that the consequences for the banking and insurance community, investment projects and business entities themselves are formed not only by these risks – climate change, institutional reforms form appropriate opportunities, among them:

- the benefits of using “low-carbon” energy sources;
- access to new markets;
- advantages of “green financing”;

9.2.2.3 *Characteristics of climate risks*

Physical risks

Physical risks are risks directly related to climate change in the region of the company’s presence and the resulting natural and man–made phenomena.

The characteristics of the physical climate risks for the project are presented.Table 9.16

Table 9.16: Physical climate risks

Risk	Description of the risk	Time period	An optimistic scenario, RTC1.9	A balanced scenario, RTC2.6	A pessimistic scenario, RTC8.5	Impact on financial indicators	Possible prevention/ risk mitigation measures
Emergency risks							
Droughts and fires	- Lack of water resources necessary for production processes - damage to property (equipment) -economic consequences of drought for the country's economy as a whole and indirect impact on the power plant	Short-term, Medium-term	Average probability	High probability	High probability	High damage	- Closed loop of water consumption - elimination of water losses - usage of underground (drainage) water resources -improvement of the system of fire protection regulations
Landslides and mudslides	Damage to property	Short-term, Medium-term	Low probability	Low probability	Low probability	Low damage	Not required
Floods	Damage to enterprise property - equipment, buildings, structures, infrastructure (power lines, road network)	Short-term, Medium-term	Low probability	Average probability	Average probability	High damage	- Short-term monitoring of the equalized Jizzakh reservoir and irrigation channels medium- and long-term forecasts of equalized regime - timely responding to Unfavorable forecasts, in particular, – implementation of engineering protective events (if necessary)
Systematic risks							

Risk	Description of the risk	Time period	An optimistic scenario, RTC1.9	A balanced scenario, RTC2.6	A pessimistic scenario, RTC8.5	Impact on financial indicators	Possible prevention/ risk mitigation measures
Air temperature rise	Changing the operating modes (conditions) of the equipment, potentially disrupting the operation	Medium-term, Long-term	Low probability	Low probability	Low probability	Low damage	Not required
Air temperature rise	Negative impact on staff health	Medium-term, Long-term	Low probability	Medium probability	High probability	High damage	The use of technologies (systems) that ensure the working conditions of personnel corresponding to sanitary standards
Decrease in the flow (water content) of the Jizzakh reservoir	Shortage of water resources for technical water supply	Long-term	Low probability	Low probability	Medium probability	Medium damage	- Diversification of water supply sources - elimination of water losses
Shortage (availability) of fuel and energy resources	Volume reduction and/or production shutdown	Long-term	Low probability	Low probability	Medium probability	High damage	- Diversification of heat and energy supply sources, in particular, the transition to alternative sources for the economic purposes of the enterprise - improving the energy efficiency of production

Transitional risks

Transitional risks are legal, technological, market and reputational risks associated with the transition to a "low–carbon" economy. As a rule, these risks are usually associated with a decrease in the use of hydrocarbons and other natural resources, as well as with the transition of the economy to renewable energy sources.

The possible transitional climate risks of the Project are discussed in Table 9.17.

Table 9.17 Transitional climate risks of the enterprise

Risk	Characteristic	Consequences
Regulatory risks (carbon taxation and other regulatory changes)	According to the World Bank's forecast, by 2050 half of the formed "carbon-intensive" greenhouse gas industries will be subject to local and global regulatory reforms, including mandatory reporting and carbon taxation	• regulatory, pricing, tax restrictions – increase in the cost of production • rising prices for raw materials and/or reducing the availability of such raw materials
Market risk	Introduction of market mechanisms for trading carbon units	• Increased operating costs, increased costs associated with the preparation and verification of climate reports (including GHG emissions) • an increase in the cost of attracting financing and/or /limiting opportunities for growth – an increase in the cost of credit funding
Reputational risks	In the global investment climate, there is a tendency for investors and financial institutions to pay increased attention to environmental and social responsibility of organizations	• Decrease in investment attractiveness

9.2.2.4 Recommendations for adaptation to climate change

9.2.2.4.1 The main directions of adaptation

Detailed recommendations for an enterprise to respond to climate change should be worked out in the appropriate documentation, optimally based on the development (expansion) of the Environmental and Social Management System being created.

The TCFD methodology provides for work in the following main areas:

- Organization. The role of the company's Board of Directors and management in climate risk management should be defined.
- Strategy. Disclosure of the actual and potential impact of risks and opportunities related to climate change on the business processes of the enterprise (development projects).
- Risk management. Methodology of identification, assessment and management of climate risks.
- Purposes. Identification and disclosure of indicators and objectives used to assess and manage climate risks and opportunities.

9.2.2.4.2 Approaches to managing climate risks and opportunities

Involving the top management of the enterprise in managing the climate strategy

Climate change is of global importance for all sectors of the economy, therefore, this external context of the company's activities should be taken into account by the company's development goals and a long-term strategy for creating additional value.

The involvement of the company's Board of Directors, as well as senior management, in decision-making on the company's climate agenda demonstrates the reflection of the company's long-term and systemic attitude to the problem of climate change, including taking into account important aspects in the daily activities of the enterprise.

Climate risks in the enterprise management system

A timely assessment of climate risks will allow the company to adapt to the effects of climate change in advance, in particular, to provide for the allocation of necessary resources to prevent and/or minimize the negative impact of climate change, or, conversely, to maximize changes that can positively affect the company's activities, in particular, have a long-term impact on its financial position.

Identification and assessment of climate risks should be carried out in accordance with applicable requirements

- standards:
  - ISO 14090:2019 Adaptation to climate change – Principles, requirements and guidelines;
  - ISO 14080:2018 Greenhouse gas management and related activities – Framework and principles for methodologies on climate actions;
  - TCFD manuals.

Development of the enterprise's corporate climate strategy and definition of climate goals

The definition of reasonable goals and the introduction of appropriate metrics will clearly demonstrate to the company's staff and stakeholders how and how the company carries out activities in the field of regulating greenhouse gas emissions, as well as implements measures to minimize the negative effects of climate change. Setting specific measurable goals creates the basis for effectively achieving emission reductions within a specific time frame.

The development of a climate strategy and enterprise policy should be based on the study (assessment) of the context of the organization, production processes and risk factors.

The main elements of the company's climate strategy:

- risks associated with climate change;
- requirements for reducing the "carbon footprint";
- monitoring and evaluation of the effectiveness of implemented measures;
- reporting and external communications.

Monitoring and reporting

On a regular (annual) basis, it is recommended to assess greenhouse gas emissions of 1, 2 and 3 coverage in accordance with the requirements of the GHG Protocol, Carbon Disclosure Project and IPCC to monitor the achievement of relevant targets.

9.2.2.4.3 Climate risk management and "carbon footprint" reduction

The ESIA executors conducted an appropriate analysis, the results of which are presented in section 9.2.1.3 of this report (including recommendations).

Sources

1. Task Force on Climate-related Financial Disclosures. Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures. 2021.
2. GHG Protocol.
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15. WBG Climate Change Knowledge Portal (CCKP 2021). Uzbekistan Agriculture Dashboard.
16. https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops- and-land-management?country=UZB&period=2080-2099
17. WBG web-based tool https://thinkhazard.org/

9.3 Acoustic and vibration effects

At the preliminary assessment stage, the impact of vibration on the population is considered insignificant (see 125-1105-SR, Section 7.10). Preliminary conclusions on the provision of sanitary standards for the level of vibration exposure in residential buildings are confirmed by the measurement data provided in the report 125-1105-BIO-Noise.

Further in this report, only acoustic effects are considered.

9.3.1 Assessment methodology

Calculations were made using the GOST 31295.2-2005 methodology applicable in the Republic of Uzbekistan [1]. The standard is fully harmonized with ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

The “Эколог-шум” (Ecologist-Noise) program implements the methodology set out in GOST 31295.2-2005 (ISO 9613-2:1996), in this regard, calculations of noise propagation were carried out using the software “Ecolog-noise 2.4.4.6”.

The calculated noise values and their comparison with the permissible levels determined by SanR&N 0267-09 [2] for daytime and nighttime are used as a criterion for assessing the noise impact zone, which fully complies with the Recommendations of the WHO Guidelines for Community Noise, World Health Organization (WHO), 1999 [3].

The calculation results were also compared with the criteria set out in the IFC Environmental Health and Safety Guidelines - Environment 1.7 Noise 2007 [4].

Noise level for areas adjacent to residential buildings and office classrooms:

- it should not exceed 55 dBA for daytime (from 07.00 to 23.00) and 45 dBA for nighttime (from 23.00 to 07.00) in accordance with table 1.7.1 of the IFC Guidelines on EHS [4];
- it should not exceed the background values by more than 3 dB.

9.3.2 Analysing the Acoustic Environment in the Vicinity of the Power Plant and Assessing the Project's Potential Contribution to the Acoustic Discomfort of Local Communities

The acoustic field of the Power Plant’s site is formed by the superposition of man-made noises of various origins, the main importance among which are transport noises (Figure 9.10):

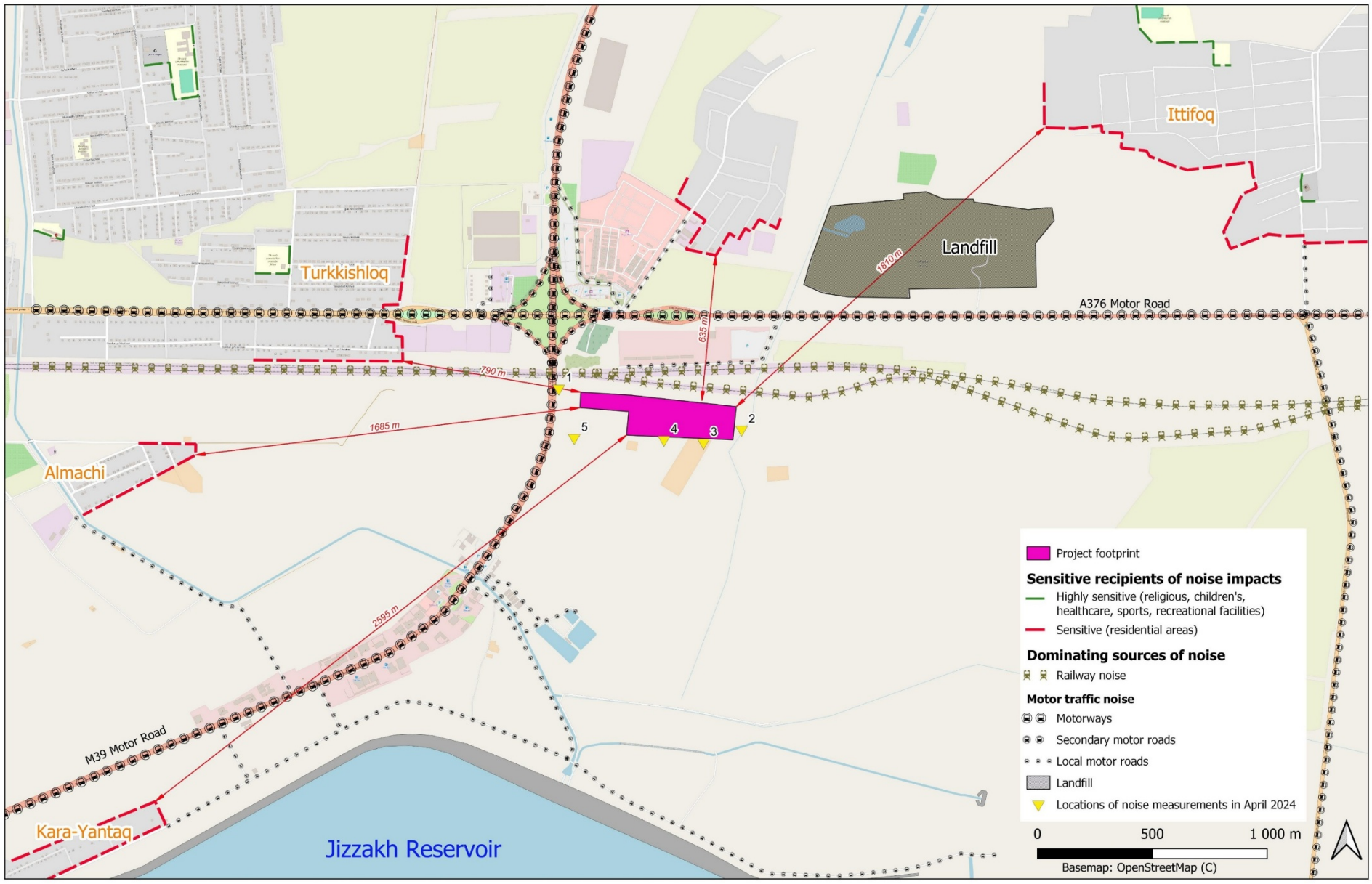
- Traffic noise coming from the republican and interregional highways Tashkent-Samarkand (M39) and Jizzakh-Guliston (A376) the intersection of which is located 250 m from the station land plot, and the roads themselves pass 100 m from the western side and 300 m from the northern side of the Project footprint (Figure 9.10),
- Railway noise from the Tashkent-Samarkand rail road twin line passing at a distance of approximately 60 m to the north of Project footprint,
- Traffic noise from the 4P34 Jizzakh-Zomin interregional road going 2.6 km east of the Project footprint, and
- Motor vehicle noise from local passages, street network of communities, and access roads.

The traffic noise is supplemented by the impact of stationary sources, the dominant of which for the Project area is the landfill site: from its side (about 600 m to the NE of the Project footprint), impulse noise is generated during waste unloading, and fluctuating noise comes from operating machinery and circulating heavy vehicles.

The nature of noise generated by railway transport is single sound events caused by the passage of trains. As for the noise from motor roads, it becomes continuous due

to the intensive traffic with fluctuations and impulses coming from overpasses and bridge crossings. Conditions of the project area, namely, the flat or gently sloping terrain and the absence of woody vegetation (except for small areas of tree belts in combination with small groups of trees), are favorable for the propagation of noise from the above sources over a considerable distance.

The land adjacent to the Power Plant on the south and east sides is used for agriculture and is represented by a combination of croplands, in-field passages for agricultural machinery and vehicles, and sporadically distributed groups of buildings and structures. Agricultural activities in these areas are not as sensitive to acoustic impacts and are themselves a source of noise emissions for farm personnel and outside observers/visitors.



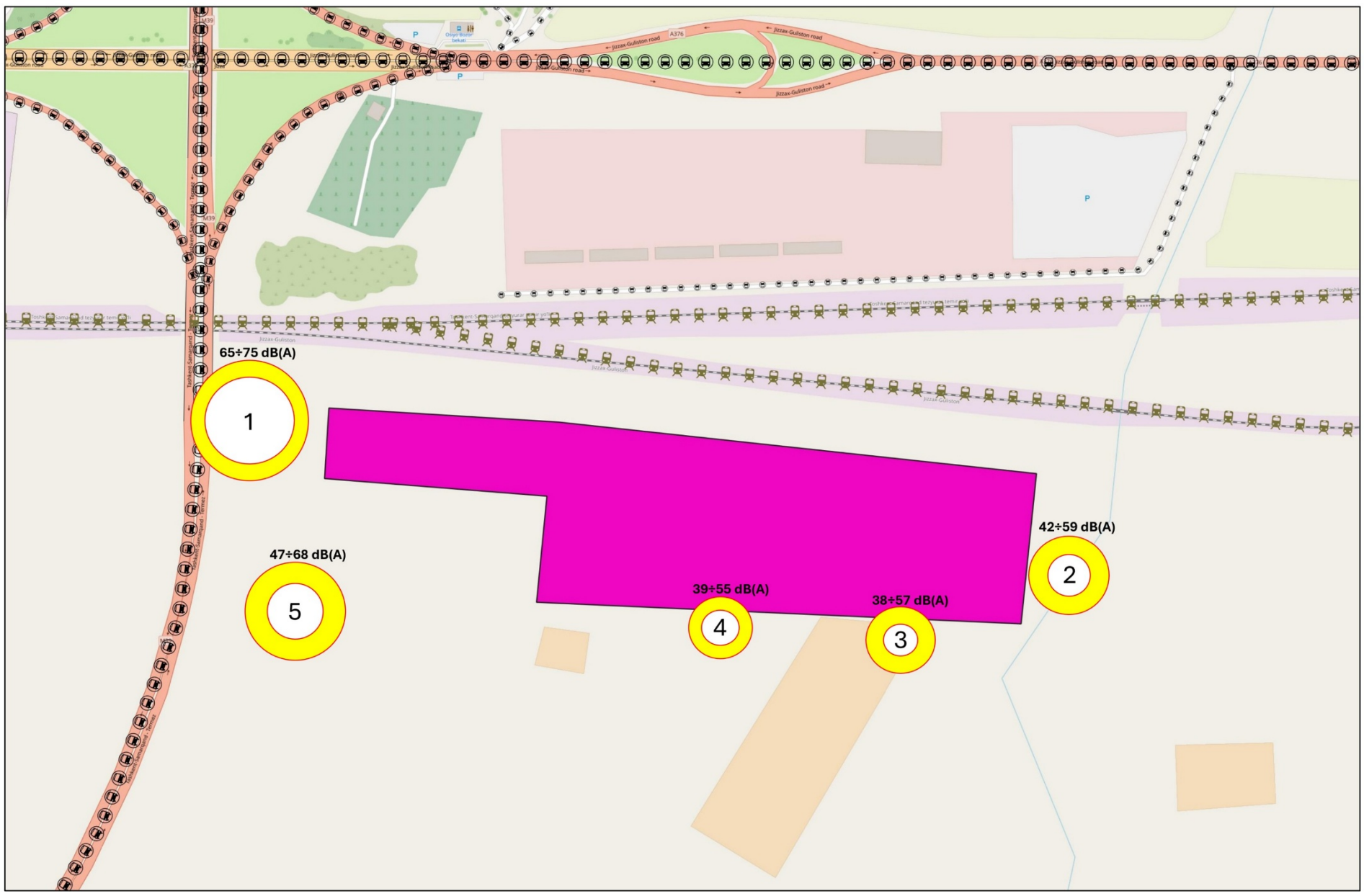


Figure 9.10 Sources, Receptors and Indicators of Acoustic Impacts in the Project Area

Field measurements of noise levels in the Project area conducted in 2024[14] confirm the domination of the acoustic impact of transport sources: at the nearest measurement point to the crossroad of the two motorways (Measurement Point No. 1, 15 m from the edge of the M39 Road's pavement) the noise level varied in the range from 65 to 75 dB(A) depending on the time (day-time records are higher due to more intensive traffic); at Point No. 5 (100 m from the M39 pavement) - in the range of 47-68 dB(A), at point No. 4 (about 500 m from both motorways) - 39-55 dB(A), at point No. 3 (500-600 m from both motorways) - 38-57 dB(A), at point No. 2 (500 and 800 m from the motorways) - 42-59 dB(A) (Figure 9.10).

Acoustically sensitive receptors are located a considerable distance away from the Power Plant's footprint - from 700 to 2600 m - and are themselves exposed to the same transport and other anthropogenic sources. Moreover, all sensitive receptors are not simply separated from the boundaries of the Power Plant's land parcel by locally dominating noise emission sources, but the siting of these sources (artificial embankments, overpasses, position in the topography) ensures their acoustic prevailing (Figure 9.11). Under such conditions, there is no reason to develop noise protection measures specifically in relation to the design of the Power Plant the contribution of which to the noise map of the surrounding area is expected to be low or even negligible.

Figure 9.11: View from the Project footprint in the direction of Jizzakh: the M39 Tashkent-Samarkand motorway flyover is located between the construction site and the nearest residential area of Turkkishloq community (see also Figure for location details)

The most sensitive receptors of noise which include places of worship, children's and health care facilities, as well as recreational areas and facilities, are located within communities and are even more guaranteed against the introduction of additional acoustic discomfort from the Project.

Agricultural facilities on the southern side of the Project footprint are unsuitable for habitation, including temporary, and are located in the downstream area of the Jizzakh Reservoir. Because of this, master plans of the municipality exclude the possibility of siting

[14] The Supplemental Background Study Report. Ref. No. 125-1105-Bio - CENGIZ ENERJI SAN. VE TIC A.Ş., 2024

residential, public or recreational facilities within this area without regard to the impact of the Power Plant and the establishment of a sanitary protection buffer zone around its territory.

Therefore, the choice of location of the Project facilities already sufficiently ensures that there will be no additional acoustic discomfort to sensitive receptors in the area, and therefore there is no need for additional modelling of the Project's noise emissions and the design of engineering noise protection measures based on this.

Given the characteristics of the area adjoining to the Project footprint, planting some tree lines along its southern boundary may be recommended to improve the aesthetics of the local landscape, make the habitats of the surrounding area more resilient and diverse and, over time, reduce both visual and acoustic impacts from the Power Plant towards the agricultural neighbourhood.

9.3.3 Construction stage

The main sources of noise at the construction stage of the enterprise will be construction machines, auxiliary mechanisms and vehicles.

The peculiarity of the considered noise sources is their operation in an open space with constant movement on the construction site, while each piece of equipment can operate in different operating modes, which causes the variability, both in time and in space, of the sound energy emitted into the environment. Thus, the noise during the operation of machinery and mechanisms will be characterized by non-constant sound levels in time.

External noise sources include:

- earth-moving equipment (bulldozers, excavators);
- assembly equipment (truck cranes, caterpillar cranes);
- mobile air compressors;
- construction machines and vehicles, forklifts
- automobile and rail transport (delivery of building materials, equipment and construction waste).

To assess the impact of noise, the noise level from noise sources from construction machinery and mechanisms was simulated. The solutions of the analog object, the construction stage, were used as initial data.

The calculation area measuring 4760 m by 6450 m, covering the adjacent residential development, was adopted with a step of the calculation grid of 50 m, a height of 1.5 m.

Taking into account the location of noise sources, their acoustic characteristics, radiation direction, as well as the planning situation and regulatory requirements, the design points RT-001 – RT-033, 050, 051, located in residential areas adjacent to an industrial site, railway tracks and a highway, were selected.

The results of the calculated assessment (Table 9.18) show that the noise level at the design points and at the border of the SPZ of the enterprise during the construction period complies with national sanitary standards SanR&N 0267- 09 [2] and WHO Recommendations [3], which indicates compliance with the requirements of the IFC [4].

The table shows the comparative characteristics of the total noise level at the design points for the current situation and the expected noise levels during the

construction period, as well as the contribution to the total noise level at the design points from machinery during construction work.

Table 9.18: Noise levels at design points at the construction stage

Number of design points	Noise level (current situation), dBA	Predicted noise level, dBA	The contribution of construction machinery and mechanisms to the acoustic effect on the adjacent to the construction site of the territory, dB
1	33.60	33.70	0.1
2	32.00	34.80	2.8
3	32.70	34.60	1.9
4	32.30	34.50	2.2
5	33.60	34.30	0.7
6	33.20	33.30	0.1
7	32.30	32.30	0
8	35.90	36.40	0.5
9	29.00	29.10	0.1
10	24.40	25.20	0.8
11	37.50	37.80	0.3
12	39.30	39.40	0.1
13	31.60	31.60	0
14	36.70	39.20	2.5
15	36.10	39.00	2.9
16	34.50	37.20	2.7
17	35.00	35.40	0.4
18	40.10	40.10	0
19	36.50	36.50	0
20	41.10	41.10	0
21	38.10	38.30	0.2
22	42.20	42.30	0.1
23	35.50	38.00	2.5
24	35.70	35.80	2.1
25	40.10	40.20	0.1
26	35.50	35.50	0
27	30.20	30.30	0.1
28	33.70	34.40	0.7
29	42.80	43.00	0.2
30	39.10	40.40	1.3
31	41.90	45.00	3.1
32	38.00	40.50	2.5
33	37.50	37.50	0
46	–*	38.70	–*
47	–*	40.60	–*
48	–*	41.00	–*
49	–*	38.40	–*
50	30.60	31.20	0.6
51	47.70	50.80	3.1

From the results presented in the table (Table 9.18), it can be concluded that the noise level for the period of construction work exceeds the existing noise level from 0.1 to 3.1 dB (at one point). The predicted noise level at the settlement points does not exceed the regulatory values of the national [2] and IFC requirements [4]. The construction phase of the combined-cycle power plant and vehicles will not significantly change the acoustic environment in the area adjacent to the construction site.

9.3.4 Operational stage

The following significant noise sources were taken into account when predicting the acoustic situation:

- sources of technological noise penetrating from the premises to the territory;
- sources of ventilation noise emitted by the open ends of the ducts;
- sources of traffic noise, determined by the movement of road and rail transport near the territory of the enterprise.

The results of the calculated assessment show that the noise level at the settlement points and at the border of the terminal SPZ at the operational stage meets the selected criteria: national sanitary standards (SanR&N 0267-09 [2]) and WHO Recommendations [3], which indicates compliance with the requirements of the IFC [4], taking into account the implementation of noise protection measures.

Table 9.19 presents the expected noise levels after the commissioning of the power plant, as well as the contribution to the total noise level at the design points from the operation of the equipment and the increase in noise from an increase in the intensity of road traffic.

Table 9.19: Noise levels at design points at the operational stage

№ of design points	**Noise level (current situation), dBA**	**Predicted noise level, dBA**	**The contribution of enterprises to the acoustic impact on the surrounding area, dB**
1.	33.60	33.60	0
2.	32.00	32.00	0
3.	32.70	32.90	0.2
4.	32.30	32.40	0.1
5.	33.60	33.70	0.1
6.	33.20	33.30	0.1
7.	32.30	32.40	0.1
8.	35.90	35.90	0
9.	29.00	29.00	0
10.	24.40	24.80	0.4
11.	37.50	37.50	0
12.	39.30	39.30	0
13.	31.60	31.60	0
14.	36.70	36.90	0.2
15.	36.10	36.10	0
16.	34.50	34.50	0
17.	35.00	35.10	0.1
18.	40.10	40.20	0.1
19.	36.50	36.50	0
20.	41.10	41.10	0
21.	38.10	38.10	0
22.	42.20	42.20	0
23.	35.50	35.50	0
24.	35.70	35.70	0
25.	40.10	40.10	0
26.	35.50	35.50	0
27.	30.20	30.30	0.1
28.	33.70	33.80	0.1
29.	42.80	43.00	0.2
30.	39.10	40.00	0.9

31.	41.90	41.90	0
32.	38.00	38.00	0
33.	37.50	37.90	0.4
50	30.60	31.20	0.6
51	47.70	49.60	1.9

From the results presented in Table 9.19, it can be concluded that the noise level after commissioning of the enterprise will change the noise level in the adjacent territories by no more than 0.9 dB.

National sanitary standards [2], as well as WHO Recommendations [3] and IFC requirements [4] for daytime and nighttime will be provided at all settlement points, except for territories adjacent to railway tracks (RT 051).

9.3.5 Recommendations

9.3.5.1 Measures to prevent and mitigate impacts

Construction stage

To prevent acoustic effects at the construction stage, the following methods are used:

- planning solutions. The construction site is removed from residential areas.

To mitigate the acoustic impact, the following organizational and technical noise protection measures are recommended:

- organization of construction in strict accordance with the planning, technological and technical solutions of the project;
- carrying out work in accordance with good practice, compliance with the rules of work, the involvement of qualified personnel for the production of work;
- monitoring of the technical condition of bulldozer and excavator engines in order to prohibit the operation of equipment emitting increased noise;
- exclusion of parking of vehicles, bulldozers and excavators with running engines, at a time when work is not carried out;
- speed limit on the access road section is up to 40 km/h.

Operational stage

To prevent acoustic effects at the operation stage, the following methods are used:

- planning solutions. The construction site is removed from residential areas;
- speed limit on the access road section is up to 40 km/h.

The proposed measures comply with the Recommendations [4].

9.3.5.2 Monitoring and reporting

To confirm compliance with national and international standards of acoustic impact, measurements of noise levels at points that simultaneously meet the following conditions are provided:

- the closest approach to the SPZ border;
- the closest approach to the main sources of noise of the enterprise;
- exclusion of the influence of other noise sources that are not related to the enterprise.

To measure the noise level of the enterprise, control points are proposed located on the border of the regulatory SPZ of the enterprise, at a height of 1.2 m with the orientation of the microphone in the direction of the territory of the power plant.

Table 9.20 Characteristics of control points of noise and vibration levels

Point No	**Addre ss**	Coordinates	
TCC 1	Entrance to the production site	40.092745	67.939482
TCC 2	The end of the production site near the ditch	40.091163	67.948810
TCC 3	Near residential buildings	40.090561	67.946963
TCC 4	Near the gas station	40.090877	67.940344

Monitoring of noise levels is planned to be carried out according to two indicators:

- sound pressure levels in octave bands with mean geometric frequencies of 31.5-8000 Hz;
- the equivalent sound level (sound level), adjusted on the “A” scale.

Taking into account the constant work of a number of departments of the enterprise, noise levels are measured during the daytime and at night, during the operation of the maximum number of equipment that determines the noise emission with the highest levels.

The duration of measurements is taken according to [24] to determine all the necessary normalized noise parameters.

Frequency – at least 4 days of measurements, once every 3 months.

When establishing the excessive impact of noise from the sources of the enterprise on residential areas, corrective actions are taken:

- identification of sources that cause excess of regulatory noise levels;
- development and implementation of additional noise protection measures.

Proposals for monitoring and reporting are presented in Table 9.21

In addition to measuring noise levels, it is necessary to inspect the construction site (at the stage of operation on an industrial site) in order to monitor the implementation of organizational and technical measures.

9.3.6 Assessment results

The acoustic impact assessment results matrix (characteristic of the acoustic effect) is given in Table 9.21.

Found that the impact of the planned activity on the acoustic environment is assessed as follows: 9.22:

- at the construction stage – negligible;
- at the operation stage – low.

Table 9.21 Measures to prevent and mitigate acoustic impacts

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Implementation method/ reporting
I.	**Construction stage**					
1.	• Construction works (earthworks, general construction works) • Transport and logistics (delivery of raw materials, fuels and lubricants, other transportation)	• Prevention of acoustic effects on the population • Mitigation of the impact of noise exposure levels on the population	• Planning solutions (removal from residential areas) • the speed limit on the section of the access road is up to 40 km/h • organization of construction in strict accordance with the planning, technological and technical solutions of the project • carrying out work in accordance with good practice, compliance with the rules of work, the involvement of qualified personnel for the production of work, • monitoring of the technical condition of bulldozer and excavator engines in order to prohibit the operation of equipment emitting increased noise • exclusion of parking of vehicles, bulldozers and excavators with running engines, at a time when work is not carried out;	- IFC EHS Section 1.7 Noise - SanR&N 0267-09 - GOST 23337-2014 (ISO 1996-1:2016, ISO 1996-1:2017)	• Measurement of noise levels in adjacent residential areas in accordance with the proposed schedule • inspections at the construction site	• Implementation of environmental management measures in accordance with the project documentation and the construction organization project • compliance with the requirements of national legislation in the field of environmental protection • training of construction contractor's personnel and maintaining their awareness • reporting on the results of noise measurement • reporting on inspection results

II.	Operational stage					
1.	• The main production process • Transport and logistics (delivery of raw materials, fuels and lubricants, shipment of products, other transportation)	• Prevention of acoustic effects on the population • Mitigation of the impact of noise exposure levels on the population • Compensation of acoustic effects on the population	• Planning solutions (removal from residential areas) • the speed limit on the section of the access road is up to 40 km/h • installation of mufflers on ventilation systems	- IFC EHS. Section 1.7 Noise - SanR&N 0267-09 - GOST 23337-2014 (ISO 1996-1:2016, ISO 1996-1:2017)	• Measurement of noise levels in adjacent residentia areas in accordance with the proposed schedule • Inspections at the industrial site	• Implementation of environmental management measures in accordance with the project documentation and the construction organization project • compliance with the requirements of national legislation in the field of environmental protection • reporting on the results of noise measurement • Reporting on inspection results

Table 9.22 Matrix of acoustic impact assessment results

Life cycle stage: construction

Recipient: population

Recipient sensitivity: average

Characteristics of impacts

Impact	Acoustic impact on the territory with normalized environmental quality indicators		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low
Consequences	Violation of the living conditions of the population (impact on the central nervous system and psyche)				

Measures	• Planning solutions (removal from residential areas) • organization of construction in strict accordance with the planning, technological and technical solutions of the project • carrying out work in accordance with good practice, compliance with the rules of work, the involvement of personnel with the necessary qualifications for the production of work • monitoring of the technical condition of engines and exhaust systems of cars, bulldozers, excavators in order to prevent the operation of equipment emitting increased noise • exclusion of parking of vehicles and cars with running engines, as well as bulldozers and excavators at a time when work is not carried out • operation of vehicles in a mode that allows vehicles to move without unnecessary loads on the engine and vibrations of the body and cargo • installation of mufflers on existing ventilation systems				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Negligible

Life cycle stage: operation

Recipient: population

Recipient sensitivity: average

Characteristics of impacts

Impact	Acoustic impact in areas with normalized environmental quality indicators		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate
Consequences	Violation of the living conditions of the population (impact on the central nervous system and psyche)				
Measures	• Planning solutions (removal from residential areas) • installation of mufflers on ventilation systems				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

Sources

1. GOST 31295.2-2005 (ISO 9613-2:1996) “Noise. Sound attenuation during propagation on the ground. Part 2. The general method of calculation”.
2. SanR&N 0267-09 “Sanitary norms and rules for ensuring permissible noise in residential, public buildings and on the territory of residential development”.
3. Guidelines for Community Noise, World Health Organization, 1999.
4. FC. General Environment, Health and Safety Guidelines (EHS).

9.4 Impacts related to waste generation

The section presents an analysis of the waste management system at the stages of construction and operation of the power plant, as well as recommendations related to this aspect.

The section has been prepared taking into account the requirements of the terms of reference, the national requirements of the legislation of the Republic of Uzbekistan and the requirements of the IFC [1-5].

Recommendations for mitigation of impacts have been developed in accordance with the requirements of the IFC [3-5].

In the process of construction and installation work, mainly construction waste is generated (construction waste, metal scraps, cleaning rags, electrode stubs, and others), as well as solid household and food waste. These wastes belong to hazard classes 4 and 5.

Waste related to the operation of road construction equipment (spent fuel, batteries, tires) is not generated, since the repair of equipment will be carried out outside the construction site, at repair bases or service stations.

9.4.1 Construction stage

During the construction period, the formation of the following waste is predicted at the construction site and at the construction camp site (If needed):

- waste of building materials (concrete and reinforced concrete products, building bricks, crushed stone, cement, wood, bitumen, insulating materials, paints and varnishes);
- waste of soils, including possibly contaminated (with petroleum products);
- construction waste;
- electrode stubs;
- scrap of ferrous metals;
- cleaning rags;
- worn-out special clothing;
- food waste;
- solid household waste.

Calculations have shown that during the construction of the facility, waste is generated in the amount of 9 items in the amount of 22684.72 tons/year.

The temporarily generated waste includes:

- waste of the soil and vegetation layer - 22,500 tons/year (hazard class 5); construction waste – 2.5 tons/year (hazard class 4);
- ferrous metal scrap – 5.5 tons/year (hazard class 5);
- electrode stubs – 0.45 t/year (hazard class 5);
- cleaning rags – 1.95 tons/year (4 hazard classes);
- worn workwear - 1,267 tons/year (4 hazard classes);
- food waste – 3.0 tons/year (hazard class 5);
- Solid waste – 32.5 tons/year (hazard class 5);
- The estimate - 139.5 tons/year (4 hazard classes).

9.4.2 Operational stage

According to the draft Environmental Management System, a total of 21 types of waste are expected to be generated during the operation of the enterprise's facilities, in the amount of 127.0 tons per year, of which:

- 18.221 tons/year, hazard class 2 (6 types of waste);
- 0.307 t/year, class 3 (1 type);
- 94.416 tons/year, class 4 (8 types);
- 13.375 tons/year, class 5 (6 types).

The list of waste generated during the operation of a combined cycle power plant is given in Table 9.23

Table 9.23: List of waste generated

Item	Name of the waste	Approximate quantity of generated waste, tons/year	Hazard class
1	Sludge from acid washing of boilers	6,0	4
2	Spent fuel (transformer oil, as well as petroleum products caught by means of oil traps)	0.56	2
3	Used fuel and lubricants (engine oils)	0.19	2
4	Used fuel and lubricants (compressor oils)	4.75	2
5	Used fuel and lubricants (turbine oil)	12,68	2
6	Scrap of ferrous metals	8.8	5
7	Non-ferrous metal scrap	0.55	5
8	Scrap lead (pieces)	0,007	2
9	Welding electrode stubs	0.5	5
10	Used batteries, not disassembled with electrolyte not drained	0,034	2
11	Used tires	0.307	3
12	Wiping material contaminated with oils, less than 15%	0.017	4
13	Worn-out workwear	0.136	4

14	Used LED panels	0.081	4
15	Waste paper waste	0.025	5
16	Waste from the medical center	0,007	4
17	Waste metal barrels	0.420	5
18	Waste plastic container	2.625	4
19	Food waste	0.3	4
20	Solid household waste	3,5	5
21	Departure from cleaning the territory	85.25	4
	Total	**127**	

9.4.3 Recommendations

9.4.3.1 Measures to prevent and mitigate impacts

Construction stage

Organizational and technical measures to prevent and mitigate negative impacts are proposed at the construction stage

Operational stage

At the operational stage, the hierarchy of measures for waste management includes the following decisions:

- prevention of waste generation;
- reducing the volume of education;
- reuse;
- regeneration;
- recycling;
- removal and final destruction.

Measures to mitigate (minimize) the impact of waste also include:

- arrangement of production and consumption waste storage sites;

9.4.3.2 Monitoring and reporting

Measures and monitoring of waste management processes are presented in Table 9.24.

9.4.4 Assessment results

The matrix of the results of the assessment of the impact of power plant activities related to waste generation is presented in Table 9.24.

It is established that the impact of the planned activity on the environment related to waste management is estimated as follows:

- at the construction stage – negligible;
- at the operation stage – low.

Sources

1. The Law of the Republic of Uzbekistan “On Nature protection” No. 754-XII dated on 09/12/1992.
2. The Law of the Republic of Uzbekistan “On waste” No. 362-II dated on April 5, 2002.
3. General Environment, Health and Safety Guidelines (EHS). IFC, 2007
4. IFC. Environmental, Health and Safety Guidelines for Waste Management Companies. IFC, 2007
5. Resolution of the Cabinet of Ministers of Uzbekistan No.78 dated on 14/02/2017.

Table 9.24: Measures to prevent and mitigate impacts related to waste management

No	Activity/ process	Tasks	Measures	Applicable requirements	Monitoring	Way of implementation/reporting
I.	**Construction stage**					
1.	Construction works (construction site; construction site)	Prevention of disordered waste storage, prevention of secondary contamination of soils, surface and groundwater protection of soils, surface and underground waters from leaks and/or spillage of liquid waste	Organization of specially equipped sites for safe temporary storage (accumulation) of waste, arrangement of waterproof coating on the sites of storage of construction and municipal solid waste ensuring waste accumulation limits; regular removal of construction and other waste by authorized contractors; separate collection of hazardous waste; storage of waste of hazard class 2-3 (oiled rags, paints and varnishes, oils and lubricants, etc.) using a secondary protective shell (pallets), preventing leakage; storage of municipal solid waste and food waste in containers with lids and in storage areas equipped with a canopy or roof to prevent them from getting wet equipment of a special maneuvering area for temporary storage of excess soil with a hard waterproof covering collection, disposal and treatment of all types of wastewater, including stormwater and meltwater (for example, according to temporary scheme) equipping with consumables and equipment for the prompt elimination of the consequences of spills or leaks	IFC EHS IFC. Guidelines for waste management enterprises on EHS protection IFC PS-1 IFC PS-3 Federal Law "On waste" Sanitary rules of the Republic of Uzbekistan dated on 04.11.1996 No. 0068-96 Sanitary rules of the Republic of Uzbekistan No. 0127-02 dated on 29/07/2002	Regular visual checks of all platforms, storage devices and containers for the collection and temporary storage of waste: the correct labeling of the storageand containers; inspection of storage containers to detect leaks, cracks or other signs of loss; detection of cracks, corrosion or damage to storage devices and containers checking the condition of the site coverage documentation of status check results Recording of any changes to platforms and/or storage devices, as well as significant changes in the amount of waste stored, must be fixed Regular activity check of waste sorting and collection Waste classification and periodic documentation of their properties, and also the correct treatment with waste, primarily with hazardous ones Documenting information about the location of all hazardous waste on the	Development and implementation of management plans in the field of occupational safety and the environment (pollution prevention and control plan during the construction phase, Waste Management Plan)

					site, as well as data on their quantity in each of these places.	
	Activity/process	Tasks	Measures	Applicable requirements	Monitoring	Implementation method/reporting
II.	Operating stage					
2.1.	Main production activity (electricity generation) Provision of basic production activities – repair work, water supply, sanitation, nutrients supply, cleaning of the territory and industrial premises Transport and logistics (delivery of materials and raw materials, fuels and lubricants, shipment of products, other transportation, storage of hazardous materials)	Prevention of the negative impact of waste on the health of the population and staff prevention of disordered waste storage prevention of secondary contamination of soils, surface and groundwater protection of soils, surface and underground waters from leaks and/or spillage of liquid waste	Minimization of waste generation; creation and implementation of a system for selecting consumers of secondary resources; creation and implementation of the system for selecting contractors for waste management; ensuring waste accumulation limits; regular waste disposal by authorized contractors separate collection of hazardous waste storage of waste of 2-3 hazard classes with the use of a secondary protective shell (pallet) that prevents leakage storage of municipal solid waste and food waste in containers with lids and in storage areas equipped with a canopy or roof to prevent them from getting wet	IFC EHS IFC EHS Safety Guidelines for Metallurgical Plants of the IFC. Guidelines for waste management enterprises on EHS protection IFC PS-1 IFC PS-3 Federal Law "On waste" Sanitary rules of the Republic of Uzbekistan dated on 04.11.1996 No. 0068-96 Sanitary rules of the Republic of Uzbekistan No. 0127-02 dated on 29/07/2002	Regular visual checks of all sites, storage facilities and containers for the collection and temporary storage of waste: the correct labeling of the storages and containers; inspection of containers for storing to detect leaks, leaks or other signs of loss detection of cracks, corrosion or damage to the storages and containers checking the condition of the site coverage documenting the results of condition checks recording of any site changes and/or storage containers, as well as significant changes in the number of stored waste Regular activity check of waste sorting and collection Periodic analysis of waste generation trends by type and quantity, taking into account the process of their forming on separate divisions of the facility Classification of waste and	reports based on the results of all types of monitoring keep records of waste accounting statistical reporting a documented selection procedure and inspections of contractors carrying out the appeal with the waste of the enterprise

					periodic documentation of their properties, as well as proper waste management, primarily hazardous Monitoring of groundwater quality (see Section 9.7) Recorded data on monitoring of collection, storing and transportation of dangerous waste processes mustinclude the following information: name and identification number of the waste; physical condition; quantity; transport documentation Documenting information about the location of all dangerous waste on the territory of the facility, as well as data on their number in each of these places	

Table 9.25 Waste Generation Impact Assessment Results Matrix

Life cycle: construction

Recipients: soil-forming rocks, surface and groundwater (groundwater)

Recipient sensitivity: low, medium

Characteristics of impacts

Impact	Contamination of soil-forming rocks, surface and underground (ground) waters		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Low
Consequences	Indirect impacts on personnel, population, flora and fauna				
Measures	• Organization of specially equipped sites for safe temporary storage (accumulation) of waste, arrangement of waterproof coating on the sites of storage of construction and municipal solid waste • ensuring waste accumulation limits • regular removal of construction and other waste by authorized contractors • separate collection of hazardous waste • storage of waste of 2-3 hazard classes (oiled rags, paints and varnishes, oils and lubricants, etc.) using a secondary protective shell (pallets) that prevents leaks • storage of municipal solid waste and food waste in containers with lids and in storage areas equipped with a canopy or roof to prevent them from getting wet • equipment of a special shunting platform for temporary storage of excess soil with a hard waterproof coating • collection, disposal and treatment of all types of wastewater, including stormwater and meltwater (for example, according to a temporary scheme) • equipping with consumables and equipment for the prompt elimination of the consequences of spills or leaks				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Negligible

Life cycle stages: operation

Recipients: soil-forming rocks, surface and underground (groundwater) waters, atmospheric air

Recipient sensitivity: low, medium, high

Characteristics of impacts

Impact	Contamination of soil-forming rocks, surface and underground (ground) waters		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate
Consequences	Indirect impacts on personnel, population, flora and fauna				

Measures	• Minimization of waste generation • creation and implementation of the system for selecting contractors for waste management • ensuring waste accumulation limits • regular removal of construction and other waste by authorized contractors • separate collection of hazardous waste • storage of waste of 2-3 hazard classes with the use of a secondary protective shell (pallet) that prevents leakage • storage of municipal solid waste and food waste in containers with lids and in storage areas equipped with a canopy or roof to prevent them from getting wet				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

9.5 Impact on surface waters

9.5.1 Assessment methodology

The assessment of the impact of the proposed activity on surface water bodies was carried out taking into account national requirements and IFC requirements in the field of protection and use of surface waters.

The nearest surface watercourse to the designated construction site is a ditch that flows at a distance of 11.5 meters in an easterly direction with a maximum capacity of 20 to 25 cubic meters (it depends on the season) of water per minute and a total depth of up to 1-2 meters along the edge of the normal water level.

The local government constructed the ditch in order to gather water and transport it to the water collection points. Jizzak Reservoir has nothing to do with the ditch and is not used for irrigation activities.

The main irrigation canal flows at a distance of 880 meters in the south-west direction with a throughput of 40 to 50 cubic meters of water per second and a total depth of 6 meters along the edge of the normal water level

The main irrigation canal originates from the Jizzakh reservoir, then flows next to the city of Jizzakh in the direction of the agricultural fields of the village of Yangikishlok and other settlements.

The coastal zone of the Jizzakh reservoir is located in the south direction from the project area at a distance of 1.7 km.

The criteria and requirements presented in the following documents were used for the assessment:

- IFC guidance documents:
  - General Environment, Health and Safety Guidelines (EHS);
  - Environmental, Health and Labor Safety for thermal power plants.
  - Environmental, Health and Safety Guidelines for Water Supply and Sanitation Systems.
- Regulatory and technical documents of the Republic of Uzbekistan:
  - O'z DSt 951:2011 "Sources of centralized domestic and drinking water supply. Hygienic, technical requirements and selection rules";
  - SanR&N RUz No. 0318-15 "Hygienic and anti-epidemic requirements for the protection of water bodies in the territory of the Republic of Uzbekistan";
  - Construction standards KMK 2.04.01-98 "Internal water supply and sewerage of buildings";
  - Construction standards KMK 2.04.03-97 "Sewerage. Outdoor networks and facilities";
  - Regulation on the procedure for approving water protection zones and sanitary protection zones of water bodies in the Republic of Uzbekistan (approved by Resolution of the Cabinet of Ministers dated 11.12.2019 No. 981);
  - Regulations on the procedure for the development and harmonization of environmental standards (approved by the Resolution of the Cabinet of Ministers No. 14 dated on 14/01/2014).

According to the IFC EHS, the concentration of pollutants due to the discharge into reservoirs of wastewater generated as a result of the production process and auxiliary operations, as well as as a result of the discharge of economically- domestic and stormwater effluents should not exceed the criteria for the quality of natural waters established by the requirements of regulators [8].

When wastewater is discharged into water bodies according to [8], it is also necessary to ensure:

- wastewater treatment standards corresponding to the industry Guidelines applicable to this project [9];
- standards established at the national or local level for household wastewater, and in the absence of such, indicative recommendation standards for household wastewater are presented in [8];
- the temperature of wastewater before discharge, which should not increase the water temperature of the water body at the boundary of the mixing zone by more than 3 °C.

Natural and wastewater quality criteria were used to analyze and forecast the condition of surface water bodies:

- indicators presented in the “Handbook of an Environmental expert” (Publication of the State Committee of the Republic of Uzbekistan for Nature Protection and State Environmental Expertise, Tashkent, 200929; p. 141);
- the evaluation criteria presented in the industry [9] (permissible concentrations in effluents at discharge into a water body, which are provided without dilution and are observed for at least 95% of the operating time of the enterprise).

The fisheries quality standards for water bodies presented in the “Handbook of an Environmental Expert” [10] correspond to the quality standards – MPC of the VNIRO handbook (1999) and previously applied in the Russian Federation [1].

The possibility of using this list and MPC in UZBEKISTAN to assess the water quality of fishery reservoirs according to 1204 indicators [1] is confirmed by the letter of the State Committee for Ecology dated 01/26/2022 No. 03- 02/3-250

A comparison of national and international wastewater requirements for discharge into water bodies is presented in Table 9.26. The table shows the quality criteria for pollutants and wastewater properties that are specific to the production and stormwater runoff of the enterprise (see Section 9.5.2).

Table 9.26: National and international requirements for wastewater from metallurgical plants when discharged into water bodies

Item	**Pollutants and indicators of wastewater properties** [1]	**Indicators according to national requirements**	**Acceptable values in effluents according to the industry Guidelines of the EHS [9]**	**Target**
1.	Temperature,^{0}C	Requirements are not set	Temperature rise in a water body no more than 3 ^{0} C [3]	Temperature increase in a water body by no more than 3 ^{0} C [3]
2.	pH	6.5-8.5	6,0-9,0	6.5-8.5
3.	Dissolved oxygen, mg/^{dm3}	4 or more	Requirements are not set	4 or more
4.	Phosphates, mg/dm^3	0.2	2.0	
5.	Sulphates, mg/dm^3	100	Requirements are not set	
6.	Chlorides, mg/dm^3	300	Requirements are not set	

7.	Ammonium nitrogen, mg/dm^3	0.4	5.0	0.4
8.	Nitrogen of nitrates, mg/^{dm3}	9.3	The amount of nitrogen of nitrates and nitrites is 25 mg/dm330	
9.	Nitrite nitrogen, mg/^{dm3}	0.03		
10.	Iron, mg/dm^3	0.1	5.0	0.1
11.	Chromium, mg/dm^3	0.07	0.1	0.07
12.	Manganese, mg/dm^3	0.01	Requirements are not set	0.01
13.	Calcium, mg/dm^3	180	Requirements are not set	180
14.	Magnesium, mg/dm^3	40	Requirements are not set	40
15.	Suspended solids, mg/dm ^{3}	requirements are not set	35	35
16.	Cyanides, mg/^{dm3}	0.05	0.5	0.05
17.	Fluorides, mg/dm ^{3}	0.32	5	0.32
18.	Total content of petroleum hydrocarbons (petroleum products), mg/^{dm3}	0.05	10	0.05
19.	Phenol, mg/dm ^{3}	0.001	Requirements are not set	0.001
20.	Total salt content, mg/dm^3	1000	Requirements are not set	1000
21.	Copper, mg/dm^3	0.001	0.5	0.001

Based on the requirement [8] to ensure locally established criteria for the quality of natural water during wastewater discharge, indicative indicators for fisheries reservoirs in accordance with the national requirements of Uzbekistan, which are more stringent than the requirements established by the IFC in [9] for all indicators, were adopted as targets for the discharge of wastewater from the enterprise into water bodies wastewater, except suspended solids and temperature.

For the temperature and concentration of suspended solids, the target indicator has been adopted at the level set by the industry Guidance on EHS (Table 9.26).

Thus, taking into account the explanation of the national regulator for the assessment of water quality in water bodies planned for the discharge of wastewater of the enterprise, the fisheries quality standards (MPC) contained in the list of VNIRO 1999 were adopted.

Due to the lack of acceptable values in the list of MPC and in the industry Manual [9], an indicative quality indicator for fisheries water bodies, presented in the “Handbook of an Ecologist expert” [10], is proposed as a target indicator for mineralization.

9.5.2 Analysis of the design scheme for water supply and sewerage of the Plant

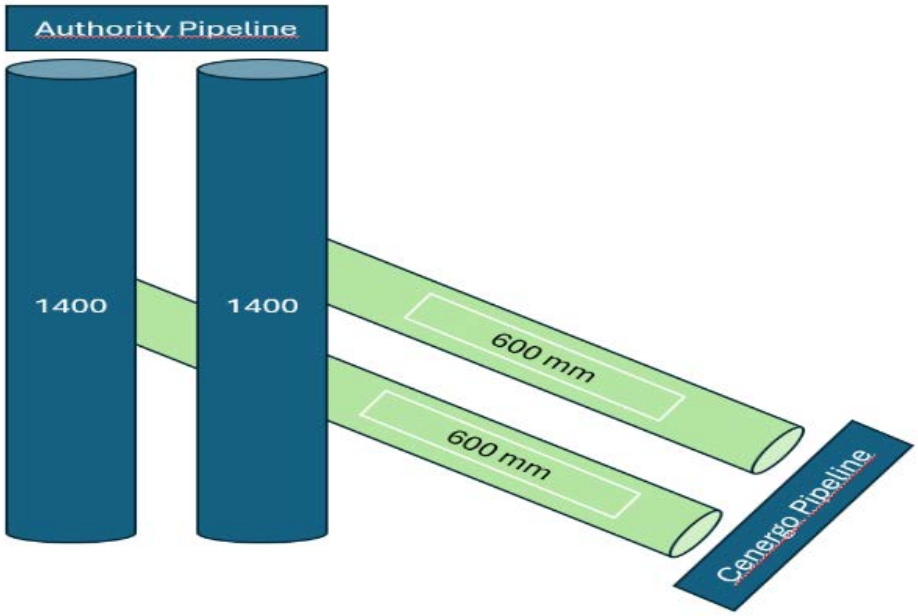
The proposed water intake site for the Project needs is equipped with concrete structures and a water level control sluice, the project provides for the use of an existing water intake with a tapping point at the designated location, no additional construction or impact on the reservoir's flora and fauna is expected.

The Water Ministry, which is in charge of supervision and maintenance, installed two pipes on the reservoir. There is a spare pipe and an operational pipe. The pipe has a 140 cm diameter and no pump has been installed. Gravity drives the water flow process. Cenergo will establish 2 pipes (60 cm) on the existing pipeline that is controlled by the authority. The pipes that will be established by Cenergo will not be related directly to the Jizzak Reservoir. The photos below demonstrate the existing pipeline systems (140 cm) that have been established by the authority. Cenergo will set up a pipeline (60 cm) on this system for intake water, and the water will flow in the Cenergo pipelines with gravity. So, there is no plan to set up any pump system in the pipeline.

Regarding the construction plan, only one pipe will be used for intake water; the second pipeline is a spare in case of emergency or maintenance.

CENERGO has carried out extensive consultations with the Reservoir Authority to confirm that the project's planned water use will not adversely affect other existing water users.

Additionally, Cenergo assured the local government that the project's water usage would not negatively affect the water shareholders or local users.



The reservoir supplies water to more than 61.72 thousand hectares of irrigated lands of the Jizzakh region and has an irrigation purpose. During the irrigation season, water from the reservoir is supplied through the drainage system back to the irrigation canal. According to data received from the Jizzakh Region Reservoir Management for 2020-2023, the actual volume of water flowing into the reservoir ranged from 23.9 million m3 in 2021 to 64.9 million m3 in 2023. At the same time, the actual water consumption from the reservoir in 2023 amounted to 42.7 million m3. In the winter months outside the irrigation season, the flow from the reservoir is at zero, the flow begins in March and ends in November, while the inflow of water and filling of the reservoir begins in January and ends in July.

According to the technology, in order to avoid the formation of salt deposits on the walls of the equipment, the cooling towers are constantly purged. Purge waters are conditionally clean. The total salt content in this water does not exceed the salt content in

the source water. It is planned to monitor the salinity in the source and purge waters. The purge water of the cooling tower and the water after cooling of the equipment are diverted to the internal sewer network of the enterprise and then it is planned to be sent to the ditch next to the industrial site.

The main characteristics of water consumption and wastewater disposal of the enterprise are adopted on the basis of the initial information provided by the Customer on the object of the planned activity.

It should be noted that when using the innovative “Dry Flexicycle” technology in the steam cycle of a dry condenser connected to the radiator cooling circuit, the total water consumption of the power plant drops to such a low level that it can be used in the most arid and arid regions. “Dry Flexicycle” is the optimal solution for power plants operating on a flexible base load (both with gas and multi-fuel configurations).

According to the data provided by the Customer, the production water consumption is formed conditionally based on the calculation of electricity generation per 1 MW of about 0.36 m3 of water.

The approximate water consumption is calculated taking into account the water consumption per 1 MW - about 0.36 m3 (water intake for the chemical water treatment system, recharge of the raw water tank, fire system and others).

With the production capacity of the power plant - 550 MW/h, the hourly water consumption will be: 550.0 x 0.36 = 200.0 m3/hour, 4800 m3/day, 1,752 000 m3/year, which will amount to 2.3% of the total annual water inflow into the reservoir.

The power plant will use a circulating water supply system with the installation of a fan-mounted cooling tower of the “CENK” type (3 fans in each tower). The cooling range of the cooling towers will be 10 C, the inlet water temperature is 34 C, the outlet water temperature is 24 C, the drip loss is 0.20% and the evaporation of water will be 1.30%.

After filling the system with a technological volume of water, then there is a periodic replenishment of water losses in the technological cycle. Replenishment of losses in the circulation system (evaporation and entrainment of water in cooling towers, purging of the circulation system) is provided by supplying additional water from the raw water tank.

The cooling water from the cooling tower will be used mainly in the condenser to condense the exhaust steam. The oil block also uses cooling water to cool the lubricating oil.

In general, the design solutions for the water supply and sanitation of the planned production (including the operation of the enterprise’s water circulation cycles) comply with the requirements of the EU BAT.

The volumes of wastewater disposal of the enterprise are presented in the table (Table 9.27).

Table 9.27: Main characteristics of the company’s wastewater disposal

Item	**Name of the drains**	**The amount of lead**		**Drainage conditions**
		m3/day.	**thous. m3/year**	
1.	Household wastewater	17.993	6277.67	They will be discharged into waterproofing cesspools with a volume of 90 m3 each, followed by export to the nearest treatment facilities on the basis of an economic agreement with specialized enterprises

2.	Conditionally clean effluents from cooling tower purging, equipment cooling	1.634	572.124	They will be sent to the ditch.
TOTAL		**19.627**	**6849.794**	

Measures to prevent or mitigate negative impacts are presented in Section 9.5.6.

During the operation phase, treated wastewater will be discharged to the ditch in terms of "Reduced permissible concentrations of pollutants in the water of surface water bodies by categories of use" standards, Fish-Farming category.

Options	Fish-farming	Cultural and household	Drinking	Irrigation*)
COD	15	40	30	40
BOD20 , mgO/L	3	3-6	3-7	10
PH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Weighted Substances	15	30	30	50
Mineralization	1000	1000	1000-1500	1000
including: sulphates	100	500	400-500	
Chlorides	300	350	250-350	
Ammonium nitrogen (ammonium saline) (NH_4^+)	0,5	2	0.5	1.5
Nitrite nitrogen (NO_2^-)	0.02	0.5	3	0.5
Nitrogen nitrate(NO_3^-)	9.1	25	45	25
Nitrites	0.08	3.3	3	
Nitrates	40	45	45	
Phosphates (PO_4^{3-})	0.3	1	3.5	1
Ether-soluble	0.05	0.8	0.8	0.8
Petroleum products	0.05	0.3	0.1	0.3
SPAV	0.1	0.5	0.5	0.5
Phenol	0.001	0.001	0.001	0.001
Fluorine (F)	0.05	1.5	0.7	1
Arsenic (As)	0.05	0.05	0.05	0.1
Iron (Fe)	0.05	0.5	0.3-3	5
Chromium (Cr^{6-})	0.001	0.1	0.05	0.1
Copper (Cu)	0.001	1	1	1
Zinc (Zn)	0.01	1	3	5
Cyanides	0.05	0.1		
Lead (Pb)	0.03	0.1	0.03	0.2
Nickel (Ni)	0.01	0.1	0.1	
Cadmium (Cd)	0.005	0.01		
Cobalt (Co)	0.1	1		
Molybdenum (Mo)	0.0012	0.5	0.25	
Strontium ($Sr2)_+$		2	7	
Selenium (Se)	0.001		0.01	
Rhodanids	0.1			
Mercury (Hg)		0.005	0.0005	

9.5.3 Construction stage

During construction work, water is used to prepare mortar, irrigate the territory to reduce dust, and for the household needs of builders. Water supply during construction works will be carried out at the expense of the borehole (wells) and the imported water supply. Imported water tanks will be filled from the sources of the water supply wells.

Imported bottled water, purchased independently by a construction contractor, is partially used for the drinking needs of builders.

During the construction of the power plant, about 650 builders and employees (50 people, including ETP) will work on the territory of the construction site.

The construction period is 36 months, about 950 days per year.

During the construction of a combined–cycle power plant, the water consumption rate per day is determined according to KMK 2.04.01.98 g, where it is 25 liters per worker and 12 liters for ETP.

The total water consumption during the construction of the power plant will be 79.80 m3/day. or 44133.0 m3/year, of which:

- for production needs - 20.56 m3/day. or 2540.0 m3/year;
- for household and drinking needs - 59.24 m3/day. or 41593.0 m3/year.

Industrial effluents are not formed during construction. The water used for the preparation of mortar, irrigation of the territory in order to reduce dusting is irretrievably lost.

Household wastewater generated during construction is planned to be sent to a temporarily installed storage tank (sewage tank) with subsequent export to the nearest treatment facilities.

The total wastewater disposal (effluents) of household effluents during the construction of a combined-cycle power plant will amount to 59.24 m3/day. or 41593.0 m3/year (excluding water consumption for production needs (irrevocable) and irrigation of the territory).

9.5.4 Operational stage

The water supply of the planned power plant during operation consists of production and household and drinking needs.

The power plant's water supply sources are:

- Pipeline of the Jizzakh reservoir that control by authority - for industrial water supply (**2.3% of the total annual water consumption at the reservoir**);
- Drilled groundwater wells - water supply for household and drinking needs.

Water consumption for the production needs of a power plant consists of water consumption:

- to recharge the steam-water cycle and the circulating cooling system;
- to purge cooling towers;
- on the need for additional water of the ChWT system.

CENERGO has carried out extensive consultations with the Reservoir Authority to confirm that the project's planned water use will not adversely affect other existing water users.

Additionally, Cenergo assured the local government that the project's water usage, including in the event of future climate change-related reductions, would not negatively affect the water shareholders or local users.

A closed, circulating cooling system is used to cool the CCGT equipment. A mixture of demineralized water and ethylene glycol is used as a cooling medium in a closed circuit.

The heated water of a closed circuit is cooled by water from an auxiliary (external) circuit, which includes wet fan cooling towers with an internal pool, pumping stations, an inhibitor dosing system and monitoring devices. The water bowl of the cooling tower is filled with clarified water supplied by pumps from the tanks of the industrial water supply.

The additional water consumption consists of the losses of the settling tanks, the circulating cooling system (evaporation and entrainment of drip liquid in cooling towers), the water consumption for purging cooling towers, as well as the intake of additional water into the ChWT system.

The primary purified water is sent to the raw water storage tank, from where the water flow is further distributed to the needs of the cooling tower, to recharge the cooling tower, to demineralize and cool the systems.

The circulating water cooled at the cooling towers is supplied via circulation pumps to the condensers of the steam turbine and to all auxiliary equipment through circulation ducts. After condensers and other heat exchangers, the spent (heated) water is sent to cooling towers for cooling by circulating water ducts.

Replenishment of losses in the circulation system (evaporation and entrainment of water in cooling towers, purging of the circulation system) is provided by supplying additional water from the raw water storage tank.

In order to avoid the formation of salt deposits on the walls of the equipment, constant purging of cooling towers is provided. Purge waters are conditionally clean. The water after purging, being conditionally clean, is planned to be discharged through the water pipes into the ditch.

For production purposes, during the operation of the 550 MW power plant, water will be used for the water cooling system of the equipment, for the water treatment system to compensate for the losses of steam and condensate in the GPU cycle.

According to the data provided by the Customer, the production water consumption is formed conditionally based on the calculation of electricity generation per 1 MW of about 0.36 m3 of water.

The approximate water consumption is calculated taking into account the water consumption per 1 MW - about 0.36 m3 (water intake for the chemical water treatment system, recharge of the raw water tank, fire system and others).

With the production capacity of the power plant - 550 MW/h, the hourly water consumption will be: 550.0 x 0.36 = 200.0 m3/hour, 4800 m3/day.

Then, further water intake for the needs of chemical water purification (primary sand filter, demineralization site, chemical preparation site, primary and secondary reverse osmosis and others) for production purposes will amount to (4800 x 350) 1680000.0 m3/year or 1680.0 thousand m3/year.

Calculations of industrial water consumption after chemical water treatment:

- for the needs of cooling, recharge of the steam–water cycle of the cooling tower - 80.5 m3/ hour, 1,932 thousand m3 / day. or 676,200 thousand m3/year;
- for the needs of a gas turbine (recharge, purge, flushing, cooling); – 35.5

m3/hour, 0.852 thousand m3/day. or 298.2 thousand m3/year;

- to recharge technologies with process water – 40.0 m3/hour, 0.960 thousand m3 /day. or 336.0 thousand m3/year;
- other consumption for production needs (water treatment, preparation of solutions, etc.) – 44.0 m3/hour, 1.056 thousand m3/day or 369.6 thousand m3/year.

Then, the total water consumption for the production needs of the power plant will amount to 200.0 m3/hour, 4,800 thousand m3/day. or 1680,0 thousand m3/year.

Calculation of water consumption for household drinking and irrigation needs.

Water for usage needs for the personnel will be supplied from the groundwater wells. The groundwater will be treated by a water treatment system. A water meter will be installed to record the actual water consumption.

Household and drinking needs consist of water consumption for the drinking needs of the working staff, water consumption for showers for the working staff, the needs of the dining room for cooking, wet cleaning of premises, and watering the territory.

The estimated water consumption for household and drinking needs was adopted in accordance with the requirements of KMK 2.04.01-98 “Internal water supply and sewerage of buildings”.

Irrigation of green spaces is planned on the territory of the industrial site of the new power plant in the area of the projected administrative and household building and fan cooling towers.

The estimated water consumption for watering green spaces was adopted in accordance with the requirements of KMK 2.04.01-98 “Internal water supply and sewerage of buildings”.

Water consumption for drinking needs.

Water consumption for the household and drinking needs of the company’s personnel is calculated according to the formula:

W = N x r x T / 1000, m3/year, where

N is the standard of water consumption per person per shift, N = 25 liters; d is the number of employees.

T is the planned number of working days.

The water consumption for the drinking needs of workers during the operation of the enterprise will be:

Q1 = 25 x 65 x 350 x 10-3 = 568.75 m3/year or 1,625 m3/day,

where 25 liters /day is the water consumption rate per worker, 65 is the number of workers per shift, 350 days is the working time per year.

The consumption of water for drinking water needs during the operation of the enterprise will be: Q2 = 12 x 5 x 350 x 10-3 = 21.0 m3/year or 0.06 m3/day,

where 12 liters / day is the rate of water consumption per ETP, 5 is the number of ETP per

at the enterprise, 350 days is the working time per year.

Then, total: 1,685 m3/day. or 589.75 m3/year.

Water consumption for plumbing work.

We determine the amount of water for household needs.

Vh= [(n× k×h)×d]/1000 (m3/year)

where:

Vh – The amount of water consumed for household needs n – the rate of water consumption per 1 person, 1 shower net, l/hour

k – Number of toilet glasses, urinals, showers and sinks, pcs. h – operating time of bathrooms, hour/day

d is the number of working days per year.

The number of sinks in the enterprise is 30 pcs , toilets - 25 pcs.

The calculation of water consumption for plumbing needs is performed according to the formula: W = N x n x k / 1000, m3/year, where

N - the standard of water consumption per 1 unit; n - the number of sources;

k - the operating time of the source;

Water consumption for plumbing (toilets, sinks).

Toilets (toilets with cisterns) – 25 units. (sewage system). The norm is 83 liters/hour per 1 unit (item 16 from the table in Appendix 2 of KMK 2.04.01-98, p. 151). They work 4 hours a day, 350 days a year.

For toilets with Vh tanks = 83 × 25 × 4 /1000 = 8,3 m3/day × 350 = 2905.0 m3/year.

Sinks – There are 30 units of sinks on the territory, they work 4 hours a day, 350 days a year. The norm is 30.0 liters/hour (item 1 from the table in Appendix 2 of KMK 2.04.01-98, p. 150).

Vh= 30 × 30 × 4 /1000 = 3,6 m3/day × 350 = 1260,0 m3/year.

Wet cleaning of premises (floor cleaning).

The area of the premises subject to wet cleaning is, according to buildings and premises where wet cleaning is necessary, 3000.0 m2 and the dining room – 340.0 m2.

The water consumption for cleaning the premises is calculated using the formula: Water consumption is calculated using the formula:

W = N x S x k x T /1000, where

N - the standard of water per 1 m2 of the territory to be cleaned, N =2 liters. S - the area of the territory to be cleaned;

k – the planned number of cleanings per day;

T the planned number of harvest days per year, T = 350 days. Wet cleaning of premises:

W = 2 x 3000.0 x 1 x 350 / 1000 = 2100.0 m3/year or 6.0 m3/day. Wet cleaning of the dining room:

W = 2 x 340.0 x 1 x 350 / 1000 = 238.2 m3/year or 0.68 m3/day. The total consumption for wet cleaning is 2338.2 m3/year or 6.68 m3/day.

60% of the water used in wet cleaning enters the cesspool, 40% of the water is irretrievable losses.

Consequently, the discharge of water (effluents) into the cesspool will be: 1402.92 m3/year or 4,008 m3/day.

Water consumption for the needs of the dining room.

The calculation of water consumption for cooking is made according to the formula:

W = N x k /1000, m3/year, where

N - the consumption standard for one conventional dish, N = 12 liters;

k - the number of dishes, k = (about 30 people eat per day. or about 10,000 meals per year);

W = 12 x 10000 / 1000 = 120.0 m3/year or 0.4 m3/day.

The norm of water disposal is equal to the norm of water consumption.

Watering of green spaces.

Water consumption is calculated using the formula:

W = N x S x to T /1000, where

N - the standard of one watering per square meter of plantings, N = 6 liters. S - the area of green spaces, S= 25000 m2;

k - the planned number of waterings per day, k = 1;

T - the planned number of watering operations per day, k = 1; T - the planned number of watering days, T = 90 days.

W = 6 x 25000 x 90 / 1000 = 13500.0 m3/year or 150.0 m3/day.

Water consumption for watering green spaces refers to irretrievable losses.

There is no wastewater discharge.

Watering the territory.

Water consumption is calculated using the formula:

W = N x S x to T /1000, where

N - the standard of one watering per square meter of the territory, N= 0.4 liters. S - the area of the territory for irrigation, S= 10000 m2;

k - the planned number of waterings per day, k = 1;

T - the planned number of watering operations per day, k = 1; T - the planned number of watering days, T = 90 days.

W = 0.4 x 10000 x 90 / 1000 = 360.0 m3/year or 4.0 m3/day.

Water consumption for watering green spaces refers to irretrievable losses.

There is no waste water discharge.

The total water consumption (water consumption) for household, drinking and irrigation needs of the power plant is 174.665 m3/day. or 21072.95 m3/year.

Water disposal.

Justification of water losses and compliance with the formation of industrial effluents.

The consumption of additional water consists of losses in the circulation system and selection for HVAC. Determination of cooling water losses in the circulation system:

Losses in the cooling tower.
Evaporation losses. The calculated evaporation losses are determined for the summer regime (VII) by the maximum average monthly daily air temperature t air = 35.7°C.
Q ev. = Q ev. x ∆t x q w/f (KMK 2.04.02-97, p. 97)
where: K ev - the coefficient of evaporation at an air temperature of 35.7°C; K ev.= 0.001565.
∆t - the temperature difference between incoming and cooled water, we preliminarily

determine ∆t=8 °C
q w/f - the circulating water flow rate, q w/f = 4500.5 m3/h. q w/f = 0.001565 x 8 x 4500.5 = 56.346 m3/h.
Wind ablation losses from the cooling tower.
We accept according to the characteristics of modern drop traps – 0.003% of the circulating water flow rate
Q w/ab. = 0.003% of q w/f.
Q w/ab. = 4500.5 m3 x 0.003%/100% = 0.135 m3/h.
Total losses in the cooling tower will be:

q c/t = q ev. + q w/ab. = 56.346 + 0.135 = 56.481 m3/h.

Losses during evaporation and various losses from wastewater settling tanks, from the pumping, transportation and storage system of water will average 0.103 m3/h.

Total losses in the circulation system will be:

Q cir.s.loss = 56,481 + 0,135 + 14,671 + 0,103 = 71,390 m3/h.

Taking into account water consumption for production needs in the total volume of 200.0 m3/hour, 4.800 thousand m3/day or 1680.0 thousand m3/year and deducting losses in the circulation system in the volume of 71.390 m3/hour, 1.713 thousand m3/day or 599.55 thousand m3/year, as well as the use of the “ZLD” water circulation system and water savings in the volume of 60.5 m3/hour, 1.452 thousand m3/day or 508.2 thousand m3/year the total water disposal (conditionally clean production wastewater) will be: 68.11 m3/hour, 1.634 thousand m3/day or 572.124 thousand m3/year. Then, conditionally clean industrial wastewater from the power plant will amount to 1,634 thousand m3/day or 572,124 thousand m3/year, which will be directed to the ditch.

9.5.5 Recommendations

9.5.6.1 Measures to prevent and mitigate impacts

Measures to prevent and mitigate impacts are presented in Table 9.28.

9.5.6.2 Monitoring and reporting

It is recommended to carry out water quality control at the stages of construction and operation of the enterprise:

- ditch – in the initial and final point on the ditch section in the area of water discharge in accordance with environmental standards of maximum permissible discharge.

9.5.6 Assessment results

Matrix of the impact assessment results (Characteristics of impacts) on groundwater is given in Table 9.29.

It is established that the impact of the proposed activity on surface waters is estimated as follows:

Ditch

- at the construction stage – no significant impact is predicted.
- at the operation stage – low.

Sources

1. The list of fishery standards: maximum permissible concentrations (MPC) and

approximately safe levels of exposure to harmful substances for water of water facilities of fishery importance / VNIRO Publishing House – Moscow, 1999
2. The European Commission. The JRC 2013 Reference Report is a reference document on the best available technologies (BAT) for the production of cast iron and steel.
3. Industrial Emissions Directive 2010/75/EC (integrated pollution prevention and control).
4. IFC's General Guidance on Environmental, Health and Labor Protection http://www.ifc.org/wps/wcm/connect/be37221a-fc47-4379-b539- https://www.ifc.org/wps/wcm/connect/be37221a-fc47-4379-b539 - eca3fe72c3e6/General%2BEHS%2B-%2BRussian%2B- %2BFinal_.pdf?MOD=AJPERES&CVID=jqeI79F
5. IFC Guidelines on Environmental, Health and Labor Protection for Metallurgical plants https://www.ifc.org/wps/wcm/connect/941b0a8c-64a2-49a7-ba1c - 16a2026635ac/Integrated%2BSteel%2BMills%2B-%2BRussian%2B- %2BFinal.pdf?MOD=AJPERES&CVID=jkD2Bji
6. Handbook of an environmental expert. State Committee for Ecology of t he Republic of Uzbekistan, 2009 .

Table 9.28: Measures to prevent and mitigate impacts on surface waters

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Implementation method/ reporting
I.	**Construction stage**					
1.	Construction works (earthworks, general construction works)	Prevention of water facilities pollution	Collection and disposal of all types of wastewater, including stormwater and meltwater from construction sites of facilities to temporary storage facilities with subsequent export to treatment facilities; the use of only specially equipped places for refueling machines and mechanisms with fuel; regular monitoring of the technical serviceability of all types of vehicles, machines and mechanisms; equipping the construction site with consumables and equipment for the prompt elimination of the consequences of spills of fuel and/or other liquids. equipment of construction workings (pits) with water treatment and drainage systems. Responsible - Construction contractor; Implementation of measures to monitor the waters of the ditch	IFC EHS IFC PS-3 National requirements	Quality control of the ditch at the sites of the company's releases inspections at the construction site	Implementation of environmental protection measures in accordance with the design documentation and the construction organization project compliance with the requirements of national legislation in the field of environmental protection Monitoring program for the construction period Spill Response Plan reporting on monitoring results, reporting on inspection results
II.	Operating stage					
2.	Provision of the main production activity – water supply, sanitation	Mitigation of impacts associated with the withdrawal of natural waters for use in the production needs of the enterprise prevention of water facilities pollution	prevention of the uncontrolled flow of wastewater into the ditch	IFC EHS (water supply and sewerage systems) IFC EHS (metallurgical plants) Environmental standards of permissible discharge of "ENTERPRISES" JSC (for drainage water releases)	Quality control of water bodies ditch) at the sites of the company's releases, on-site inspections	Implementation of environmental protection measures in accordance with design documentation compliance with the requirements of national legislation in the field of environmental protection Monitoring program for the operation period, reporting on monitoring results reporting on inspection results

Table 9.29: Matrix of surface water impact assessment results

Life cycle stage: operation

Recipient: Ditch (where the treated water will be discharged)

Recipient sensitivity: average

Characteristics of impacts

Impact	Chemical water pollution		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Regional	Long-term	Reversible	Medium	Moderate
Consequences	Indirect effects on population health, economic entities				
Activities	• prevention of the uncontrolled flow of wastewater into the ditch				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Regional	Long-term	Reversible	Small	Low

9.6 Impact on soil cover

The characteristics of the soil cover of the area of the planned activity are presented in 125-1105-ESIA-PE- Book 2.

The soils of the allocated area for the construction of combined-cycle power plant with a capacity of 550 MW are characterized by transitional hydromorphic soils, where meadow-gray grassy soils predominate, as well as saline soils.

Some areas of the soil cover of the land allocated for the construction of the power plant are formed on grassy loess and loess loams, they are also distinguished by the greater thickness of the humus horizon and the deeper position of the carbonate horizons.

The soil of the selected area is characterized by a uniform mechanical composition, most often loamy or light loamy, a monotonous grayish color and a uniform humus content.

The results of soil and ground testing (see 125-1105-BIO, Section 1) showed that the content of copper, nickel, lead, zinc, chromium, and cadmium exceeds the MPC established in the RUz for mobile forms of metals.

At the same time, it should be noted that soil quality indicators for mobile forms of metals are focused on the assessment of pollutants that form the risks of translocation effects (first of all, risks in the production of agricultural products used to feed the population).

From this point of view, as well as taking into account the industrial purpose of the construction site, recommendations on the levels of Soil Remediation Circular intervention (2013), there are no restrictions for the project related to soil contamination. Nevertheless, when preparing proposals for monitoring environmental components and action plans, it is advisable to provide for the assessment of the soil condition of recreational facilities located in the area of the planned activity and/or on the border of the SPZ of the power plant.

9.6.1. Construction stage

The impact on the soil cover of the enterprise site is predicted during leveling and planning work on the construction site.

Airborne contamination of soils in areas adjacent to the enterprise is also not predicted due to the incomparable levels of impact of natural factors (natural transfer of suspended matter with wind currents) and levels of impact of sources associated with construction work (ground excavation, earthworks, etc.).

Contamination of soil-forming rocks can only be associated with improper practice of temporary accumulation of waste, storage and handling of fuels and lubricants, spills of fuels and lubricants, use of faulty construction machinery, equipment and vehicles.

9.6.2. Operational stage

The impact on the soil cover of the power plant territory is not predicted due to its future absence (the territory will be concreted).

The only type of impact on the soil cover characteristic of the stage of operation of the enterprise is aerogenic pollution of the territory adjacent to the power plant.

The intensity of this indirect impact is determined by airborne contamination of soils, associated not so much with the operation of the enterprise, but with the influence of other municipal and industrial facilities and transport, and with the influence of natural wind

transfer of suspended matter.

Pollution of soil-forming rocks, as at the construction stage, at the operational stage can only be associated with improper practices of temporary accumulation of waste, storage and handling of fuels and lubricants, spills of fuels and lubricants, the use of faulty equipment, machinery and vehicles.

9.6.3. Recommendations

9.6.3.1. Measures to prevent and mitigate impacts

Preventive measures to eliminate contamination of the construction site with waste, solutions to prevent spills of fuels and lubricants, the use of serviceable machinery, equipment and vehicles prevent contamination of soil-forming rocks and related consequences (for example, contamination of surface waters, migration of pollutants along the underground water flow, etc.) both at the construction stage and at the operation stage.

Minimization of the level of aerogenic pollution of the soil cover of the areas adjacent to the industrial site is ensured by the implementation of measures to protect the atmospheric air from chemical pollution.

As a result of consideration of the impacts on the soil cover and the associated consequences, the implementation of the following preventive measures is recommended.

- Construction stage:
  - collection, disposal and treatment of all types of wastewater, including stormwater and meltwater (for example, according to a temporary scheme);
  - preparation of a Spill Response Plan (petroleum products) for construction contractors, staff training;
  - preparation of specially equipped places for refueling machines and mechanisms with fuel (if necessary, refueling them at the construction site);
  - monitoring the condition of all types of vehicles, machines and mechanisms;
  - organization of specially equipped sites for safe temporary storage (accumulation) of waste;
  - equipping construction contractors with consumables and equipment for the prompt elimination of the consequences of spills of fuel and lubricants and/or other liquids.
- Operational stage:
  - implementation of a set of measures to protect atmospheric air from chemical pollution;
  - equipment of the enterprise’s site with stormwater sewerage;
  - collection, disposal and treatment of all types of wastewater;
  - preparation of spill response plan (oil products), personnel training;
  - organization of specially equipped sites for safe temporary storage (accumulation) of waste;
  - monitoring the condition of all types of vehicles, machinery and equipment;
  - equipping the enterprise’s divisions with consumables and equipment for the prompt elimination of the consequences of spills of fuels and lubricants and/or

other liquids.

9.6.3.2. Monitoring and reporting

In order to exclude adverse effects associated with the impact on the soil cover, it is recommended to provide:

- monitoring of chemical contamination of the soil cover of TNPC (for example, recreational areas, sports grounds) – only for the stage of operation;
- in case of spills – operational monitoring of the state of substrates;
- inspections at the construction site (only for the construction stage).

Proposals for monitoring and reporting are presented in the Table (Table 9.30).

9.6.4. Assessment results

Matrix of the results of the impact assessment (Characteristics of impacts) on the soil cover is given in Table 9.31

It is established that the impact of the planned activity on the soil cover is estimated as follows:

- at the construction stage – negligible;
- at the operation stage – low.

Table 9.30 Measures to prevent and mitigate impacts on soil cover

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Implementation method/ reporting
I.	Construction stage					
3.	Construction works (earthworks, general construction works)	Prevention of contamination of soil-forming rocks and related consequences (pollution of underground water, etc.)	Collection, disposal and treatment of all types of wastewater, including stormwater and meltwater (for example, according to a temporary scheme) preparation of a Spill Response Plan (petroleum products) for construction contractors, staff training preparation of specially equipped places for refueling machines and mechanisms with fuel (if necessary, refueling them at the construction site); monitoring the condition of all types of vehicles, machines and mechanisms organization of specially equipped sites for safe temporary storage (accumulation) of waste equipping construction contractors with consumables and equipment for the prompt elimination of the consequences of spills of fuel and lubricants and/or other liquids	IFC EHS IFC PS-3 SanR&N No. 0183-05 Hygienic requirements for the quality of soil in populated areas in specific natural and climatic conditions of Uzbekistan SanR&N No. 0191- 05 Maximum permissible concentrations (MPC) and approximate permissible concentrations (OPCs) of exogenous harmful substances in the soil SanR&N No. 0212-06. Sanitary rules and norms for hygienic assessment of the degree of soil pollution of different types of land use in the specific conditions of Uzbekistan	Operational control of the condition of substrates (in case of spills) inspections at the construction site	Implementation of environmental management measures in accordance with the project documentation and the construction organization project compliance with the requirements of national legislation in the field of environmental protection Spill response plan (petroleum products) training of construction contractors' personnel and maintaining their awareness reporting on inspection results
II.	Operational stage					

4.	Main production activity Providing basic production activities – repair work, water supply, water drainage, dewatering, cleaning of the territory and production facilities Transport and logistics (delivery of raw and other materials, fuels and lubricants, shipment of products, other transportation, storage of hazardous materials)	Prevention of contamination of soil-forming rocks and related consequences (pollution of underground water, etc.) minimization of aerogenic pollution of the soil cover of the areas adjacent to the enterprise	Implementation of a set of measures to protect the atmospheric air from chemical pollution equipment of the enterprise's site with stormwater sewerage collection, disposal and treatment of all types of wastewater preparation of a Spill response Plan (oil products), staff training organization of specially equipped sites for safe temporary storage (accumulation) of waste, monitoring the condition of all types of vehicles, machinery and equipment equipping the enterprise's divisions with consumables and equipment for the prompt elimination of the consequences of spills of fuels and lubricants and/or other liquids	IFC EHS IFC PS-3 SanR&N No. 0183-05 Hygienic requirements for the quality of soil in populated areas in specific natural and climatic conditions of Uzbekistan SanR&N No. 0191- 05 Maximum permissible concentrations (MPC) and approximate permissible concentrations (OPCs) of exogenous harmful substances in the soil SanR&N No. 0212-06. Sanitary rules and norms for hygienic assessment of the degree of soil pollution of different types of land use in the specific conditions of Uzbekistan	Monitoring of chemical contamination of soil cover of TNPC (for example, recreational areas, sports grounds) operational control of the condition of substrates (in case of spills)	Reports on the results of soil monitoring Implementation of environmental protection measures in accordance with the design documentation compliance with the requirements of national legislation in the field of environmental protection Spill response plan (petroleum products) staff training and awareness maintenance reporting on inspection results

Table 9.31: Matrix of the results of the assessment of the impact on the soil cover

Life cycle stage: construction, operation

Recipient: soil-forming rocks

Recipient sensitivity: low

Characteristics of impacts

Impact	Contamination of soil-forming rocks		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Low
Consequences	Underground water pollution				

Measures	• collection, disposal and treatment of all types of wastewater, including stormwater and meltwater (for example, according to temporary scheme) • preparation of a Spill response Plan (oil products), staff training • preparation of specially equipped places for refueling machines and mechanisms with fuel (only for the construction stage) • monitoring the condition of all types of vehicles, machines and mechanisms • organization of specially equipped sites for safe temporary storage (accumulation) of waste • equipping with consumables and equipment for the prompt elimination of the consequences of spills of fuel and lubricants and/or other liquids				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Negligible

Life cycle stage: exploitation

Recipient: soils

Recipient sensitivity: average

Characteristics of impacts

Impact	Aerogenic pollution of the soil cover of the territory adjacent to the enterprise		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Domestic	Medium-term	Reversible	Small	Moderate
Consequences	Indirect effects on the flora and fauna				
Measures	• A set of measures to protect atmospheric air from chemical pollution				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Medium-term	Reversible	Small	Low

9.7. Impact on the flora

In accordance with the requirements of IFC PS-1 and PS-6, as well as the norms of the Laws of the RUz “On Nature Protection”, “On environmental expertise”, the main tasks of botanical research within the framework of the ESIA are defined as follows:

- analyze the initial state of the flora in the area of the proposed activity (based on field surveys and analysis of published and stock data);
- identify critical habitats and vulnerable rare and endemic species that may be potentially negatively impacted;
- assess the impacts on the flora (including on critical habitats and protected plant species)
- give a forecast and assessment of the impacts on the flora of the proposed activity.

During a field survey in May 2024, it was determined that the Project Area contains only converted habitats that, according to the IUCN Habitats Classification Scheme (Version 3.1), belong to type 14 Artificial – Terrestrial (Anthropogenic terrestrial habitats), subtypes 14.1 Arable Land, 14.2 Pastureland and 14.4 Rural Gardens and type 15 Artificial – Aquatic, subtype 15.9 Canals and Drainage Channels, Ditches. There are no natural habitats in the Project area. At the time of the survey, construction work was underway on the site, and vegetation had already been destroyed throughout the western half of the site, and several dirt roads run through the central and eastern parts, along which heavy machinery continuously moves.

As a result of botanical research, it was established that the landscapes and vegetation cover of the Project area were completely transformed as a result of human economic activity, and the territory contains transformed habitats (agricultural irrigated lands, residential buildings, farms, infrastructure) with communities of cultural and weed synanthropic vegetation. There are no natural biotopes in the Project area. The species composition of the plants of the Project area is represented by species widely distributed in the developed plains and foothill regions of Uzbekistan. A significant proportion in the species composition and a high abundance in the vegetation cover of synanthropic, weedy plants, including adventitious ones, is an indicator of the anthropogenic transformation of the ecosystems of the studied territory. The survey showed that there are no vulnerable, rare and endemic plant species and critical habitats in the Project area that meet the criteria set out in Performance Standard 6 of IFC.

9.7.1. Construction stage

At the time of the impact assessment, preparatory planning work was underway on the site allocated for construction, thereby having a direct impact on vegetation.

In total, 68 plant species from 26 families were identified in the study area, of which 26 are weedy synanthropic species (including 6 adventitious), and 5 are cultivated (including both introduced and cultivated local species). Rare species listed in the Red Book of Uzbekistan or the IUCN Red List, as well as quarantine weeds included in the national list of quarantine objects, have not been found.

It is established that the spread of the identified adventitious species is not related to the activities of the Project at the construction stage, all the noted introduced species have been naturalized in Uzbekistan for a long time and are widespread in anthropogenic landscapes in the country.

9.7.2. Operational stage

The commissioning of the enterprise should also not have a significant impact on the flora of the area of the planned activity, since the main risks are controlled by measures to protect atmospheric air and other components of the natural environment, provided in

accordance with national legislation and the IFC PS (see. Sections 9.1, 9.4). There are practically no risks associated with the operation of the enterprise for the introduction and spread of adventitious species.

9.7.3. Recommendations

9.7.3.1. Measures to prevent and mitigate impacts

Special measures to prevent and/or mitigate impacts on the flora, compensation in addition to the already provided measures for the protection of atmospheric air and other components of the natural environment, are not required.

9.7.3.2. Monitoring and reporting

It is recommended to conduct a phytopathological examination of the SPZ of the enterprise during the growing season and create stationary sites for geobotanical and phytopathological monitoring in the SPZ of the enterprise;

9.7.4. Assessment results

There are no critical natural and/or transformed vegetation habitats in the area of the planned activity that meet the criteria set out in the IFC Performance Standard 6.

No threatened plant species listed on the IUCN Red List have been found on the territory.

Even though transformed biotopes predominate in the territory, natural and anthropogenic plant communities are dominated mainly by local species (not counting plantations of agricultural crops).

It has been established that the main anthropogenic factors negatively affecting the vegetation of the territory under consideration are agriculture, the expansion of settlements, unauthorized landfills, and the spread of adventitious species.

Special measures to prevent and/or mitigate impacts on the flora, compensation in addition to the already provided measures for the protection of atmospheric air and other components of the natural environment, are not required

The matrix of the results of the impact assessment (characteristics of the impact) on the flora is given in Table 9.32

The impact of the proposed activity on vegetation is estimated as negligible at all its stages.

Table 9.32: Flora impact assessment results

Life cycle stage: construction
Recipient: plant communities and individual types of vegetation
Recipient sensitivity: negligible
Characteristics of impacts

Impact	Removal of natural habitats		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Negligible
Consequences	None				
Measures	Not provided: there are no natural habitats on the site of the enterprise,				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Negligible

Life cycle stage: operation
Recipient: plant communities and individual types of vegetation
Recipient sensitivity: negligible
Characteristics of impacts

Impact	Impacts on habitats associated with aerogenic pollution		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Minor	Negligible
Consequences	None				
Measures	Not provided: there are no natural habitats on the site of the enterprise,				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Negligible

9.8. Impact on terrestrial wildlife

In accordance with the requirements of IFC PS-1 and PS-6, as well as the norms of the Laws of the RUz “On Nature Protection”, “On environmental expertise”, the main tasks of zoological research within the framework of the ESIA are defined as follows:

- to analyze the initial state of terrestrial wildlife in the area of the proposed activity (based on field surveys and analysis of published and stock data);
- identify critical habitats and vulnerable rare and endemic species that may be potentially negatively impacted;
- assess the impacts on terrestrial wildlife (including critical habitats and protected animal species)
- to give a forecast and assessment of the impacts on the fauna of the proposed activity.

As a result of zoological research, it was established that in the area of the planned activity, transformed habitats predominate (irrigated agricultural lands, settlements, industrial enterprises, infrastructure facilities).

The fauna of terrestrial vertebrates has undergone significant changes and is currently represented by a rather meager variety and mainly species capable of coexisting with humans – synanthropic species such as house mouse, gray rat, dwarf bat, myna, magpie, etc.

Birds are represented by a wide variety due to the proximity of the project area to the Jizzakh reservoir, which attracts a large number of birds both during migration and for wintering.

During the survey of the planned area, we selected 7 observation points that most characterize the composition of the local fauna of terrestrial vertebrates. 34 species of terrestrial vertebrates have been recorded in the studied territories, of which 2 species belong to amphibians, 5 species to reptiles, 24 species to birds, 3 species to mammals. Of these, 1 bird species (white stork Ciconia ciconia) is included in the national Red Book

It has been established that the existing impact on the animal world of the territory is associated mainly with population growth, expansion of settlements, and agriculture.

9.8.1. Construction stage

Since the construction site of the power plant is an industrial and agricultural landscape where there are no natural biotopes, direct negative effects on fauna are excluded at the construction stage.

It is also worth noting that there are no natural biotopes, protected animal species and critical habitats in this area.

It has been established that the spread of the identified invasive species (muskrat and gray rat) is not related to activities at the construction stage, all the noted introduced species have long been naturalized in Uzbekistan and are widespread in anthropogenic and natural landscapes.

9.8.2. Operational stage

Since the construction site is an agricultural landscape where there are no natural biotopes, a direct negative impact on the fauna is excluded at the construction stage.

The analysis carried out in accordance with the requirements of clause 16 of IFC PS-6 showed that the habitats of a number of rare animal species (mainly birds) in the area of the planned activity are not classified as critical.

It has been established that the spread of the identified invasive species (muskrat and gray rat) is not related to activities at the construction stage, all the noted introduced species have long been naturalized in Uzbekistan and are widespread in anthropogenic and natural landscapes.

9.8.3. Recommendations

9.8.3.1. Monitoring and reporting

After completion of construction and commissioning of the combined cycle power plant, it is recommended to conduct studies to monitor the condition of fauna, in particular rare and endangered species, in the Project impact area.

9.8.4. Assessment results

The study of the current state of the fauna of terrestrial vertebrates was carried out directly on the territory of the Project for the construction of a combined cycle power plant with a capacity of 550 MW in the Jizzakh region in accordance with IFC PS-6, in order to obtain data to assess the potential impacts on them and develop measures to mitigate the impact of negative factors on the diversity of animals, including rare species and their habitats.

The site allocated for the construction of a combined–cycle power plant is a cultural landscape with various biotopes – agricultural fields, orchards, reservoirs, artificial water structures for irrigation of land with cultivated vegetation, settlements with developed infrastructure.

During the survey of the planned area, we selected 7 observation points that most characterize the composition of the local fauna of terrestrial vertebrates. In the surveyed territories, 32 species of terrestrial vertebrates were recorded, of which 1 species is amphibian, 5 species are reptiles, 23 species are birds, 3 species are mammals.

The fauna of the studied Project area is represented mainly by synanthropic species. Many species of hydrophilic birds have adapted to the conditions of the anthropogenic landscape. Terrestrial vertebrates are important components of modified ecosystems and good indicators reflecting the degree of intensity of anthropogenic impacts and ecosystem transformation. One of the rare and endangered species in the project area is the white stork, Ciconia ciconia.

The animals are distributed according to their habitats and biological characteristics in a cultural landscape. The existing circumstances of the Project do not have a negative impact on the fauna in a wide range.

Matrix of the results of the impact assessment (characteristics of the impact) on the flora is given in Table 9.33

It has been established that the significance of the impact of the planned activity on the animal world is assessed as follows:

- at the construction stage – negligible
- at the operation stage – low.

Table 9.33 Matrix of the results of the assessment of impacts on terrestrial wildlife

Life cycle stage: construction

Recipient: habitats of terrestrial animals and individual species of terrestrial animals

Recipient sensitivity: medium

Characteristics of impacts

Impact	Habitat removal and related indirect consequences		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low
Consequences	None				
Measures	Not provided: there are no natural habitats on the construction site				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low

Life cycle stage: operation

Recipient: habitats of terrestrial animals and individual species of terrestrial animals

Recipient sensitivity: medium

Characteristics of impacts

Impact	Habitat removal and related indirect consequences		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low
Consequences	Death and injury of animals				
Activities	Not provided: there are no natural habitats on the construction site				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

9.9. Cumulative impacts

Cumulative impacts are impacts generally recognized as significant based on scientific opinion and/or based on the concerns of the affected communities.

Various environmental and social impacts of existing facilities/projects and/or natural, natural-anthropogenic environmental factors in combination with additional effects of the planned activity cause the emergence of cumulative impacts.

Section 3.6 of 122-1105-ESIA-PE-Book 1 sets out methodological approaches to the CIA based on the following requirements:

- IFC PS-1 [1];
- International Finance Corporation Guidelines: Performance Standards on Environmental and Social Sustainability, PS-1, P37-P43 [2];
- “Assessment and management of cumulative impacts: a guide for the private sector in emerging markets” [3].

9.9.1. Determining the scope of work, stage 1

9.9.1.1. Detection of CESC[15]

CESC – recipients and factors (elements) of the natural environment, the consideration of which is advisable as part of the CIA.

According to [3], the CIA includes impacts that are recognized as important based on scientific concepts and/or problems of the affected communities.

The CIA does not consider potential impacts that may occur without the project and/or independently of the project.

Identification of the CESC is carried out taking into account:

- the results of consultations with stakeholders (see Section 5 128-1105- ESIA-PE-Book 1);
- the results of the analysis of the forecast of impacts on environmental components (see Section 9).

If the impact on a recipient is assessed as “negligible” or “low”, then the corresponding recipient is not classified as CESC.

As a result of using this approach, the following CESCS (components of the natural environment and natural-anthropogenic objects) were considered within the framework of the CIA:

- atmospheric air (chemical composition and acoustic parameters);
- surface water bodies;

9.9.1.2. Justification of spatial frameworks

Section 8.1. presents the characteristics of the zone of influence on the natural environment. An analysis of the localization of elements that form the zone of influence shows that its boundaries are determined by:

- the zone of influence of the company’s emissions of pollutants into the atmosphere;
- the zone of acoustic discomfort generated by the noise sources of the enterprise;

9.9.1.3. Justification of time frames

SD-1 of the IFC requires consideration of ongoing or planned activities that are not directly related to the project, which are being implemented, planned or can be reasonably predicted.

In accordance with the recommendations [4], it is advisable to consider ongoing/existing projects/facilities, as well as projects whose implementation is expected to begin within 5 years from the completion of the CIA. The rationale for the five-year lag is based on the assumption that beyond this lag, the amount of uncertainty significantly worsens the quality of the forecast.

The time frame is also determined by the availability and quality of source data on existing facilities and/or prospective projects.

According to the recommendations [3], it is advisable to use the stages of the life cycle of an enterprise project as a time frame.

Considering that the project should be implemented within 5 years, it is proposed to use this period of time as the forecast period for the CIA.

9.9.2. Determining the scope of work, stage 2

[15] This section examines the CESCs related to the natural environment.

Taking into account the incomparability of the characteristics (scale) of the impacts of the stages of construction and operation of the enterprise on the components of the natural environment, within the framework of the CIA, the analysis is carried out for the stage of operation of the enterprise.

The formalized CIA scheme can be characterized as follows:

Cumulative effects=Impacts of the Project +"External" objects/projects]

Major sources of environmental impact in the north-eastern industrial zone of Jizzakh city are such enterprises as: battery production, reinforced concrete factories, oil depots, textile production, oil extraction production, etc. Inorganic dust, cement dust, nitrogen oxides, sulfur, carbon, and aromatic hydrocarbons are released into the atmosphere of the area from the listed sources of exposure.

According to the Decree of the President of the Republic of Uzbekistan No. DP- 4516 dated on March 15, 2013 and Resolution of the Cabinet of Ministers No. 190 dated July 1, 2013, "Jizzakh" special industrial zone (SIZ) has been established in the city.

In Jizzakh city, as in other developed cities, motor transport accounts for more than 80% of all emissions of pollutants. During the combustion of fuel with exhaust gases, nitrogen and carbon oxides, hydrocarbons and products of their incomplete combustion, lead compounds and benz(a)pyrene enter the atmosphere.

There are no stationary (systematic) observations of the level of atmospheric pollution in Jizzakh.

Based on the National Report on the state of the environment and the use of natural resources in the Republic of Uzbekistan (2008-2011) in Jizzakh region, the degree of load on solid particles is small, and emissions of nitrogen oxides, sulfur dioxide, and volatile organic compounds are low.

The emissions of these enterprises contain carbon monoxide, dust, nitrogen oxides, sulfur dioxide, hydrocarbons, soot and aldehydes. Highways of regional importance are characterized by low traffic intensity and are a source of dusting and emissions by mobile vehicles of carbon oxides, nitrogen, hydrocarbons, sulfur dioxide and solid particles.

Freight and passenger transportation of both urban and regional significance is carried out by automobile enterprises of various departmental subordination, as well as small private enterprises and firms. Automobile enterprises and gas stations are scattered throughout the republic. Fuel combustion products and hydrocarbons enter the atmosphere from these facilities.

During the design consultations with the population of makhallas located in the zone of influence of the enterprise, many complaints were expressed about the impact and unpleasant smell from the landfill located in the northeast of the projected facility. It is noted that a particularly intense effect in the form of an unpleasant smell is felt in the evening.

The following "external" sources of atmospheric air pollution are also important for CIA:

- in terms of chemical pollution:

- individual residential sector – a significant part of households is heated in the cold season with the help of stoves;

- in terms of chemical and acoustic pollution:

- road transport;

- railway transport.

One of the sources of pollution of water bodies is surface runoff from the municipal territory, as well as sites of industrial and municipal enterprises.

Rain, thawed and irrigation waters are polluted with suspended particles of inorganic

and organic origin, characterized by a high content of petroleum products, suspended solids, and in some cases bacterial contamination.

These drains are diverted without treatment into ditch

The enterprise's activities are also associated with impact on surface water bodies:

organized drainage of industrial, conditionally clean wastewater to the ditch.

9.9.3. Determination of the background state of the CESC

As part of the ESIA, chemical pollution of atmospheric air was monitored from April to July 2024. The purpose of the research is to obtain up–to-date and reliable information on the level of cumulative chemical pollution of the atmosphere in the area of the enterprise location.

In the course of these works, in particular:

- measurements of concentrations of nitrogen oxides, sulfur dioxide, carbon monoxide, suspended particles PM1, PM2.5 and PM10 using the Zephyr compact air quality monitor. The total duration of monitoring is 2 months. To determine the impact of the Jizzakh PPE and other sources of cumulative effects on the atmospheric air near the project area.

Information on background chemical pollution of atmospheric air, taking into account cumulative effects, is summarized in Section 6.10.1 of Report 125-1105-ESIA-PE- Book 2.

The state of surface waters is discussed in Section 6.10.3 of Report 125-1105-ESIA-PE-Book 2 and in Section 9.4 of this report.

9.9.4. Results of the cumulative impact assessment

The matrix of CIA results (characteristics of cumulative effects on environmental components) is given in Table 9.34.

It has been established that the cumulative effect of the planned activity on the atmospheric air is estimated as moderate. Residual effects are also assessed as moderate.

The cumulative effect on the waters of the ditch is associated with the discharge of wastewater.

In both cases, the effects on the channel, including residual ones, are assessed as low.

It is proposed to continue the studies of the ditch water quality initiated within the framework of the ESIA and provide for:

- production control at wastewater discharges;
- monitoring pollution levels in the background and control sections.

Based on the results of monitoring the waters of the ditch, it is recommended to assess the feasibility of developing and implementing a set of additional compensatory water protection measures (if necessary).

Table 9.34 Matrix of cumulative impact assessment results

Life cycle stage: operation

Recipient: population

Recipient sensitivity: average

Characteristics of impacts

Impact	Chemical pollution of atmospheric air		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	regional	Long-term	Reversible	Medium	Moderate

Consequences	Indirect impacts on population health, flora and fauna, and soils				
Activities	• production control at the sources of pollutant emissions • monitoring of the level of atmospheric air pollution at TNPC • development and implementation of a set of additional compensatory air protection measures (if necessary)				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate

Impact	Acoustic pollution of atmospheric air		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	regional	Long-term	Reversible	Medium	Moderate
Consequences	Indirect impacts on population health				
Activities	• industrial control at noise sources • monitoring of the noise level at the TNPC • development and implementation of a set of additional compensatory noise protection measures (if necessary)				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate

Life cycle stage: operation
Recipient: ditch
Recipient sensitivity: average
Characteristics of impacts

Impact	Chemical water pollution		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Regional	Long-term	Reversible	Medium	Moderate
Consequences	Indirect impacts on human health, aquatic organisms				
Activities	• Industrial control at wastewater outlets • monitoring pollution levels in the background and control sections • development and implementation of a set of additional compensatory water protection measures (if necessary)				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

Sources

1. Performance standards for environmental and social sustainability. IFC, 2012

2. International Finance Corporation Guidelines: Environmental and Social Sustainability Performance Standards. IFC, 2012

3. Good Practice Guide “Assessment and Management of cumulative impacts: a guide for the private sector in emerging markets”. IFC, 2013

4. Guidelines for the assessment of indirect and cumulative impacts, as well as interactions under exposure, Report prepared by Haider for the DG XI of the European Commission, Brussels, May 1999

10. SOCIO-ECONOMIC IMPACT ASSESSMENT

Social impact assessment is a special type of cost-benefit analysis, in which the positive economic results of a project are compared with the social consequences associated with negative impacts.

To assess the potential socio-economic consequences, data and information on the relevant initial characteristics of the social environment have been identified and reviewed. The data is collected and presented at different spatial levels (national, regional and local, depending on the context).

Primary data on socio-economic characteristics were collected in April, May and June 2024. Due to the lack of some official data, measures have been taken to collect relevant information from all available sources.

Observations were carried out on the territory of local communities, meetings and conversations with local governments, as well as a study of traffic intensity in the area of planned activities.

During the work:

- basic socio-economic research and data collection were carried out;
- consultations were held with officials to obtain a description of the socio-economic conditions in the area of the planned activity, in particular in the territories of local communities and the affected farm;
- the condition of roads and other infrastructure that can be used within the framework of the project have been determined.

The following restrictions apply to the work performed:

- in some cases, it was impossible to obtain observational data for a five-year period;
- data is not always available. In this case, if possible, efforts were made to obtain qualitative data (instead of quantitative).

However, these limitations ensure the integrity of the assessment.

10.1. Impact on the labor market

According to the recommendation of the World Bank, jobs should mainly be created through the formation of new enterprises, as well as through the expansion of existing enterprises.

The structural weaknesses of the Uzbek labor market, according to the World Bank, include insignificant incentives to work, there are shortcomings in the qualifications of employees and insufficient opportunities for training technical skills in enterprises.

It is noted that young people who do not have a job or study account for 24% [16]of all youth aged 16-24 years (26.4% in the group from 16 to 29 years). Unemployment is especially high among girls — 4 times higher than among boys. This creates a relatively high unemployment rate among young people, a high proportion of the economically inactive population, as well as limited labor mobility.

The persistence of demographic pressure on the labor market and, consequently, the problem of a shortage of jobs makes it difficult to reduce unemployment.

The World Bank states that the number of jobs in the economy of the RUz created annually should be doubled only in order to take new employees entering the labor market.

[16] https://documents.worldbank.org/en/publication/documents- reports/documentdetail/235891634705237783/youth-employment-in-uzbekistan-opportunities-and-challenges

Job creation is a significant positive impact associated with the construction of a combined-cycle power plant. The construction phase lasts 36 months from 2024 to 2027. The search and recruitment of personnel is carried out on the basis of the “Regulations on the procedure for the selection and recruitment of personnel at “Cenergo” LLC in accordance with labor legislation.

When selecting candidates for vacant positions, preference is given to:

1. Persons with higher specialized education (corresponding to the job profile) and work experience in the specialty.

2. Graduates of universities with relevant specialized education.

3. Persons with secondary specialized education (corresponding to the job profile) and work experience in the specialty.

4. College graduates with relevant specialized education, who have completed industrial and pre-graduate practice at the plant.

5. Qualified employees of 5-6 categories who have a profession according to the profile of the plant and work experience.

6. Employees of 3-4 categories who have a profession according to the profile of the plant and work experience in the profession.

The applicant’s business professional qualities are determined during the preliminary interview process.

In the structural unit, where, after a preliminary interview, the applicant is sent to a vacant workplace or position, an interview is also conducted to assess the applicant’s professional qualities and his compliance with the vacancy. Employment is formalized by signing a bilateral employment contract.

10.1.1 Construction stage

During the peak period of the construction phase, the need for labor will be about 650 people.

The construction of the projected facilities will be carried out by personnel working mainly on a shift basis and living in a construction camp (If needed) built by the Contractor[17], or Jizzakh, since the city is located next to the construction site.

The contracting company will attract qualified personnel from other regions of Uzbekistan, citizens of the Republic of Uzbekistan who have gained the necessary experience and qualifications at previous facilities and China.18

It is assumed that some of the construction workers hired from among the residents of Sharaf-Rashidov district and Jizzakh city will be unskilled labor.

As a result of consultations with “Cenergo” LLC, contractors may have non-employees during the construction period, temporary workers associated with a short-term amount of work (it is assumed that these will be isolated cases), so the Contractor plans to attract permanent staff for the entire construction period according to the classification of work. The social impacts and risks for the Project and its area of influence, due to the possible participation of several freelance staff, are assessed as negligible and, based on this, are not considered in detail in the ESIA materials. Given the total number of people employed in the construction industry of the district, the involvement of labor resources in the construction of the facility may cause

[17] The Khokimiyat of the district did not allocate the land plot for the construction of the Contractor's camp at the time of the assessment, so the exact location is not known. **The establishment of the camp may be canceled by Genergo due to feasibility concerns.**

[18] At the time of the event, a contract was signed with the contractor China Energy ZTPC

short-term positive changes in the labor market.

10.1.2 Operational stage

The combined-cycle power plant will be put into operation in 2027.

The total demand of the project for labor resources for the period of operation is 70 people, of which 65 people are workers and 5 managers, specialists and employees. The total number of workplaces created under the combined–cycle power plant project is 70 units.

The maximum number of permanent production staff will be reached in 2027, when the facility will be put into operation.

It is assumed that, as in the case of construction workers, local residents (i.e. residents of Sharaf-Rashidov district and Jizzakh city) will be involved as production (if there is a special technical education) and maintenance personnel.

There is no provision for participation in the operation phase for non-employees; all personnel will be permanent and included in the staff on the basis of a work contract.

As of January 2024, the average monthly salary in Sharaf-Rashidov district amounted to 2 743 000 UZS.

It is assumed that due to the implementation of the project, the average nominal wage level will increase at the regional level and rise to the level of wages in Jizzakh city.

Due to the implementation of the project, a positive indirect impact on the activities of power plant suppliers and electricity consumers is predicted, as well as the formation of an induced effect (consumer expenses of employees and companies of suppliers and customers).

The effect is manifested in the indicators of workplaces created in related industries, according to international estimates (World Steel Association), the indicator for power plants is 14.7 workplaces.

This means that the implementation of the project will ensure the creation of new workplaces in related industries for more than 1000 people.

Additional jobs are mainly for enterprises in the energy and transport sectors of the economy.

The emergence of jobs at the enterprise will create new workplaces in the service sector (for example, in catering or retail enterprises).

Taking into account the fact that one workplace in industry creates, on average, 3 workplaces in the service sector, additional employment of about 210 people is projected (Table 10.1).

Table 10.1: The impact of the project on employment, people.

Employment at the power plant	70
Employment in related industries	1000
Employment in the service sector	210
Total employment as a result of the project implementation	1280

Thus, as a result of the project implementation, it is expected to provide jobs for at least 1280 people, which will increase the employment rate of the working-age population.

When compared with the number of unemployed (8.5 thousand people in Sharaf-Rashidov district, see Table 16, 125-1105-ESIA-PE-0, Book 2), providing jobs can potentially reduce the unemployment rate by 15%.

10.1.3 Recommendations

10.1.3.1 Measures to prevent and mitigate impacts

As a result of the consideration of the impacts on the labor market, positive impacts at the construction and operation stages have been identified.

It is recommended to encourage the recruitment of qualified personnel, both at the construction stage and at the operation stage, among the able-bodied population of Sharaf-Rashidov district and Jizzakh city to reduce the unemployment rate among the population, improve living standards in the area of planned activity, reduce migration outflow of the population and minimize social tension in society.

Measures to enhance the positive effects of training and advanced training are discussed in section 10.3.3.1

10.1.3.2 Monitoring and reporting

To stimulate the positive effects associated with the impact on the labor market, it is recommended (Table 10.2):

- to develop and implement the Human Resources and Human Rights policies of “Cenergo” LLC, which will continue to apply to the terminal and ensure compliance with the requirements of the IFC and ILO PS-2, including transparent and open recruitment mechanisms, the principles of combating child and forced labor, the principles of non-discrimination and equal opportunities based on gender, nationality, ethnicity, race or religion; prohibition of any form of harassment in the workplace, a mechanism for reviewing employee complaints and defining clear responsibilities for their implementation;
- provide for the implementation and introduction of the social and environmental policy of “Cenergo” LLC, including training obligations, and the creation of a transparent hiring procedure among residents of the region (including women, youth, and representatives of vulnerable groups of the population).

10.1.4 Assessment results

It has been established that the positive impact of the planned activity on the labor market is of moderate importance, both at the construction stage and at the operational stage.

Sources

1. World Bank Report of September 2021 “Youth Employment in Uzbekistan”

Table 10.2: Measures to prevent and mitigate labor market impacts

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	**Construction stage**					
1.	Construction works (earthworks, general construction works)	To conduct a priority reception of Project personnel among the able-bodied population of the Sharaf-Rashidov district and Jizzakh city	Implementation of the personnel policy of the Enterprise, which includes transparent mechanisms and open mechanisms for hiring personnel. realization and implementation of the socio-environmental policy of the enterprise. providing reliable information about the enterprise activities in a timely and complete manner to all Stakeholders	- IFC PS-2 National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan “On employment of the population” No. 510-XII dated on 13/01/1992	- Operational control of the human resources department - accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues	- Grievance mechanisms (GRM) for the Project staff and the enterprise as a whole, a separate GRM for the public - compliance with the requirements of national legislation in the field of employment - Training program, procedures and conditions for the selection of specialists among the residents of the region (including women, youth, representatives of vulnerable groups of the population)
II.	Operational stage					

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting

2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transport and logistics (delivery of raw materials, petroleum, oil and lubricants, other transportation, storage of hazardous materials);	Priority recruitment of Project personnel among the able-bodied population of Sharaf-Rashidov district and Jizzakh city	Updating the personnel policy of the enterprise, which includes transparent mechanisms and open mechanisms for hiring personnel. realization and implementation of socio-environmental policy of the ENTERPRISE. providing reliable information about the ENTERPRISE activities in a timely and complete manner to all Stakeholders	IFC PS-2 National requirements: Labor Code of the Republic of Uzbekistan, 1996 Law of the RUz “On employment of the population” No. 510-XII dated 13/01/1992	Operational control of the personnel department of the ENTERPRISE accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues)	GRM for the Project personnel and the enterprise as a whole separate GRM for the population compliance with the requirements of national legislation in the field of employment Training program, procedures and conditions for the selection of specialists among the residents of the region (including women, youth, representatives of vulnerable groups of the population)

Table 10.3 Matrix of labor market impact assessment results

Life cycle stage: construction

Recipient: able-bodied population

Recipient sensitivity: medium

Characteristics of impacts

Impact	Job creation		Orientation	Genesis	Mechanism
			Positive	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Regional	Short-term	Reversible	Medium	Moderate
Consequences	None				
Measures	To develop and implement Human Resources and Human Rights policies; that will further extend to the enterprise and ensure compliance with the requirements of the IFC and ILO PS-2. Realization and implementation of social and environmental policy				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Regional	Short-term	Reversible	Medium	Moderate

Life cycle stage: exploitation

Recipient: able-bodied population

Recipient sensitivity: average exposure

Characteristics of impacts

Impact	Job creation		Orientation	Genesis	Mechanism
			Positive	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Reversible	Medium	Moderate
Consequences	None				
Measures	To develop and implement Human Resources and Human Rights Policies that will further extend to the enterprise and ensure compliance with the requirements of the IFC and ILO PS-2. Realization and implementation of social and environmental policy				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Reversible	Medium	Moderate

10.2. Impact on economic development

The key benefits of the combined cycle power plant construction project related to economic growth include the following aspects:

- increase in the volume of electricity produced, generation of 550 MW;
- The consumption of natural gas per 1 kW/hour is 2.0 times less than in traditional power units and the efficiency is more than 61%, thus saving natural resources
- increase in the revenue side of the country's budget due to the sale of electricity;
- the budget of the Jizzakh region will increase due to an increase in tax revenues associated with the commissioning of the facility (VAT -12%, income tax – 15%, property tax – 1.5%, social tax – 12%), as well as as a result of the indirect impact of the project on the development of the local economy;.

10.2.1. Construction stage

The scale of the project will provide electricity to a number of districts of the Jizzakh region and Jizzakh city.

Construction companies and subcontractors, transport and service organizations will be involved in the construction, construction materials, finished reinforced concrete products and structures, etc. will be purchased on the local market.

Participation in the project will provide additional income, preservation of existing or creation of new workplaces, tax payments to budgets (VAT, income tax, etc.).

Income growth will stimulate the subsequent consumption of goods and services.

10.2.2. Operational stage

The main factors contributing to GDP growth (gross domestic product per employee) are labor productivity growth and employment growth. The project assumes simultaneous growth of employment and labor productivity.

An increase in labor productivity will ensure the creation of more efficient and, accordingly, higher-paying workplaces.

During the period of operation, it is necessary to provide for contributions to the social development of the region /charity in the amount of 2% of net profit in the design calculations.

The implementation of the project will also create an opportunity for socially significant investments and charity. Improving the infrastructure of the Sharaf-Rashidov district and through repairs, reconstruction of highways, as well as the construction of additional facilities to provide electricity.

Additional tax revenues to the budget during the operation of the power plant will increase budget financing for education, health, culture, and social policy, including state benefits and compensation payments to the population at the local, regional, and national levels.

Thus, the wages of those employed in the public sector are increasing, new jobs are being created in social sectors, which affects the level and quality of life of the population: the situation on the labor market is improving and employment income and social transfers to the population are increasing, the availability and quality of social services are increasing.

The project activities will make a significant contribution to increasing income and raising the level of internal solvency of the population of the Sharaf-Rashidov district, as well as the

Republic of Uzbekistan as a whole. The growth of household incomes and the expansion of effective demand are the result of paying for the work of those employed in the workplaces created at the projected facilities and the development of current production.

The implementation of the project will give an additional incentive to the development of the energy industry of Uzbekistan, through the implementation and contribution to the development of the "Concept of providing the Republic of Uzbekistan with electric energy for 2020-2030"

10.2.3. Recommendations

10.2.3.1 Measures to prevent and mitigate impacts

As a result of the consideration of the impacts on economic development, positive impacts at the construction and operation stages have been identified.

It is recommended to implement and introduce the Human Resources, Human Rights Policies, Code of Conduct and other related policies of the project, especially in terms of the system, which includes a training program, a transparent hiring procedure among residents of the region (including women, youth, and representatives of vulnerable groups).

10.2.4. Assessment results

It has been established that the impact of the planned activities on economic development is assessed as moderate at the stages of construction and operation.

Table 10.4 Matrix of economic development impact assessment results

Life cycle stage: construction

Recipient: Economics

Recipient sensitivity: high

Characteristics of impacts

Impact	Impacts on economic development		Orientation	Genesis	Mechanism
			Positive	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Short-term	Reversible	Medium	Moderate
Consequences	Provision of electricity to several districts of the region Additional income, tax payments to the budgets Reduction of natural gas consumption				

Life cycle stage: operation

Recipient: Economics

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impacts on economic development		Orientation	Genesis	Mechanism
			Positive	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Regional	Long-term	Irreversible	Medium	Moderate
Consequences	Provision of electricity to a number of districts of the region Additional income, tax payments to budgets Reduction of natural gas consumption				

10.3. Impact related to training, professional development

The development of professional skills of personnel is important for ensuring product quality, operational safety and, ultimately, for the economic efficiency of production.

Enterprise management pays attention to hiring educated and qualified personnel. As part of the personnel work, Regulations on rotation, on internship of managerial personnel and on the personnel reserve should be developed and approved.

Training can be carried out by experienced specialists on the basis of the enterprise. For the organization of educational processes, qualified specialists and the necessary conditions for training should be available.

Professional development of specialists and heads of departments is carried out by sending them to similar combined-cycle power plants.

10.3.1. Monitoring and reporting

- Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues.
- Program of medical examinations and management systems in the field of employee health protection.
- Development of Human Resources and Human Rights Policies and transparent recruitment procedures.

10.3.1.1. Construction stage

At the construction stage, contractors will involve specialists of construction professions based on the requirements and qualifications necessary for the implementation of the construction process.

Professional development and training of personnel will be carried out on occupational safety and health at construction sites.

There will also be awareness-raising activities and training on the risks of socially-related diseases and ways to control them, interaction with the population of the project area and the Code of Conduct for Contractor Employees.

Already at the construction stage, the training of project personnel for the operational stage will begin.

Providing training is required not only for the launch of production, but also in the future, since improving qualifications, improving management, and replenishing personnel (for example, due to employees retiring and leaving their positions) is a continuous process.

The training program should include:

- theoretical internship;
- internship at a similar enterprise;
- internship at the facility site.

At the final stage of installation and during the commissioning period, a practical internship on equipment designed and supplied by Siemens will be conducted for the staff.

. The positive impact of training and advanced training will also be exerted on newly recruited project personnel selected from the residents of Sharaf-Rashidov district and Jizzakh city.

The implementation of the project will create a demand for skilled labor. This means that

the implementation of the project, by presenting a demand for highly qualified labor, will ensure an increase in the educational and qualification level of the labor force and reduce the scale of unskilled labor in the region.

The improvement of professional qualification requirements for employees is an incentive for the development of the vocational education system at the levels of the region and the republic as a whole.

10.3.2. Operational stage

At the operational stage, advanced training will be required for managerial, administrative, and production personnel, as well as for employees. The introduction of new production equipment will require appropriate personnel to maintain high standards of professionalism and productivity.

Additional training at the operational stage is also necessary to improve management, replenish the staff due to the retirement of employees and retirement from positions.

Training at the operational stage will have a positive impact on the qualifications of the enterprise personnel, as well as on the development and competitiveness of the enterprise as a whole.

10.3.3. Recommendations

10.3.3.1. *Measures to enhance the positive effects*

As a result of consideration of the impacts associated with training, positive impacts at the stage of construction and operation have been identified.

To enhance the positive effects, it is recommended to provide for the introduction of testing and qualification exams for project personnel.

10.3.3.2. *Monitoring and reporting*

Proposals for monitoring and reporting are presented in Table 10.5.

10.3.4. Assessment results

It has been established that the positive impact of the planned activities related to training and professional development is assessed as moderate.

Table 10.5: Measures to enhance the positive effects of training, professional development

Item	Activity/process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	**Operational stage**					
1	Construction works (earthworks, general construction works)	To ensure timely improvement of the educational and qualification level of existing staff and initiate the training of new personnel	To introduce personnel training programs as part of the process of implementing the power plant construction project and ensure timely improvement of the educational and qualification level of existing personnel and training of new personnel. To provide for the implementation of the social and environmental policy of the enterprise, especially with regard to the education of residents of the region (including women, youth, representatives of vulnerable groups of the population)	IFC PS-1 IFC PS-2 National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan “On employment of the population” No. 510-XII dated on 13/01/1992 - Law “On Labor Protection”, 2016	- Accounting of complaints and suggestions from the public and personnel with monthly reporting - personnel testing and qualification exams	- GRM for Project personnel and the enterprise as a whole - separate GRM for the population - compliance with the requirements of national legislation in the field of employment and labor protection - Training program, procedures and conditions for the selection of specialists among the residents of the region (including women, youth, representatives of vulnerable groups of the population)

Table 10.6: Matrix of impact assessment results related to training and professional development

Life cycle stage: operation

Recipient: personnel

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impacts related to training and professional development		Orientation	Genesis	Mechanism
			Positive	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Irreversible	Medium	Moderate
Consequences	There are no negative consequences				
Activities	Improving the educational and qualification levels of existing staff and training new staff Implementation and introduction of the socio-environmental policy of the project, especially in terms of the system, which includes a training program for residents of the region (including women, youth, representatives of vulnerable groups)				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Irreversible	Medium	Moderate

10.4. Land acquisition, economic relocation

10.4.1. Land acquisition and resettlement impact

According to the results of the SCA of the allotment site for the construction of a combined–cycle power plant, it was found that the entire site affects the territory of one farm, whose lands are used mainly for grazing livestock.

A plot of land of 9.42 hectares was allocated for construction by the khokimiyat of Sharaf-Rashidov district on the basis of the decision of the Khokim of the district No. 01-51 dated on 30/01/2024.

In fact, according to the document, 9.42 hectares of land belonging to the “Donabek Sano” farm, based on cadastral documentation No. 4429 dated on 31/10/2018, were transferred to the state on a permanent basis, and 2 hectares of land were taken for temporary use and will be returned to the farm after the completion of the construction of the facility.

According to the Khokimiyat and cadastral authorities of Sharaf-Rashidov district, before part of the farm land was acquired for the construction of a power plant, the total area of the farm was 46 hectares. Of these, 4 hectares are irrigated lands, the rest are dryland.

Due to the dense urban development of Jizzakh and Sharaf-Rashidov district and the availability of farmland, it was not possible to use vacant land owned by the state.

Analysis of the available information suggests that the placement of a combined-cycle gas power plant in a designated area near Jizzakh city is optimal from the point of view of the effectiveness of investment costs.

The provision of the design electric capacity of a combined-cycle gas turbine power plant with a capacity of 550 MW to the existing energy system will solve the issue of covering the shortage of energy supply in a number of districts of Jizzakh region and Jizzakh city.

The choice of the location of the combined cycle gas turbine power plant planned for construction is also due to the availability of available sources of water consumption, a gas pipeline and other necessary infrastructure.

Thus, the construction of combined-cycle power plant had the minimum possible impacts associated with temporary and permanent alienation of land, the consequences of which are expressed in the loss of pasture areas and farm structures.

Based on the assessment report, the amount of compensation amounted to 507 100 000 UZS, the report was agreed upon with the head of the farm and, on the basis of an agreement concluded between the farmer and the Khokimiyat, the amount was paid to the farmer.

While the compensation for affected structures was calculated using a market value approach, aligning with local regulations, the application of depreciation on these structures reduces the restoration costs. This approach is inconsistent with Performance Standard 5, which mandates compensation at "full replacement cost," ensuring that affected parties can restore their livelihoods without incurring additional expenses.

According to the appraisal report, the full replacement cost is 753 832 870 UZS, this cost includes:

Cost of the land plot under the structure - 35 321 000 UZS

Full replacement cost of the structure - 718 511 870 UZS

Thus, the farmer must additionally be paid the amount of 246 732 870 UZS.

Temporary land take: 2 hectares of land were taken for temporary use and will be returned to the farm after the completion of the construction of the facility. The land was not

being used at the time of the land order. Thus, the farmer did not lose any income due to the temporary use of the land plot.

10.4.2. Sanitary Protection Zone

Sanitary Protection Zone (SPZ): SanPiN No. 0350-17, a regulatory document in Uzbekistan, outlines the sanitary norms and rules for the protection of atmospheric air, specifically concerning residential areas. Key restrictions outlined in SanPiN No. 0350-17 pertain to the type of activities and facilities that are permitted within these protection zones. It is prohibited to locate within the boundaries of the sanitary protection zone and on the territory of industrial sites:

- food industry enterprises, as well as enterprises producing tableware, containers, equipment, etc.
- for the food industry, warehouses of finished products, enterprises producing beverages and water for drinking purposes.

According to the Positive Conclusion of the State Ecology Expertise (Order Number: 01-1-101228, valid until 05.02.2027) issued for Jizzakh CCGT Project, it is stated that as per SanPiN No. 0350-17, “Sanitary norms and rules on the protection of atmospheric air in residential areas of the Republic of Uzbekistan,” “Thermal Power Plants and district heating stations with a heat capacity of 200 Gcal and above, operating on gas and gas-oil fuel (the latter as reserve),” must maintain a normative sanitary protection zone of 300 meters. (The design capacity of the plant is 550 MW or 472.9 Gcal).

The general view below shows the 300-meter buffer zone around the emission sources, depicted on a Google Earth image.

Figure 10.1: 300m Buffer Zone from the Jizzakh CCGT Power Plant Emission Source

On a 300m radius from the Plant location there are several structures advised as being poultry farm owned by Madaniyat Tarovati LLC.

On October 31, 2024, Madaniyat Tarovati LLC applied to the Jizzakh Regional Department of

Sanitary-Epidemiological and Public Health Service to conduct an inspection on the possibility of operating this enterprise in the SPZ of the power plant. In response to this letter, the SES organized a visit and inspection of the company's activities.

Jizzakh Regional Department of Sanitary-Epidemiological and Public Health Service during the inspection it was established that the building of the poultry farm, owned by Madaniyat Tarovati LLC, has a construction area of 10,000 m2, is designed to house up to 30,000 broiler chickens and is located at a distance of at least 2,000 meters from the nearest residential area. Considering that, in accordance with paragraph 6.3. of the Sanitary Standards and Rules No. 0350-17 of 2017 “On the Protection of the Atmosphere of Residential Areas of the Republic of Uzbekistan”, this facility is a Class III object. Also, the poultry farm building is located at a distance of 2000 meters from the nearest residential area (has a security zone in relation to residential areas). Taking into account that, in accordance with paragraph 2.17 of the above rules, the enterprise does not produce food products, and the operation of this facility does not fall under the requirements of the sanitary protection zone of the 550 MW power plant located next to it, the Jizzakh Regional Department of Sanitary-Epidemiological and Public Health does not object to the operation of this poultry farm in the SPZ of the Thermal Plant.

The full replay of the Jizzakh Regional Department of Sanitary-Epidemiological and Public Health Service is provided in Annex 1

Thus, the placement of this enterprise in the SPZ of the enterprise will not lead to economic displacement and loss of income Madaniyat Tarovati LLC.

10.4.3. Associated objects

This document considers any potential economic displacement that will be created by the Project excluding the associated facilities and any consequent temporary land restriction. The land within the proposed Combined-cycle gas turbine power plant boundary (CCGTPP Area) allocated by the khokimiyat of Sharaf-Rashidov district to the Cenergo LLC, but has been subject to a Social Compliance Audit (SCA) into historical land use, which may have already been cleared from the project area.

10.4.4. Construction stage

According to the cadastral department of Sharaf-Rashidov district, the project affected 1 land plot, the lands of the "Donabek Sano" farm enterprise.

According to the results of the social audit, it was determined that before the start of construction work, the Khokimiyat of Sharaf-Rashidov district conducted an independent assessment to determine the amount of damage caused to the farm enterprise. Compensation according to an independent assessment has been paid in full, while the farm is satisfied with the result of the assessment in relation to the damage caused. But according the IFC PS-5 the farmer must additionally be paid the amount of 246 732 870 UZS.

Thus, the construction of project facilities had an impact related to the alienation of land (temporary and permanent land acquisition), the consequences of which are expressed in the loss of rainfed areas and the demolition of farm buildings.

10.4.5. Operational stage

At the operational stage, the project does not provide for additional land acquisition and/or economic relocation. Production activities are carried out on the territory of the allocated site without expanding the boundaries of the enterprise.

10.4.6. Recommendations

10.4.6.1. Measures to prevent and mitigate impacts

Measures to prevent and mitigate impacts at the construction stage are not considered, since the impact has already occurred, and the alienation of land plots took place in connection with the practical start of work and the decision of the Khokim of the district.

At the stage of operation, the impact on land users is not predicted.

Taking into account the current status of work with the farm enterprise affected by the project, it is recommended:

- to consult with the affected farms to get acquainted with the results of the assessment, provide information about the GRM;
- receiving written confirmation from the farm that there are no claims related to compensation;
- conducting a social audit to determine the residual effects and verify the procedures for implementing the measures discussed above.

10.4.6.2. Monitoring and reporting

In order to exclude adverse consequences associated with the acquisition of land for the project, it is recommended to conduct a social audit and issue an appropriate report.

10.4.7. Assessment results

It has been established that the significance of the impacts of the planned activities related to the acquisition of land is estimated as low.

Sources

1. Data from cadastral authorities and the khokimiyat of Sharaf-Rashidov district (valuation report, cadastral documentation, payment documents).
2. Decisions of the Khokim of Sharaf-Rashidov district on land allocation related to the construction of combined-cycle power plant.

Table 10.7: Measures to prevent and mitigate impacts associated with land acquisition and economic displacement

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	Construction stage					
1.	Construction works (earthworks, general construction works)	Ensuring payment of compensation and reimbursement of damage to the affected farm	- Complete census of affected assets - conducting consultations with the affected household to familiarize themselves with the results of the assessment, providing information about the GRM of the project - payment of compensation based on the results of an independent assessment with written confirmation of the absence of claims related to the payment of compensation, conducting a social audit to determine the residual effects and verify the procedures for implementing the measures described above	IFC PS-5 National requirements: - Land Code of the RUz, 1998 - Resolution of the Cabinet of Ministers No. 911 (16/11/2019) - Decree of the President of the Republic of Uzbekistan No. DP-6243 dated on 08/06/2021 - Resolution of the Cabinet of Ministers No. 146 (25/05/2011)	- Accounting of complaints and suggestions from the farm enterprise with monthly reports on the resolution of issues - social audit	- GRM for affected farms - compliance with the requirements of national legislation on land alienation and restoration of livelihoods - report on the results of the social audit

Table 10.8: Matrix of impact assessment results from land acquisition, economic displacement

Life cycle stage: construction

Recipient: Farms

Recipient sensitivity: medium

Characteristics of impacts

Impact	The impact associated with the alienation of land plots		Orientation	Genesis	Mechanism
			Negative	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Irreversible	Small	Low
Consequences	Crop losses, rainfed areas, and demolition of farm buildings				
Activities	Census of affected assets to consult with the affected farm to get acquainted with the results of the assessment, and provide information about the GRM payment of compensation based on the results of an independent assessment with written confirmation from the farm that there are no claims related to compensation conducting a social audit to determine residual impacts and verify the procedures for implementing measures				

10.5. Labor influx and population change

The implementation of the planned activities will be associated with the influx of a significant number of personnel, which will be especially typical for the construction phase.

Along with employees hired directly by “Cenergo” LLC, employees will also be hired by (sub)contracting organizations, including, with a high degree of probability, from outside the Jizzakh region, with subsequent residence in a construction camp (If needed), which will be built for the purposes of the project by the Contractor, in Jizzakh city and Sharaf-Rashidov district.

When considering the issue of living conditions for project personnel, first of all, it is important to consider the relevant international and national regulatory framework. [19] Several international documents recognize the right to an adequate standard of living conditions for each employee as part of the observance of human rights. For employees, recognition of such a right is included in ILO Recommendation 115 “On the conditions of residence of Workers” (1961).

10.5.1. Construction stage

The well-being of local communities and their social context may deteriorate due to the influx of outside labor. The lack of qualified labor resources will contribute to labor migration from other regions of Uzbekistan, possibly from abroad.

The potential beneficial effect of such migration may be to increase demand for locally produced products and services, which may create advantages for small businesses and farms in Jizzakh city and Sharaf-Rashidov district.

Of course, it is preferable to involve local labor, as this has many advantages; not only in terms of reducing the need for housing, but also because it increases direct and indirect benefits for the local population, the approach is supported in all aspects by the EBRD and IFC. However, the requirements for the qualification of personnel, the calendar schedule of the construction stage made it necessary to use the option with the use of shift personnel.

At the initial stage of the project, the question of whether housing for employees is required at all was considered. In this regard, the needs for labor, including skills and likely numbers during the project cycle, were analyzed, and an assessment of the capabilities of the local population to meet these labor needs was carried out.

The influx of labor can lead to conflicts between newcomers and local residents. It is highly likely that these conflicts will be local in nature and will not lead to a significant decrease in the level of security of the population.

An increase in the incidence of socially-related diseases is also possible due to the influx of labor. The risk of this impact can be reduced by implementing within the Project its own program of medical examinations and a management system in the field of protection of employees health, as well as by conducting systematic information and explanatory work to inform employees about the risks of infection with socially conditioned diseases and ways of controlling these risks.

It is necessary to provide mitigating measures in the form of the development and implementation of social assistance programs for vulnerable groups of people. The implementation of these programs will significantly reduce the likelihood of adverse consequences.

[19] https://www.ifc.org/wps/wcm/connect/60593977-91c6-4140-84d3-737d0e203475/workers_accomodation.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-60593977-91c6-4140-84d3-737d0e203475-jqetNIh

10.5.2. Operational stage

At the operational stage, the total number of new workplaces under the project will amount to 70 people, of which 65 (92%) workers and 5 (8%) managers, specialists and employees, including administrative and managerial personnel.

The work and rest schedule of key workers, duty personnel, managers and specialists employed in shifts is adopted in accordance with the operating schedule of the main process equipment - continuous, three-shift, 8-hour, for managers, specialists not employed in shifts, as well as for some repair personnel - a single-shift work schedule with two days off.

The influx of labor in connection with the implementation of the project will lead to a slight increase in the load on social infrastructure facilities such as hospitals and other medical institutions, schools, leisure and recreation facilities, housing, public transport and others.

The analysis carried out at the stage of basic socio-economic research showed that the population of Jizzakh city and Sharaf-Rashidov district is adequately provided with hospitals and polyclinics.

Despite the fact that in the short term, the influx of labor will lead to some increase in the burden on social infrastructure, it can be expected that an increase in demand will lead to infrastructure development, which will provide an additional positive effect.

Based on the assessment provided in 125-1105-ESIA-P0-Book 2, Sections 7.4 and 7.5, it was determined that the average school occupancy in Sharaf-Rashidov district is 585 pupils, which indicates a sufficient number of schools in the district.

At the same time, it is unlikely that the increased burden on social infrastructure in connection with the implementation of the project will lead to a decrease in the welfare of the population. Providing assistance to potentially vulnerable groups of people who may be directly affected by negative impacts will be key.

An increase in inflation, in particular, food and housing prices, can also be caused by an influx of labor and a change in the level of demand. It is unlikely that this impact will actually lead to a decrease in the overall well-being of people, since demand will stimulate additional production and an increase in the number of services provided to the population, but it is necessary to understand that this impact may affect vulnerable groups.

At the stage of operation, there may be unsatisfied expectations of the able–bodied population in the field of employment, as well as dissatisfaction of the local population - those employed within the framework of the project, and those whose applications turned out to be unsuccessful.

10.5.3. Recommendations

10.5.4. Measures to prevent and mitigate impacts

As a result of considering the impacts associated with the influx of labor and population changes and the consequences of these impacts, it is recommended to implement the following measures.

- Construction stage:
  - the goals for hiring local residents will be agreed between the contractor and “Cenergo” LLC. The terms of employment will be determined to manage job expectations, work with the local population (number and type of vacancies) will be carried out with the help of Public Relations Specialist. Unskilled labor will preferably be hired from among the local population affected by the project;

- social requirements will be included in the procurement process of the project. Taking into account the relevant considerations to increase the well-being of the population of Jizzakh city and Sharaf-Rashidov district, conditions will be created, as necessary, for the purchase of goods and services from economic entities of the district and the city;
- The policy to exclude alcohol consumption at work sites will be applied by the Contractor. Code of conduct for employees will be prepared and brought to the attention of staff for review, signing and implementation. Within the framework of the project, regular reviews of measures to mitigate the effects on public health and safety will be conducted, as well as consultations with the chairmen of makhallas every six months. The consultations will be aimed at informing about the progress of the project and the results and include discussion of any changes;
- code of conduct will also include a ban on the use of illegal drugs, bribery and corruption;
- recreational facilities (recreation facilities, dining room, etc.) should be created on the territory of the construction site.;
- providing assistance to potentially vulnerable groups of people who may be directly affected by the negative impacts associated with increased burden on infrastructure;
- development and implementation of a program of medical examinations and a management system in the field of personnel health protection, conducting awareness-raising work on the risks of socially caused diseases and ways to control them.

- Operational stage:
  - with the help of Public Relations Specialist, provide access to employment information, explaining in advance to the local population the number and type of opportunities;
  - create transparent hiring procedures – regarding ethnicity, religion, disability, or gender. Clear job descriptions will be provided before recruitment, which will explain the skills required for each position. Vacancies will be advertised in local communities through publicly available media.

10.5.5. Assessment results

It is established that the significance of the negative impacts of the planned activity in connection with the influx of labor is estimated as low.

Table 10.9: Measures to prevent and mitigate impacts related to the influx of labor and population change

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	Construction stage					
1.	Construction works (earthworks, general construction works)	Prevention and mitigation of impacts on the population and infrastructure due to the influx of labor and population growth	- The policy to exclude alcohol consumption at work sites will be applied by the Contractor. Code of conduct for employees will be prepared and brought to the attention of staff for review, signing and implementation. Within the framework of the project, regular reviews of measures to mitigate the effects on public health and safety will be conducted, as well as consultations with the chairmen of makhallas every six months. The consultations will be aimed at informing about the progress of the project and the results and include discussion of any changes; - Code of Conduct will also include a ban on the use of illegal drugs, bribery and corruption - recreational facilities (recreation facilities, dining room, showers, etc.) should be created on the territory of the construction site. - providing assistance to potentially vulnerable groups of people who may be directly affected by the negative impacts associated with an increase in the burden on infrastructure - Development and implementation of a program of medical examinations and a management system in the field of personnel health protection, conducting awareness-raising work on the risks of socially caused diseases and ways to control them	IFC PS-1 IFC PS-2 IFC PS-4 National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan “On employment of the population” No. 510-XII dated on 13/01/1992 - Law “On Labor Protection”, 2016. - Law “On the protection of citizens’ health” dated 29/08/1996	- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues - results of medical examinations of personnel health	- GM for project staff and the public - Public Health and Safety Plan
II.	Operational stage					

2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transport and logistics (delivery of raw materials, petroleum, oil and lubricants, other transportation, storage of hazardous materials);	Managing the employment expectations of the local population and implementing transparent selection procedures	- Creation of transparent recruitment procedures – regarding ethnicity, religion, disability or gender - clear job descriptions will be provided before recruitment, which will explain the skills required for each position - vacancies will be announced in local communities through public media and consultation meetings	IFC PS-1 IFC PS-2 IFC PS-4 National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan "On employment of the population" No. 510-XII dated on 13/01/1992 - Law "On Labor Protection", 2016. - Law "On the protection of citizens' health" dated 29/08/1996	Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues	GM for project staff and the public Compliance with the requirements of national labor legislation

Table 10.10: Matrix of the results of the assessment of the impact of the influx of labor and population change

Life cycle stage: construction

Recipient: population

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impact of labor influx		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Medium	Moderate
Consequences	• The emergence of conflicts with local residents • The increase in the incidence of socially-related diseases • The increase in the burden on social infrastructure facilities				

Activities	• Development and implementation of its own medical examination program and management system in the field of employee health protection within the framework of the Project • Conducting systematic information and explanatory work to inform personnel about the risks of infection with socially caused diseases and ways to control them • development and implementation of social assistance programs for vulnerable groups • development and implementation of the Personnel Code of Conduct				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low

Life cycle stage: operation

Recipient: population

Recipient sensitivity: medium

Characteristics of impacts

Impact	The impact of the influx of labor and population changes		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low
Consequences	The increase in the burden on social infrastructure facilities				
Activities	• Development and implementation of social assistance programs for vulnerable groups				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

10.6. Child and forced labor

Project task – to prevent any form of child and forced labor in the supply chain and project activities.

The main equipment of the project is provided by the world leader, Siemens (the risk of child and forced labor in the Siemens supply chain is excluded due to the provisions of the company's Corporate Ethics). The main component of the material balance at the operational stage is natural gas produced by highly qualified personnel who have received special training in large state–owned gas production companies in Uzbekistan. The risk of child and forced labor in the field of gas production is minimal (this industry is not seen in the abuse of child and forced labor), unlike enterprises operating, for example, in agriculture, mining and light industry.

Uzbekistan has ratified eight fundamental ILO conventions that address the “basic labor standards”, including provisions on child and forced labor (for more information, see 125-1105-ESIA-PE- Book 1, Section 2).

Permanent large-scale seasonal employment in construction and agriculture creates a risk of using child and forced labor for the project.

Migrants, seasonal workers, public sector workers and subcontractors, as well as children are considered highly sensitive because they are at risk.

According to the Human Rights Organization's [20] 2024 report, independent observers have not identified any signs of forced labor in various industries for the second year in a row. However, there were isolated cases of forced labor on cotton plantations.

Given the ongoing efforts of the Government, civil society and the international community to eliminate the problem of child and forced labor in Uzbekistan, the significance of this potential impact is projected to be relatively low.

10.6.1. Construction stage

The main impacts of the planned activities at the construction stage are related to the provision of services by contractors and the supply of products by suppliers using child and forced labor.

In order to prevent any forms of child and forced labor at the stage of construction of a combined cycle power plant, it is necessary to develop procedures for screening contractors and include provisions on child and forced labor in contracts with suppliers and contractors, and to determine measures of influence for their violation.

10.6.2. Operational stage

The risk and impact of any form of child or forced labour during the operational phase of the power plant is unlikely, as the Human Resources and Human Rights Policies will ensure that the project as a whole does not involve the use of child or forced labour, and will also reflect in the policy national and international requirements for personnel and supply chain workers who are not in an employment relationship.

A grievance mechanism available to all project workers, including contract and subcontractor workers, as well as supply chain workers (discussed in Section 10.8) they will also help to minimize this risk.

[20] https://www.hrw.org/ru/world-report/2024/country-chapters/uzbekistan

10.6.3. Recommendations

10.6.3.1. Measures to prevent and mitigate impacts

As a result of consideration of the impacts associated with child and forced labor and the consequences of these impacts, it is recommended to implement the following preventive measures.

- Construction stage:
  - include in the Human Resources and Human Rights Policies the principles of equal working conditions, excluding discrimination, child and forced labor, and violation of the rights of personnel;
  - Oblige contractors and subcontractors to adhere to the Human Resources Policy of the Project through the provisions of the contract;
  - Develop the Contractor's Code of Conduct and familiarize employees and contractors with it;
  - contracts with suppliers and contractors should contain provisions on child and forced labor and define penalties for their violation;
  - establish an employee grievance mechanism that is accessible to all employees, including contract and subcontract workers and supply chain personnel;
  - create an identity card system for all project employees and keep up-to-date (daily) records of persons working at project facilities at any given time;
  - appoint at least two labor and social affairs officers who will be responsible for monitoring contractors and their subcontractors (during the construction phase) in ensuring compliance with the Human Resources and Human Rights Policies
  - report to local authorities and relevant authorities the cases of child and forced labor or any suspicion of them
  - report to international lenders on the results of monitoring during the construction period in relation to child and forced labor as part of the mandatory reporting under loan agreements.
- Operational stage:
  - Human Resources Policy should exclude the use of child or forced labor in the project and in the enterprise, and also reflect in this policy national and international requirements for workers who are not in an employment relationship and for workers in the supply chain;
  - establish and implement workers grievance mechanism that is accessible to all project workers, including contract and subcontract workers, as well as supply chain workers. Moreover, workers should not be restricted from joining or forming workers' organizations, or from bargaining for collective agreements.

10.6.3.2. Monitoring and reporting

10.6.3.2.1. Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues;

10.6.3.2.2. Monthly social monitoring reports, including an assessment of the

effectiveness of measures to prevent forced and child labor.

10.6.4. Assessment results

It is established that the significance of the impacts of the planned activities related to child and forced labor is estimated as low.

Table 10.11: Measures to prevent and mitigate the impacts of child and forced labour

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	Construction stage					
1.	Construction works (earthworks, general construction works)	Prevention of child and forced labor	- Introduction of the principles of equal working conditions into the Personnel Policy, excluding discrimination, child and forced labor, violation of personnel rights - requirements for contractors to adhere to the personnel policy of the project through the provisions of the contract - develop a Contractor Code of Conduct and familiarize all employees and contractors with it; contracts with suppliers and contractors must contain provisions on child and forced labor and define measures of influence for their violation - create grievance mechanism accessible to project personnel, including contract and subcontractor workers, as well as supply chain workers - create an identity card system for all project employees and keep up-to-date (daily) records of persons working at the project facilities; - appoint at least two labor and social affairs officers who will be responsible for monitoring the activities of contractors and their subcontractors (during the construction phase) in relation to personnel management policies - report to local authorities and relevant authorities the cases of child and forced labor or any suspicion of them - to inform creditors about the results of monitoring during the construction period in relation to child and forced labor within the framework of mandatory reporting	IFC PS-1 IFC PS-2 Forced Labour Convention No. 29, (1930) - Protocol of 2014 to the Forced Labor Convention (1930) Abolition of Forced Labour Convention No.105, (1957) Worst Forms of Child Labour Convention No. 182, (1999) Minimum Age Convention No. 138 (1973) National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan “On employment of the population” No. 510-XII dated on 13/01/1992 - Law “On Labor Protection”, 2016.	- Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues - monthly reports on social monitoring, including the implementation of measures to prevent forced and child labor.	-GRM for project personnel and the public - fulfillment of the national legislation on labor activity requirements - Human Resources and Human Rights Policies - Contractor Code of Conduct
II.	Operational stage					

2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transport and logistics (delivery of raw materials, petroleum, oil and lubricants, other transportation, storage of hazardous materials);	Prevention of child and forced labor	- The Human Resources Policy should exclude the use of child or forced labor in the project and in the enterprise, and also reflect in this policy national and international requirements for workers who are not in an employment relationship and for workers in the supply chain - establish and implement workers grievance mechanism that is accessible to all project workers, including contract and subcontract workers, as well as supply chain workers. Moreover, workers should not be restricted from joining or forming workers' organizations, or from bargaining for collective agreements	IFC PS-1 IFC PS-2 Forced Labour Convention No. 29, (1930) - Protocol of 2014 to the Forced Labor Convention (1930) Abolition of Forced Labour Convention No.105, (1957) Worst Forms of Child Labour Convention No. 182, (1999) Minimum Age Convention No. 138 (1973) National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan "On employment of the population" No. 510-XII dated on 13/01/1992 - Law "On Labor Protection", 2016.	- Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues	- GM for project staff and the public - fulfillment of the national legislation on labor activity requirements

Table 10.12 Matrix of impact assessment results related to child and forced labour

Life cycle stage: construction

Recipient: personnel

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impacts related to child and forced labor		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low
Consequences	Violations of the principles of equal working conditions, discrimination, and violations of staff rights				

Activities	• Include into the Human Resources and Human Rights Policies the principles of equal working conditions, excluding discrimination, child and forced labor, personnel rights violation • Oblige contractors and subcontractors to adhere to the Human Resources Policy of the Project through the provisions of the contract • Develop the Contractor's Code of Conduct and familiarize employees and contractors with it • Contracts with suppliers and contractors should contain provisions on child and forced labor and define penalties for their violation; • Establish workers' grievance mechanism that is accessible to all employees, including contracted and subcontracted workers, as well as supply chain personnel;				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

Life cycle stage: operation

Recipient: personnel

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impacts related to child and forced labor		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Low
Consequences	Violations of the principles of equal working conditions, discrimination, violations of staff rights				
Measures	• Include into the Human Resources and Human Rights Policies the principles of equal working conditions, excluding discrimination, child and forced labor, personnel rights violation; • Contracts with suppliers and contractors should contain provisions on child and forced labor and define penalties for their violation; • Establish an employee grievance mechanism that is accessible to all employees, including contract and subcontract workers and supply chain personnel;				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

10.7. Impact on access to transport infrastructure

The following aspects of the project could potentially have an impact on social facilities and transport infrastructure:

- carrying out work on moving soil/excavation, transportation of bulky equipment may inadvertently damage existing infrastructure.

10.7.1. Construction stage

During peak periods of construction and commissioning of the facility in 2026-2027, traffic intensity is projected to increase by approximately 30% of the current level (see Table 10.710.7.1, 125-1105-ESIA-PE-Book 2).

Potential impacts:

- road surface wear/degradation – when using the road network to access the project area;
- traffic jams and delays (road closures), especially during periods of delivery of oversized and/or heavy goods.

10.7.2. Operational stage

No significant impact on access to infrastructure and its deterioration during the operational phase is expected.

10.7.3. Recommendations

10.7.3.1 Measures to prevent and mitigate impacts

As a result of considering the impacts associated with access to infrastructure, as well as the consequences of these impacts, it is recommended to implement the following measures.

- Construction stage:
  - contractor will ensure the preparation and implementation of the Traffic Management Plan (TMP), which will be approved by “Cenergo” LLC and the relevant regulatory authority in Uzbekistan for traffic control;
  - ensuring the safe movement of vehicles through detours or temporary access roads (if necessary);
  - proper road signs, lighting, well designed road safety signs, signallers to direct traffic.
  - periodic inspection and restoration of worn-out pavement due to the equity participation of the project.

10.7.3.2 Monitoring and reporting

- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues;
- report on the implementation of the Traffic Management Plan

10.7.4. Assessment results

It has been established that the significance of the impact of the planned activity on access to transport infrastructure is assessed as low, both at the construction stage and at the operational stage.

Table 10.13: Measures to prevent and mitigate impacts related to access to transport infrastructure

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation / reporting
I.	Construction stage					
1.	Construction works (earthworks, general construction works)	Prevention and mitigation of impacts on transport infrastructure	- The Contractor will ensure the preparation and implementation of the Traffic Management Plan (TMP), which will be approved by "Cenergo" LLC and the relevant regulatory body in Uzbekistan for traffic control - ensuring unimpeded and safe movement of traffic through bypasses or temporary access roads (if necessary) - proper road signs, lighting, well thought out road safety signs, signalmen to control traffic	IFC PS-1 IFC PS-4 National requirements: - Law "On the protection of citizens' health" dated 29/08/1996	- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues - results of medical examinations of employees health.	- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues; -Report on the implementation of the Traffic Management Plan
II.	Operational stage					
2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transportation and logistics (delivery of raw materials, fuels and lubricants, other transportation, storage of hazardous materials)	Prevention and mitigation of impacts on transport infrastructure	Preparation and implementation of optimal logistics schemes and Traffic Management Plan for the transportation of heavy goods	IFC PS-1 IFC PS-4 National requirements: - Law "On the protection of citizens' health" dated 29/08/1996	- Accounting for complaints and suggestions from the public and personnel with monthly reports on resolving issues	- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues; -Report on the implementation of the Traffic Management Plan

Table 10.14: Matrix of impact assessment results on access to transport infrastructure

Life cycle stage: construction

Recipient: municipal infrastructure

Recipient sensitivity: high

Characteristics of impacts:

Impact	Impacts on access to infrastructure		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Moderate
Consequences	• Impact on road infrastructure • Impact on traffic				
Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Ensuring unhindered and safe movement of traffic through detours or temporary access roads (if necessary); • Proper road signs, lighting, well-designed road safety signs, signalers to direct traffic				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Minor	Low

Life cycle stage: operation

Recipient: municipal infrastructure

Recipient sensitivity: high

Characteristics of impacts:

Impact	Impacts on access to infrastructure		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Moderate
Consequences	• Impact on road infrastructure • Impact on traffic				
Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Preparation and implementation of optimal logistics schemes				
Residual	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significanc**

impact					**e**
	Local	Long-term	Reversible	Minor	Low

Table 10.1515: Measures to prevent and mitigate impacts associated with access to Man transportinfrastructure

Item No.	**Activity/process**	**Task**	**Measures**	**Applicable requirements**	**Monitoring**	**Implementation method/reporting**
I.	Construction stage					
1.	Construction work (earthen, general construction work)	Prevention and softening impacts on transport infrastructure	- The Contractor will provide training and implementation of the Traffic Management Plan (TMP), which will be approved by “Cenergo” LLC and the relevant regulatory body for traffic control in Uzbekistan - ensuring unimpeded and safe movement of traffic through bypasses or temporary access roads (if necessary) - proper road signs, lighting, thoughtful road safety signs, signalmen for control movement	IFC PS-1 IFC PS-4 National requirements: - Law "On the protection of citizens' health" from 29.08.1996	- Recording complaints and suggestions from the public and staff, with monthly reports on resolution of issues. - Results of employee medical examinations.	- Recording complaints and suggestions from the public and staff, with monthly reports on resolution; - Report on the implementation of the Traffic Management Plan
II.	Operational stage					

2.	Main production activity (electricity production) Providing for the main activity – repair work, water supply, water disposal, dewatering, cleaning of the territory and production facilities Transportation and logistics (delivery of raw materials and materials, fuels and lubricants, other transportation, storage of hazardous materials)	Prevention and mitigating the impacts on transport infrastructure	Preparation and implementation optimal logistics schemes and Traffic Management Plan during transportation heavy loads	IFC PS-1 IFC PS-4 National requirements: - Law "On the protection of citizens' health" from 29.08.1996	- Recording complaints and suggestions from the public and staff, with monthly reports on resolution of issues.	- Recording complaints and suggestions from the public and staff, with monthly reports on resolution; - Report on the implementation of the Traffic Management Plan

Table 10.1616: Matrix results assessments impact on access to transport infrastructure

Stage vital cycle: construction

Recipient: municipal infrastructure

recipient sensitivity: high

Characteristics of impacts:

Impact	Impacts on access to infrastructure		**Direction**	**Genesis**	**Mechanism**
			Negative	Direct	-
Primary impact	**Scale**	**Duration**	**Reversibility**	**Size**	**Significance**
	Local	Short-term	Reversible	Small	Moderate
Consequences	• Impact on road infrastructure • Impact on traffic				

Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Security unimpeded and safe movements transport through bypasses paths or temporary access roads paths (at necessity); • Proper road signs, lighting, good well-thought-out road signs security, signalmen for motion control				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Size**	**Significance**
	Local	Short-term	Reversible	Minor	Low

Life cycle stage: operation

Recipient: municipal infrastructure

Recipient sensitivity: high

Characteristics of impacts:

Impact	Impacts on access to infrastructure		**Direction**	**Genesis**	**Mechanism**
			Negative	Direct	-
Primary impact	**Scale**	**Duration**	**Reversibility**	**Size**	**Significance**
	Local	Long-term	Reversible	Small	Moderate
Consequences	• Impact on road infrastructure • Impact on traffic				
Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Preparation and implementation optimal logistics schemes				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Size**	**Significance**
	Local	Long-term	Reversible	Minor	Low

10.8. Supply chain impacts

The social and environmental risks and impacts of the project supply chain are associated with suppliers of goods and services necessary for the implementation of the project. One of the objectives of the IFC PS-2 is to ensure the protection of workers, including vulnerable categories such as children, migrant workers, workers employed by third parties, as well as workers in the customer's supply chain.

The supply chain extends to equipment, materials, components, goods or products used in current activities.

The supply chain of goods may include suppliers of raw materials and suppliers of parts and components for assembly and production.

The term "primary supplier" refers to those suppliers who provide goods and materials required for the project's core business processes.

The supply chain of the Project can be complex and consist of a large number of suppliers of different levels. It is difficult to assess the full supply chain of a project, and areas of risk and impact are usually identified.

Supplier activity monitoring should be integrated into the overall Project management system. This will help determine if mitigation procedures and measures are being implemented correctly, and provide feedback on new areas of risk and hazard.

10.8.1. Construction stage

The IFC PS-2 chain of custody requirements do not apply to materials and components used during the construction phase of the project.

The main social and environmental impacts and risks associated with the supply chain during the construction phase may include child and forced labour in the provision of services by contractors and the delivery of products by suppliers, in addition to where there is a high level of risk to the safety of workers in the supply chain. "Cenergo" LLC must introduce procedures and take measures to reduce the level of risk, ensuring that key suppliers and contractors take measures to prevent or eliminate situations that pose a threat to life.

The ability to completely eliminate these risks will depend on the level of administrative control or degree of influence over key suppliers and contractors. Where corrective actions are difficult to implement, "Cenergo" LLC should, over time, reorient the chain to suppliers and contractors who can demonstrate that they are capable of meeting the requirements of IFC PS-2.

The table below examines the main environmental requirements of "Cenergo" LLC for contractors and suppliers.

Table 10.17: Environmental requirements for suppliers of "Cenergo" LLC

Requirements for contractors and suppliers of raw materials, equipment, and services	
Groups of requirements	**Requirements for contractors**
General requirements	- Availability of a certified environmental management system and/or a certified integrated management system (HSE) - Availability of an environmental management system and/or an integrated management system (HSE) - availability of standards and procedures in the field of HSE

Requirements for construction contractors	- Maximum possible use of local raw materials for construction work - emergency preparedness - the presence of a system for handling hazardous materials and substances (if their use is necessary) - liquidation of temporary infrastructure facilities taking into account the possibility of reuse
Preventing climate change	- Availability of PG management system - accounting of fuel and energy consumption, transfer of this data to "Cenergo" LLC for climate reporting purposes regularly - the use of technologies, equipment and practices that involve the use of renewable energy sources - use of electric, hybrid, biofuel and/or gas vehicles
Resource conservation	Use of water efficiency measures in contractors/suppliers' operations (reduction of water consumption and conservation of water resources, for example, through the use of rainwater harvesting and use, as well as the introduction of recirculating water systems)
Waste management	- Availability of a waste management system - application of technologies and materials that involve the use of secondary raw materials - use of complexes for processing solid municipal and biological waste - use of waste-free and low-waste technologies in construction - availability of waste separation system - availability of waste composting solutions - waste management in the areas of consumer services, food and cleaning - liquidation of temporary infrastructure facilities taking into account the possibility of reuse - availability of equipment (technologies) for waste processing that meet environmental requirements[21] - availability of waste transportation vehicles that meet environmental requirements[22] - availability of waste disposal facilities that meet environmental requirements[23]
Requirements for equipment, materials and raw materials	
Use of hazardous/toxic substances	- refusal to use materials/raw materials recognized as hazardous or toxic to humans or polluting the environment (if there are reasonable alternatives) - refusal to use ozone-depleting substances
Energy efficiency and resource conservation	- Use of certified technologies (equipment) in the field of energy, heat and water conservation

[21] For contractors engaged in waste processing.

[22] For contractors involved in waste transportation

[23] For contractors involved in waste disposal

As determined by IFC PS-2, Cenergo LLC must conduct due diligence in its supply chain to avoid receiving benefits or financial gain from such practices.

The project should make special efforts and conduct additional due diligence where such practices are widespread or known to exist at certain levels of the supply chain in specific industries or regions.

The financial benefit of child and forced labor is a specific risk where labor cost is one of the project competitiveness factors.

The project must make the most of its influence to eliminate child and forced labor in its supply chain. It is also necessary to take measures to prevent or eliminate life-threatening situations within the supply chain.

Implementation procedures, such as procurement procedures, will ensure that child and forced labor requirements and labor safety issues are included in orders and contracts with suppliers.

10.8.2. Operational stage

During the operation phase, the same risks and impacts are considered as during the construction phase.

10.8.3. Recommendations

10.8.3.1 Measures to prevent and mitigate impacts

Based on the consideration of supply chain-related impacts and the consequences of these impacts, the following measures are recommended to be implemented.

- Construction stage:
  - develop and implement environmental and social criteria for selecting suppliers/contractors;
  - Develop Supply Chain Sustainability Assessment Procedure
  - include in the Human Resources and Human Rights Policies the principles of equal working conditions, excluding discrimination, child and forced labor;
  - oblige contractors, subcontractors and suppliers of the Project to adhere to the Human Resources and Human Rights Policies of the Project through the provisions of the contract;
  - contracts with suppliers and contractors must contain provisions on child and forced labor, labor safety, and define measures of influence for their violation;
  - creation of a publicly accessible mechanism for dealing with complaints from staff, including employees working under contracts and subcontracts, as well as supply chain workers;
  - inform creditors of the results of monitoring during the construction period regarding child and forced labor as part of mandatory reporting under loan agreements;
  - take measures to prevent or eliminate situations within the supply chain that pose a risk to the health and life of personnel.
- Operational stage:

At the operational stage, the same measures are considered as at the construction stage.

10.8.3.2 Monitoring and reporting

- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues;
- Monthly reports on social monitoring, including the implementation of measures to prevent forced and child labor.

10.8.4. Assessment results

It was found that the significance of the impacts of the planned activity related to the supply chain is assessed as moderate at the construction stage and low at the operational stage.

Table 10.18: Measures to prevent and mitigate impacts related to supply chains

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	**Stages of construction, operation**					
1.	Construction works (earthworks, general construction works)	Eliminating child and forced labor from the supply chain	- Develop and introduce environmental and social criteria for selecting suppliers/contractors - Develop Supply Chain Sustainability Assessment Procedure - include in the Personnel Policy the principles of equal working conditions, excluding discrimination, child and forced labor - oblige contractors, subcontractors and suppliers of the Project to adhere to the personnel policy of the Project through the provisions of the contract - contracts with suppliers and contractors must contain provisions on child and forced labor, labor safety, and define measures of influence for their violation - creation of a publicly accessible mechanism for dealing with complaints from staff, including employees working under contracts and subcontracts, as well as supply chain workers - inform creditors of the results of monitoring during the construction period regarding child and forced labor as part of mandatory reporting under loan agreements - measures to prevent or eliminate situations within the supply chain that pose a risk to the health and life of personnel - development and implementation of environmental requirements for suppliers in accordance with Table 10.8.1	IFC PS-1 IFC PS-2 Forced Labour Convention No. 29, (1930) - Protocol of 2014 to the Forced Labor Convention (1930) Abolition of Forced Labour Convention No.105, (1957) Worst Forms of Child Labour Convention No. 182, (1999) Minimum Age Convention No. 138 (1973) National requirements: - Labor Code of the Republic of Uzbekistan, 1996 - Law of the Republic of Uzbekistan “On employment of the population” No. 510-XII dated on 13/01/1992 - Law “On Labor Protection”, 2016.	- Accounting for complaints and suggestions from the population and staff with monthly reporting on the resolution of issues - monthly reports on social monitoring, including the implementation of measures to prevent forced and child labor	-GRM for project personnel and the public - Fulfillment of the national legislation on labor activity requirements - Human Resources and Human Rights Policies - Contractor Code of Conduct

2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transportation and logistics (delivery of raw materials and supplies, fuels and lubricants, other transportation, storage of hazardous materials)		- taking measures to prevent or eliminate situations within the supply chain that pose a danger to the health and life of personnel.			

Table 10.19: Matrix of supply chain impact assessment results

Life cycle stages: construction, operation

Recipients: business entities, personnel

Recipient sensitivity: average

Characteristics of impacts

Impact	Supply chain impacts		Orientation	Genesis	Mechanism
			Negative	Indirect	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Regional	Short term and long term	Reversible	Medium	Moderate
Consequences	Indirect impacts from violation of equal working conditions principles that exclude discrimination, child and forced labor, violation of personnel rights in the supply chain, indirect consequences for components of the natural environment				
Activities	Develop and introduce environmental and social criteria for selecting suppliers/contractors include in the Human Resources and Human Rights Policies the principles of equal working conditions, excluding discrimination, child and forced labor oblige contractors, subcontractors and suppliers of the Project to adhere to the personnel policy of the Project through the provisions of the contract contracts with suppliers and contractors must contain provisions on child and forced labor, labor safety, and define measures of influence for their violation creation of a publicly accessible mechanism for dealing with complaints from staff, including employees working under contracts and subcontracts, as well as supply chain workers inform creditors of the results of monitoring during the construction period regarding child and forced labor as part of mandatory reporting under loan agreements measures to prevent or eliminate situations within the supply chain that pose a risk to the health and life of personnel				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Regional	Short term and long term	Reversible	Small	Low

10.9. Cultural heritage

The impact associated with construction work on the designated site is considered.

Since the construction site is located on an agricultural territory that has been developed for many decades, the impact on the archaeological and cultural heritage on the territory of the construction site is considered to be minimal.

10.9.1. Construction stage

When studying the project documentation and holding a consultation meeting with the head of the Agency for Cultural Heritage of the Jizzakh Region, an answer was received about significant cultural and archaeological heritage sites located in this area.

The agency has provided information on the location of 3 cultural heritage sites located at a distance of over 5 kilometers from the construction site.

10.9.2. Operational stage

Impact on cultural heritage at the operational stage is not predicted (excluded).

10.9.3. Recommendations

10.9.3.1 Measures to prevent and mitigate impacts

Based on the above data, in accordance with PS-8, it is advisable to include a Procedure for detecting accidental finds in the Environmental and Social Management Plan.

10.9.3.2 Monitoring and reporting

Provide reporting on the implementation of the Procedure for the detection of accidental finds.

10.9.4. Assessment results

It has been established that the impact of the planned activity on cultural heritage is assessed as negligible.

10.10. Workers' rights, safety and labor protection

Occupational health and safety in industrial activities remains a serious problem in Uzbekistan. The practice of fulfilling safety and labor protection requirements by contractors and subcontractors of the RUz is assessed as insufficiently effective. These issues should be considered not only for the personnel of "Cenergo" LLC, but also for contractors. "CENERGO" LLC will develop and implement a Grievance Redress Mechanism to handle worker grievances for the personnel of "Cenergo" LLC, but also for contractors as a tool for monitoring working conditions, safety, and the rights of project workers.

10.10.1. Construction stage

It is expected that during the peak construction period, at least 650 workplaces will be created within the framework of the project, the duration of which is directly related to the construction period of the power plant. The majority of the workers will be engaged by the Contractor and will consist of unskilled and skilled labor.

Expected impacts include the operation of heavy machinery and transport, working at height, construction work, the use of electrical equipment, the handling of hazardous materials and other hazardous activities.

Due to the nature of the activities carried out during the construction phase, the safety of personnel is a key risk with the possibility of accidents that can lead to injury and death, as well as loss of working time.

Occupational Health and Safety (OHS) will be prepared by the Contractor prior to commencement of construction work.

The Contractor must ensure strict implementation of the OHS plan through its occupational safety and health officer.

In addition, the Contractor will conduct a series of training courses and safety meetings.

The Contractor will regularly inspect, test and maintain all security equipment (including fire-fighting equipment), scaffolding, fencing, work platforms, lifts, stairs and other means of access, lifting, lighting, marking and security equipment

Employees (before the work starts) will be provided with appropriate PPE free of charge suitable for performing electrical work, such as protective boots, harnesses, helmets, gloves, protective clothing, goggles and protective headphones.

With regard to the rights of workers and personnel, the Contractor must ensure that the following measures are implemented:

- The provisions in the Contractors' contract should include, as far as practicable, clauses to address issues related to collective bargaining, downsizing, placement of employees and shortage of employees, to ensure compliance with the requirements of the ILO and IFC;
- development and implementation by the Contractor of a Personnel policy (Human Resources and Human Rights Policies) for hiring, training, evaluation and remuneration of the project workforce;
- the Policy should prevent all employees of any form of discrimination in the workplace and ensure fair and equal treatment;
- establishing a grievance mechanism so that employees can raise reasonable workplace issues. The contractor will inform employees about the complaint mechanism when hiring and make it easily accessible to them;
- employees will not be restricted in joining or creating workers' organizations, as well as in negotiating collective agreements, and the Contractor will not discriminate against employees who form or join collectives or conclude collective agreements;
- preparing a redundancy plan to mitigate the impact of sudden termination of employment contracts, including, for example and where appropriate, the implementation of a transparent redundancy process and labour consultation mechanisms. The contractor will explain the temporary nature of the workplaces during the hiring process and will explain to workers the need to prepare for job loss and manage their income wisely while employed.

All employees will have contracts describing their job responsibilities and working conditions, as well as explaining their content. The contractor will hire a group of occupational health and safety specialists to implement and manage the above tasks.

All subcontractors of the project will be provided with copies of the ESMP (Environmental and Social Management Plan) of the Contractor. All subcontracts will include provisions ensuring compliance with the ESMP at all levels of subcontracting.

All subcontractors will have to appoint a safety officer who will be on the Construction Site for the duration of the relevant subcontract. To implement the above points, the contractor will appoint qualified personnel for environmental protection, health and safety at work.

10.10.2. Operational stage

Occupational health and safety management will be carried out in accordance with national regulatory documents and at the operational stage of the project.

The process of improving working conditions must be carried out systematically. In order to achieve sound SP conditions, it is necessary to finance the establishment of permanent mechanisms for their review, planning, implementation, evaluation and appropriate action.

This should be achieved through the establishment of occupational health and safety management systems.

The selection and implementation of specific measures to prevent industrial injuries and diseases among workers depends on the main hazardous factors and expected injuries and diseases.

The main hazardous production factors are:

- natural gas leak and gas contamination;
- steam leak;
- electricity;
- explosion and flame;
- location of work places and equipment at height.

Harmful factors of the production process, if exposed to a person over a long period of time and intensively, can lead to the development of occupational diseases in the worker. These factors include:

- thermal, ultraviolet, ionizing and other radiation;
- electromagnetic fields;
  dust and gas released into the atmosphere of the production premises;
- high level of noise and vibration, ultrasound.

The personnel of combined cycle power plant will be exposed to all of the above factors.

The probability of exposure to each hazardous factor should be assessed in accordance with the provisions of the instructions of the International Labour Organization "Occupational safety when working with chemicals" and "Environmental factors in the workplace", or other provisions of equal or greater importance.

Activities to assess the effects of hazardous factors are carried out by competent persons in the process of certification and inspection of workplaces with the provision of information to staff about the results of the assessment.

Ensuring safe working conditions includes timely staff training and periodic monitoring of staff knowledge, training in first aid rules, and regular medical examinations of staff.

It is recommended to develop and implement a long-term training program in the field of OHS, provided by specialists in the relevant field of OHS.

The expected impact on the health, safety and labor protection of personnel at the operational stage is as follows:

- risks for employees in connection with hazardous work;
- the impact on the health of personnel due to dangerous and harmful production factors of
- violation of workers' rights.

The proposed mitigation measures described should help reduce the risk of incidents.

10.10.3. Recommendations

10.10.3.1 Measures to prevent and mitigate impacts

As a result of considering the health, safety and environmental impacts, as well as the consequences of these impacts, it is recommended to implement the following measures.

- Construction stage:
  - The Occupational Health and Safety Plan (OHS) will be prepared by the Contractor;
  - The contractor will conduct a series of safety training courses;
  - regular inspection, testing and maintenance of all safety equipment (including fire-fighting equipment), scaffolding, fencing, work platforms, lifts, stairs and other means of access, lifting, lighting, marking and security equipment;
  - employees will be provided with appropriate PPE suitable for work, such as safety boots, harnesses, helmets, gloves, protective clothing, safety glasses and protective headphones;
  - keeping logs of briefings, training records, and safety-related incidents, including incidents close to omissions;
  - development and implementation by the contractor of a Personnel Policy (Human Resources and Human Rights Policies) for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees;
  - grievance mechanism to enable workers to raise workplace issues;
  - the possibility of joining or creating workers organizations, as well as negotiating collective agreements.
- Operational stage:
  - Occupational Health and Safety Plan (OHS) will be prepared;
  - conducting training courses and safety meetings on an ongoing basis;
  - conducting periodic monitoring of personnel knowledge, training in the rules of first aid, regular medical examinations of personnel, primarily those employed in hot shops.
  - provision of appropriate PPE suitable for basic jobs such as safety boots, harnesses, helmets, gloves, protective clothing, safety glasses and protective headphones;
  - development and implementation by the contractor of a Personnel Policy (Human Resources and Human Rights Policies) for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees;
  - employee grievance mechanism; informing employees about the grievance mechanism during employment.
  - training in first aid rules,
  - regular medical examinations of personnel.

10.10.3.2 Monitoring and reporting

- Accounting for complaints and suggestions of staff with monthly reporting on resolving issues;
- monthly reports on the implementation of the Occupational Health and Safety (OHS) Plan.
- analysis of incidents at the enterprise
- training in occupational health and safety (OHS) with subsequent knowledge testing

Suggestions for monitoring and reporting are presented in Table 10.18

10.10.4. Assessment results

It has been established that the significance of residual impacts on the rights, health, safety and labor protection of personnel is assessed as follows:

- at the construction stage – negligible;
- at the operation stage – low.

Table 10.20: Measures to prevent and mitigate impacts related to workers' rights, health and safety issues

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	**Construction stage**					
1.	Construction works (earthworks, general construction works)	Ensuring the safety and health of the personnel, implementation of OHS	- Preparation of the Occupational Health and Safety (OHS) Plan by the Contractor - conducting training courses on safety precautions - regular inspection, testing and maintenance of all safety equipment (including fire-fighting equipment), scaffolding, fencing, work platforms, lifts, stairs and other means of access, lifting, lighting, marking and security equipment - providing personnel with appropriate PPE suitable for the work performed, such as safety boots, harnesses, helmets, gloves, protective clothing, safety glasses and ear protection; - keeping logs of briefings, training records, and safety-related incidents, including incidents close to omissions - development and implementation by the contractor of a Personnel Policy for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees - grievance mechanism to enable workers to raise workplace issues - the possibility of joining or creating workers organizations, as well as negotiating collective agreements	- IFC PS-1 - IFC PS-2 - IFC PS-4 National requirements: - Labor Code of the Republic of Uzbekistan, 1996. - Law of the Republic of Uzbekistan "On employment of the population" No. 510-XII dated on 13/01/1992 - Law "On Labor Protection", 2016.	- Accounting for complaints and suggestions of staff with monthly reporting on resolving issues - Monthly reports on the implementation of the Occupational Health and Safety (OHS) Plan analysis of incidents at the enterprise, training in occupational health and safety (OHS) with subsequent knowledge testing	- GRM for project personnel and the public - fulfillment of the national legislation on labor activity requirements - (Human Resources and Human Rights Policies) - Contractor Code of Conduct - The Occupational Health and Safety (OHS) plan
II.	Operational stage					

2.	Main production activity (electricity generation) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transport and logistics (delivery of raw materials, petroleum, oil and lubricants, other transportation, storage of hazardous materials);	Ensuring the safety and health of the personnel, implementation of OHS	- Preparation of the Occupational Health and Safety (OHS) Plan - conducting training courses and safety meetings on an ongoing basis; - conducting periodic monitoring of personnel knowledge, training in first aid rules, regular medical examinations of personnel. - provision of appropriate PPE suitable for basic jobs such as safety boots, harnesses, helmets, gloves, protective clothing, safety glasses and protective headphones - development and implementation by the contractor of a Personnel Policy for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees; - employee grievance mechanism; informing employees about the grievance mechanism during employment. - training in first aid rules - regular medical examinations of staff, first of all.	- IFC PS-1 - IFC PS-2 - IFC PS-4 National requirements: - Labor Code of the Republic of Uzbekistan, 1996. - Law of the RUz “On employment of the population” No. 510-XII dated on 13/01/1992 - Law “On Labor Protection”, 2016. Appendix No. 1 to the Resolution of the CM of the RUz No. 263 dated on 15/09/2014 Regulation on the procedure for certification of workplaces for working conditions and equipment hazards	- Accounting for complaints and suggestions of staff with monthly reporting on resolving issues - Monthly reports on the implementation of the Occupational Health and Safety (OHS) Plan - analysis of incidents at the enterprise, training in occupational health and safety (OHS) with subsequent knowledge testing	GM for project staff and the public Compliance with the requirements of national labor legislation - The Occupational Health and Safety (OHS) plan

Table 10.21: Matrix of the results of the assessment of impacts related to workers’ rights, health and safety issues

Life cycle stage: construction

Recipient: personnel

Recipient sensitivity: medium

Characteristics of impacts

Impact	**Impacts related to workers’ rights, health and safety issues**		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Short-term	Not applicable	Small	Low
Consequences	Impact on personnel health				

Activities	The Occupational Health and Safety Plan (OHS) will be prepared by the Contractor The contractor will conduct a series of safety training courses regular inspection, testing and maintenance of all safety equipment (including fire-fighting equipment), scaffolding, fencing, work platforms, lifts, stairs and other means of access, lifting, lighting, marking and security equipment employees will be provided with appropriate PPE suitable for work, such as safety boots, harnesses, helmets, gloves, protective clothing, safety glasses and protective headphones keeping logs of briefings, training records, and safety-related incidents, including incidents close to omissions development and implementation by the contractor of Human Resources and Human Rights Policies for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees grievance mechanism to enable workers to raise workplace issues the possibility of joining or creating workers organizations, as well as negotiating collective agreements				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Short-term	Not applicable	Insignificant	Negligible

Life cycle stage: operation

Recipient: personnel

Recipient sensitivity: medium

Characteristics of impacts

Impact	**Impacts related to workers' rights, health and safety issues**		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Not applicable	Small	Moderate
Consequences	Impact on personnel health				
Activities	Preparation of the Occupational Health and Safety (OHS) Plan conducting safety training courses on an ongoing basis conducting periodic monitoring of personnel knowledge, training in first aid rules, regular medical examinations of personnel provision of appropriate PPE suitable for all types of work, such as protective boots, harnesses, helmets, gloves, protective clothing, safety glasses and protective headphones development and implementation by the contractor of Human Resources and Human Rights Policies for hiring, training, evaluation and remuneration of the project workforce, preventing any form of discrimination in the workplace and ensuring fair and equal treatment of all employees; grievance mechanism informing employees about the grievance mechanism during employment				
Residual impact	Scale	Duration	Reversibility	Magnitude	Significance
	Local	Long-term	Not applicable	Minor	Low

10.11. Health, safety and well-being of the population

This section discusses the impacts of the project on the health, safety and welfare of the population and the corresponding measures to prevent/mitigate them.

Aspects of the project that have potential impacts on public health and safety:

- increase in the intensity of motor vehicle traffic, especially heavy vehicles and equipment;
- accidental situations;
- chemical and acoustic pollution of atmospheric air;
- actions of the Contractor's personnel and security service.

10.11.1. Construction stage

Potential impacts on public safety:

- conflicts between construction site and camp (If needed) security and safety personnel, workers and local residents (risk of injury);
- an increase in the intensity of traffic flows on roads used by the population means an increased risk of road accidents leading to accidents and, potentially, injuries or deaths.

Potential public health impacts:

- an increase in the number of disease vectors, such as rodents (if food/drinks are stored incorrectly and solid/liquid waste is not managed properly), with a concomitant increase in the incidence of vector-borne diseases;
- an increase in the number of cases of infectious diseases as a result of interaction between workers and the local population. With a potential peak population of 850 people (mainly men), there is a risk of infectious diseases spread (for example, tuberculosis and sexually transmitted diseases such as HIV, etc.);
- risk of water-borne diseases in case of inefficient waste management;
- increased pollution levels due to increased traffic and transportation of construction materials.

10.11.2. Operational stage

The risk of multi-mediated exposure due to aerogenic precipitation, contamination of drinking water, and food is predicted to a lesser extent.,

The health of the population is interconnected with the state of the environment. Ecologically determined classes of diseases are able to vividly indicate the impact of the environment on the health of the population. The most sensitive to the effects of environmental factors are the hematopoietic, cardiovascular, central nervous, genitourinary systems, as well as the respiratory organs.

According to baseline studies (see report 125-1105-ESIA-PE-Book 2), in the area of the planned activity, classes of diseases (diseases of the respiratory system, diseases of the blood and diseases of the hematopoietic organs) are more pronounced, largely associated, among other things, with environmental conditions, in particular, with the level of air pollution and the lifestyle of the population.

Accordingly, activities to organize health monitoring of the population of the Sharaf-Rashidov district are of priority importance for the project. The main tasks of monitoring are

monitoring of health impact factors (atmospheric air quality), assessment of the predicted state of health and planning of measures aimed at improving the health of the population.

10.11.3. Recommendations

10.11.3.1 Measures to prevent and mitigate impacts

As a result of consideration of the impacts related to the health, safety and well-being of the population, as well as the consequences of these impacts, it is recommended to implement the following measures.

- Construction stage:
  - carrying out work in accordance with safety standards and regulations and national regulations;
  - The contractor, as part of the implementation of the environmental and social management plan, will prepare and implement a public health and safety management plan;
  - set out in the Code of Conduct the rules, ethical obligations, clear and accessible disciplinary procedures related to the activities of the security service;
  - mandatory requirement for security service employees to undergo regular professional training (indicating the type and frequency of training, as well as the proportion of employees who have completed the training);
  - policy governing the "use of force" and clear provisions regarding proportionality to risk. When ensuring security, the use of force by security personnel is permitted only for preventive and defensive purposes and must be proportionate to the nature and scale of the risks;
  - GRM implementation;
  - consultation and review of measures to mitigate impacts on public health and safety;
  - Construction road warning signs will be placed at road crossings and other locations specified by the traffic management plan, such as along access roads before they are used by construction vehicles;
  - in areas where schools are located in close proximity to the road, explanatory work on safety issues will be carried out;
  - the movement of vehicles will be limited to certain access roads and designated working areas (except in emergency cases);
  - development and implementation of programs to train and inform employees about the risks and prevention measures associated with sexually transmitted diseases, including HIV and other infectious diseases (eg. tuberculosis). Information on diseases and preventive measures will be provided to communities living near the construction camp (If needed).
- Operational stage:
  - monitoring the health of the population of the Sharaf-Rashidov district, joint work of “Cenergo” LLC and the sanitary and epidemiological welfare and public health service of the Sharaf-Rashidov district,
  - measures provided for by decisions on the protection of atmospheric air from chemical and acoustic influences (see Sections 9.1, 9.3).

10.11.3.2 Monitoring and reporting

Activities may include:

- monitoring of factors harmful to humans and their assessment;
- identification of urgent and long-term measures to prevent and eliminate the impact of harmful factors on population health;
- development of proposals for decision-making in the area of ensuring the sanitary and epidemiological well-being of the population;
- informing government bodies, local government bodies, organizations and the population about the results obtained during monitoring.

Reporting suggestions:

- accounting for complaints and suggestions from the population with monthly reporting on resolving issues;
- monthly reports on the implementation of the Public Health and Safety Plan.
- reports on monitoring the health of the population of the Sharaf-Rashidov district.

10.11.4. Assessment results

It has been established that the significance of the impacts of the planned activity on the health, safety and well-being of the population is assessed as negligible at the construction stage and low at the operation stage.

Table 10.22: Measures to prevent and mitigate impacts related to the health, safety and well-being of the population

Item	Activity/ process	Task	Measures	Applicable requirements	Monitoring	Method of implementation/reporting
I.	Construction stage					
1.	Construction works (earthworks, general construction works)	Ensuring the population's safety, health and well-being	- The contractor, as part of the implementation of the environmental and social management plan, will prepare and implement a public health and safety management plan - GRM implementation - consultation and review of measures to mitigate impacts on public health and safety - construction road warning signs will be placed at road crossings and other locations specified by the project, such as along access roads before they are used by construction vehicles - in areas where schools and markets are located in close proximity to the road, explanatory work on safety issues will be carried out - the movement of vehicles will be limited to certain access roads and designated working areas (except in emergency cases) - development and implementation of programs to train and inform employees about the risks and prevention measures associated with sexually transmitted diseases, including HIV and other infectious diseases (eg. tuberculosis). Information on diseases and preventive measures will be provided to communities living near the construction camp (If needed) - set out in the Code of Conduct the rules, ethical obligations, clear and accessible disciplinary procedures related to the activities of the security service - mandatory requirement for security service employees to undergo regular professional training (indicating the type and frequency of training, as well as the proportion of employees who have completed the training); - policy governing the "use of force" and clear provisions regarding proportionality to risk. When ensuring security, the use of force by security	- IFC PS-1 - IFC PS-4 - National requirements Law “On the protection of citizens’ health” dated on 29/08/1996	- Accounting for complaints and suggestions from the population with monthly reporting on resolving issues - monthly reports on the implementation of the Public Health and Safety Plan.	- GRM for the public - fulfillment of the requirements of national legislation on the public health protection - Contractor Code of Conduct - Public Health and Safety Plan

			personnel is permitted only for preventive and defensive purposes and must be proportionate to the nature and scale of the risks			
II.	Operational stage					
2.	Main production activity (electricity production) Provision of the main activity – repair work, water supply, sanitation, water supply, cleaning of the territory and industrial premises Transport and logistics (delivery of raw materials, petroleum, oil and lubricants, other transportation, storage of hazardous materials);	Ensuring the population safety, health and well-being	- measures provided for by decisions on the protection of atmospheric air from chemical and acoustic influences (see Sections 9.1, 9.3)	- IFC PS-1 - IFC PS-4 National requirements: - Law "On the protection of citizens' health" dated 29/08/1996	Monitoring of factors harmful to humans and their assessment - identification of urgent and long-term measures to prevent and eliminate the impact of harmful factors on population health - development of proposals for decision-making in the area of ensuring the sanitary and epidemiological well-being of the population - informing government bodies, local government bodies, organizations and the population about the results obtained during monitoring	- GRM for the population - reporting on monitoring results - Public Health and Safety Plan

Table 10.23: Population Health, Safety and Welfare Impact Assessment Results Matrix.

Life cycle stage: construction

Recipient: population

Recipient sensitivity: high

Characteristics of impacts

Impact	Impacts on public health, safety and welfare		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Irreversible	Small	Moderate
Consequences	Deterioration of public health, injuries, and fatalities				

Activities	• The contractor, as part of the implementation of the environmental and social management plan, will prepare and implement a public health and safety management plan • GRM implementation • consultation and review of measures to mitigate impacts on public health and safety • construction road warning signs will be placed at road crossings and other locations specified by the project, such as along access roads before they are used by construction vehicles • in areas where schools and markets are located in close proximity to the road, explanatory work on safety issues will be carried out • the movement of vehicles will be limited to certain access roads and designated working areas (except in emergency cases) • development and implementation of programs to train and inform employees about the risks and prevention measures associated with sexually transmitted diseases, including HIV and other infectious diseases (eg. tuberculosis). Information on diseases and preventive measures will be provided to communities living near the construction camp (If needed) • - set out in the Code of Conduct the rules, ethical obligations, clear and accessible disciplinary procedures related to the activities of the security service • - mandatory requirement for security service employees to undergo regular professional training (indicating the type and frequency of training, as well as the proportion of employees who have completed the training) • - policy governing the "use of force" and clear provisions regarding proportionality to risk. When ensuring security, the use of force by security personnel is permitted only for preventive and defensive purposes and must be proportionate to the nature and scale of the risks				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Irreversible	Minor	Negligible

Life cycle stage: operation

Recipient: population

Recipient sensitivity: high

Characteristics of impacts

Impact	Inhalation and acoustic effects on various population groups.		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	–
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Irreversible	Small	Moderate
Consequences	Deterioration of public health, injuries, fatalities				

Activities	• measures provided for by decisions on the protection of atmospheric air from chemical and acoustic influences (see Sections 9.1, 9.3)				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Irreversible	Minor	Low

10.12 Cumulative impacts

10.12.1. Determining the scope of work, stage 1

10.12.1.1 Detection of CESC[24]

CESC – recipients and factors (elements) of the social environment, the consideration of which is advisable as part of the CIA.

In line with the Good Practice Guidance on Assessing and Managing Cumulative Impacts: A Guide for the Private Sector in Emerging Markets (IFC, 2013), the CIA includes impacts that are considered important based on scientific concepts and/or the concerns of affected communities.

The CIA does not consider potential impacts that may occur without the project and/or independently of the project.

Identification of the CESC is carried out taking into account:

- the results of consultations with stakeholders (see Section 5 125-1105-ESIA-PE-Book1);
- results of the forecast of impacts on the social environment (see Section 10).

As noted above, if the impact is assessed as
“negligible” or “low”, then the corresponding recipient is not classified as a CESC.

The main recipients include components of the social environment, such as personnel, population, infrastructure, as well as socio-economic factors (living conditions of the population, including employment, demographic shifts, social infrastructure, ethnic characteristics, etc.).

As a result of using the specified approach within the framework of the CIA, the following CESC components of the social environment were considered:

- labor market;
- transport infrastructure;
- social infrastructure.

10.12.1.2 Justification of spatial frameworks

Section 8 presents the characteristics of the zone of influence on the social environment. An analysis of the localization of elements that form the zone of influence shows that its boundaries are determined by:

- industrial site of a combined-cycle power plant;
- Contractor’s construction camp (If needed);
- municipal territories – makhallas adjacent to the industrial site, within the boundaries of the SPZ;
- zone of indirect influence of the project (includes Jizzakh city as a whole, Sharaf-Rashidov district of Jizzakh region).

[24] This section examines the CESCs related to the surrounding social environment.

10.12.1.3 Justification of time frames

The time frame for the assessment is adopted in accordance with the approach discussed above in Section 9.12.1.

10.12.2. Determining the scope of work, stage 2

CIA of the social environment is carried out for the construction and operation stages of the project.

It is stated above that the implementation of the project, in particular the creation of jobs, has a significant positive impact on the labor market at the level of Jizzakh city and Sharaf-Rashidov district.

It is expected that during the construction stage, some of the construction workers will be hired from among the residents of the Sharaf-Rashidov district and Jizzakh city, which will ensure short-term positive changes in the labor market.

At the operational stage, the creation of jobs at the power plant will create new jobs in the service sector (for example, in the catering industry or retail outlets). Considering that one job in production creates, on average, 3 workplaces in the service sector, additional employment of about 210 people is predicted.

It was also established that the significance of the negative impacts of the planned activity at the operational stage in connection with the influx of labor into the social infrastructure is assessed as moderate.

The influx of labor in connection with the implementation of the project will lead to a slight increase in the load on social infrastructure facilities such as hospitals and other medical institutions, schools, leisure and recreation facilities, housing, public transport and others.

Project aspects such as the transportation of large equipment and cargo, as well as during the construction phase, will impact the transport infrastructure, in particular the road surface (wear/degradation) and traffic volume (traffic jams, traffic delays). The significance of the impact of the planned activity on access to transport infrastructure is assessed as moderate, both at the construction and operational stages.

During peak periods of construction and commissioning of the facility in 2026-2027, traffic intensity is projected to increase by approximately 30% of the current level.

No significant impact on access to transport infrastructure is expected during the operational phase.

10.12.3. Determination of the background state of the CESC

Labor force and employment, access to public and social services, and transport infrastructure are discussed in Section 7 of Report 125-1105-ESIA-PE-Book 2 and in Sections 10.1, 10.5 and 10.7 of this report.

10.12.4. Results of the cumulative impact assessment

The characteristics of cumulative impacts on the components of the social environment are given in Table 10.24.

It was found that the cumulative impact of the planned activity on the labour market at both stages is assessed as moderate. Residual impacts are also assessed as moderate, which is associated with changes in the way of life and quality of life of communities on a long-term basis, and a decrease in unemployment.

The environmental and social policy of the project creates the basis for the implementation of subsequent plans of the enterprise for the priority employment of the working population of Jizzakh city and the Sharaf-Rashidov district. It is expected that all combined cycle power plant development projects will be implemented taking into account mitigation measures.

The cumulative impact on transport infrastructure is associated with an increase in traffic intensity and the volume of freight transport. Residual impacts on transport infrastructure are assessed as moderate. Mitigation of the consequences associated with the impact on traffic and road infrastructure is ensured by the preparation and implementation of a Traffic Management Plan (TMP), ensuring the smooth and safe movement of traffic along alternative routes.

The impact on social infrastructure is assessed as moderate, the residual impact as low.

In order to prevent negative consequences of cumulative impacts on the social infrastructure of the district, within the framework of the implementation of social and environmental policy, it is recommended to provide for:

- participation of the project in the shared development of infrastructure of the Sharaf-Rashidov district;
- development and implementation of social assistance programs for vulnerable groups of the population.

Table 10.24: Matrix of results of the assessment of cumulative impacts on the social environment

Life cycle stage: construction

Recipient: able-bodied population

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impact on the labor market		**Orientation**	**Genesis**	**Mechanism**
			Positive	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Medium	Moderate
Consequences	None				
Measures	• To develop and implement Human Resources and Human Rights Policies hat will further extend to the enterprise and ensure compliance with the requirements of the IFC and ILO PS-2 • Development, implementation and introduction of social and environmental policies of the enterprise				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Medium	Moderate

Life cycle stage: construction

Recipient: transport infrastructure

Recipient sensitivity: high

Characteristics of impacts

Impact	Impacts on access to infrastructure		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Medium	Moderate
Consequences	• Impacts on road infrastructure and traffic				

Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Ensuring unhindered and safe movement of traffic through detours or temporary access roads (if necessary) • Proper road signs, lighting, well thought out road safety signs, barriers and flaggers to control traffic				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Short-term	Reversible	Small	Moderate

Life cycle stage: operation

Recipient: able-bodied population

Recipient sensitivity: medium

Characteristics of impacts

Impact	Impact on the labor market		**Orientation**	**Genesis**	**Mechanism**
			Positive	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate
Consequences	None				
Measures	• To develop and implement Human Resources and Human Rights Policies will further extend to the enterprise and ensure compliance with the requirements of the IFC and ILO PS-2 • Development, implementation and introduction of social and environmental policies of the enterprise				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate

Life cycle stage: operation

Recipient: population

Recipient sensitivity: medium

Characteristics of impacts

Impact	Access to social infrastructure		**Orientation**	**Genesis**	**Mechanism**
			Negative	Indirect	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	Moderate
Consequences	The increase in the burden on social infrastructure facilities				

Activities	• Participation of the enterprise in shared development of infrastructure of the Sharaf-Rashidov district • Development and implementation of social assistance programs for vulnerable groups				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Low

Life cycle stage: operation

Recipient: transport infrastructure

Recipient sensitivity: high

Characteristics of impacts

Impact	Impacts on access to infrastructure		**Orientation**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Medium	High
Consequences	• Impacts on road infrastructure and traffic				
Measures	• Preparation and implementation of the Traffic Management Plan (TMP) • Preparation and implementation of optimal logistics schemes				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Magnitude**	**Significance**
	Local	Long-term	Reversible	Small	Moderate

11. ECOSYSTEM SERVICES

11.1. Introduction

IFC Performance Standard 6 defines ecosystem services as *"the benefits to people and businesses derived from the use of ecosystems,"* which is consistent with the definition in the Millennium Ecosystem Assessment 2001 [25](ME) Work Program.

In 2012, The IFC has adopted revised performance standards for environmental and social sustainability, which include references to ecosystem services mentioned in other performance standards in addition to the requirements outlined in PS-6 (Table 11.1). More recently, the European Commission has put forward a proposal to amend the European EIA Directive, in particular to include a study of ecosystem services.

Since there is no single classification of ecosystem services, the framework outlined in the EA is widely accepted and, as stated in the recommendation note for IFC PS-6 (paragraph 2), is a good starting point for research.

According to the EA, ecosystem services are divided into four types:

- **provisional services** - the products that people receive from ecosystems. These include, among others, (i) crops, livestock and game animals, seafood, wild plant and animal foods, and plants studied by ethnobotany; (ii) drinking water, water used for irrigation and industry; (iii) plant communities that are the source for biopharmaceuticals, construction material and biomass used as renewable energy sources. The products can come from sustainably managed ecosystems, such as agriculture, aquaculture, plantation forestry, natural or semi-natural ecosystems, such as fishing, wild plant collection, and wildlife hunting; genetic resources (genes and genetic information used to breed plants and animals, biotechnology),
- **regulating services** - the benefits derived from regulating ecosystem processes. Among other things, these include regulating climate processes (ecosystems affect climate both locally and globally) and the carbon cycle locally; reducing the negative effects of natural disasters; purifying water and air; controlling the spread of pests and pathogens; pollination, and others,
- **cultural services** - the cultural, educational, and spiritual benefits people receive from ecosystems. These include, among other things, cultural, spiritual and religious development through cultural-historical, spiritual and religious sites; recreational opportunities such as sports, hunting, fishing, ecotourism; scientific research, education, and
- **supporting services** - natural processes necessary to maintain other ecosystem services, such as soil formation, water and nutrient cycling, and primary production.

Supporting services are different from providing, regulating, and cultural services; unlike all of these types of services, which provide a direct benefit. Supporting services affect human conditions indirectly, and usually over a long period of time; soil formation, for example, can take place over tens or even hundreds of years. All other ecosystem services - providing, regulating, and cultural - depend on supporting ones.

Supporting services are associated with specific biophysical structures or ecosystem processes, so, for example, soil, trees, and other plants are involved in maintaining water balance. They also underlie the provision of services of direct value to people, such as

[25] https://www.millenniumassessment.org/ru/Index-2.html

reducing surface water runoff, air filtration, water quality, timber supply, wild plant and animal foods. These ecosystem services benefit the people who need them.

IFC PS-6 acknowledges that sustainable development cannot be achieved if biodiversity or ecosystem services are lost or degraded due to development activities and, therefore, requires that "if the risk and impact identification process identifies the potential for adverse impacts of the Project on ecosystem services, the client must identify ecosystem services of primary importance." Since ecosystem services, by their nature, are cross-sectoral, they apply to several IFC performance standards, see Table 11.11.

The benefits of ecosystems are manifested on many levels, and users can also be very different. At the local level, ecosystem services are often the basis for living and subsistence in rural areas, especially for the poor. For example, the collection of plants for folk medicine can replace more expensive pharmaceuticals produced industrially.

Benefits can also occur at the regional level, such as protecting residential areas and businesses from flooding and soil erosion due to tree plantations, or at the national level, such as places that are part of a country's cultural heritage.

Globally, ecosystems regulate the climate and maintain the biodiversity that underlies the creation of biological production. Businesses and projects can also benefit from ecosystem services through direct use of resources (e.g., water) or protection from natural disasters (e.g., floods).

Identifying and defending such services can have additional benefits, namely helping to avoid penalties and negative media coverage, enhancing the company's reputation, and in some cases allowing the use of effective alternatives to more expensive technical solutions.

IFC PS-6 acknowledges that sustainable development cannot be achieved if biodiversity or ecosystem services are lost or degraded due to proposed activities. The client should identify ecosystem services of primary importance and conduct an appropriate assessment.

Ecosystem services are addressed by several IFC performance standards (Table 11.1).

Table 11.1: Ecosystem services in the IFC Performance Standards 2012.

Activity standards	**Requirements**
PS-1: Assessment and Management of Environmental and Social Risks and Impacts	Where the Project involves specifically involved physical elements, aspects, and facilities that may have adverse impacts, environmental and social risks and impacts are identified in the context of the Project's sphere of influence. This sphere of influence includes, respectively, ...the Project's indirect impacts on biodiversity or ecosystem services that are essential to the existence of the impacted community

Activity standards	Requirements
PS-4: Public Health and Safety	The Project's direct impact on ecosystem services of high importance may have negative consequences for the health and safety of affected communities. Within this Performance Standard, only ecosystem support and regulating services, as defined in paragraph 2 of Performance Standard 6, are considered...where possible and appropriate, the client should identify risks and potential impacts on ecosystem services of high value that may be impaired by climate change. Adverse impacts must be avoided, and if this is not possible, the client must take steps to mitigate such impacts in accordance with paragraphs 24 and 25 of Performance Standard 6. With respect to the use and loss of access to ecosystem services that provide ecosystem services, the client must take mitigation measures in accordance with paragraphs 25-29 of Performance Standard 5
PS-5: Land Acquisition and Involuntary Resettlement	This activity standard applies to the physical displacement and/or economic displacement of populations resulting from the following land use activities:...limiting access to land or use of other resources, including public property and natural resources such as marine and other water resources, timber and non-timber forest resources, fresh water, medicinal plants, hunting grounds, watersheds, grazing and croplands (natural resource assets referred to in the Activity Standard 6)
PS-6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	If the risk and impact identification process indicates the potential for adverse impacts from the Project on ecosystem services, the client should conduct a systematic review to identify ecosystem services of primary importance...and relevance to affected communities, and in areas where the client has direct management control or significant influence over such ecosystem services. If such impacts are inevitable, the client must minimize them and take mitigation measures to maintain the value and function of the services of primary importance. With respect to impacts on critical ecosystem services on which the Project depends, the client should minimize impacts on them and implement resource efficiency measures in its operations, as outlined in Performance Standard 3. Additional provisions related to ecosystem services are included in Performance Standards 4, 5, 7, and 8
PS-8: Cultural Heritage	If a client discovers tangible cultural heritage items of no particular value, mitigation measures must be applied to avoid exposure to them. If impacts on cultural heritage sites cannot be avoided, the client should apply mitigation measures as follows: minimize adverse impacts and implement on-site restoration measures that ensure that the value and functionality of cultural heritage sites are maintained, including measures to maintain and restore ecosystem processes that require it (as required by Performance Standard 6 relating to ecosystem services and the conservation of biodiversity)

This chapter provides an assessment of the potential impacts of project activities on ecosystem services during the construction and operation phases. In addition, measures are indicated to prevent negative impacts on ecosystem services of high importance, and in cases where it is impossible to prevent the impact - to minimize it, and if there are residual impacts - to compensate/neutralize such impacts and the risks associated with it.

The purpose of this material is:

- to assess the impact of proposed activities on ecosystem services in order to manage risks and take advantage of project implementation;
- For unavoidable impacts – to develop appropriate mitigation measures that will maintain the value and functionality of priority ecosystem services.

This section summarises research findings to consider them at the ecosystem level and to assess how impacts on one aspect of the environment may affect other aspects.

a. Assessment Methodology

The ecosystem services assessment methodology used in this chapter is based on the Ecosystem Services Identification, Valuation and Integration (ESIVI) approach. The ESIVI approach is designed to provide an accurate and transparent framework for evaluating ecosystem services, as required by the IFC Performance Standards.

The ESIVI method was developed on a conceptual framework that directly links ecosystem services and human well-being, and on a conceptual framework created by the World Resources Institute (WRI) for analyzing ecosystem services for impact assessment purposes.

In the WRI concept, the project is the center of the relationship between human well-being, ecosystem services, ecosystems, and ecosystem change factors. The concept recognizes that the project can affect all components of the concept and is itself influenced by them. It describes two ways in which the Project connects with ecosystem services in terms of:

- potential impacts on existing relationships between human well-being, ecosystem services, and ecosystems;
- the Project's influence on these relationships to achieve positive results.

The ESIVI method is based on the results obtained in the course of strategy development and implementation of projects aimed at assessing ecosystem services over the past decade, as well as on a number of guidelines summarizing good global practices in this area of activity, including:

- Millennium Ecosystem Assessment (2005) Ecosystems and Human Well-Being: A Biodiversity Synthesis.
- IFC Performance Standards 1, 4, 5, 6, 7 and 8 and related guidelines.
- Landsberg et al. (2013), "Integrating ecosystem services into impact assessment: a step-by-step method.

The ecosystem services assessment procedure involves four steps:

- **work scope definition** - defining the services provided by ecosystems that the Project may affect or depend on;
- **determination of baseline condition** - assessment of ecosystem services for ecosystems that will be affected by the Project (determining the level of ecosystem services in case the Project would not have been implemented), identification of users of ecosystem services and the benefits they can receive from the services provided;
- **impact assessment** - determining the potential impacts of the Project on ecosystem services and their users, the significance of these impacts, and identifying the most significant ecosystem services;

- **assessment of mitigation and residual impacts** - defining a list of measures that can be taken to predict and prevent adverse impacts on the most significant ecosystem services and, in cases where it is impossible to prevent the impact, measures to minimize it, as well as determining the residual impacts after the application of mitigating measures.
- The evaluation procedure and the key sources of information for each step are presented in table below .

Table 11.2: Ecosystem services assessment procedure [26]

Stage	Steps	Information source
Defining of scope of work	- Defining the ecosystem of services that may be affected by the project and (or) the project may depend on them - Defining the potentially affected beneficiaries - Defining the scope of those services that would be, most likely, considerably affected	- Sections of ESIA - Review of literature - Cartography and image obtaining - Site visit
Baseline studies	- Elaboration of measures to define the scope of services - Identification of key trends and potentially adverse impacts - Identification of beneficiaries from using the services and assessment of sensitivity to changes	- Sections of ESIA - Consulting with concerned parties - Review of literature - Site visit
Impact assessment	- Assessment of nature and significance of impact on the ecosystem services and consequences for the beneficiaries - Identification of priority services	- Sections of ESIA - Consulting with concerned parties - Interaction with technical specialists responsible for the ESIA development
Mitigation of adverse impact	- Defining the measures focused on the prevention of adverse consequences or, at least, maintaining the significance and functionality of prioritized services in cases when it is not feasible to prevent the impact	- Sections of ESIA/Review of literature - Consulting with concerned parties - Interaction with technical specialists responsible for the ESIA development

b. Defining the Scope of Work

The purpose of the scoping stage is to identify the ecosystem services that the proposed activity may affect or be affected by the Project.

Due to the diversity and connectivity of ecosystems and the uncertainty of how each process in an ecosystem will respond to change, it is a challenge to identify and assess the likely impacts of a project on specific ecosystem services. Furthermore, the wide range of people potentially benefiting from ecosystem services and the diversity

[26] https://digitallibrary.un.org/record/761976/files/TEEB_D2_Druckvar_end_RUSSIAN.pdf

of those benefits, make assessing the project's impact on ecosystem services and the Project's dependence on ecosystem services very challenging.

In this regard, assessing the impact on each ecosystem service, its dependencies, and the economic effect of such interactions are beyond the scope of project's ESIA. Effective ESIA emphasizes the assessment of services that have the greatest significance; their more detailed assessment is carried out, if necessary, in additional reports.

For instance, it would not be feasible to perform a full socio-economic assessment of each ecosystem service as part of an ESIA, while the assessment of individual services is an important component of livelihood restoration plans that depend on ecosystem services such as fisheries and farming.

Ecosystem Services Identification, Valuation and Integration (ESIVI) method, includes an ecosystem services checklist using guidelines, baseline data lists.

The ESIVI assessment compiled a list of ecosystem services that can be used to systematically define services (Table 11.3).

Table 11.3 List of ecosystem services in the proposed activity area

Ecosystem Services	**Types of services**
Supporting services	Provision of water resources (Local and magistral canals, Jizzakh Reservoir) Diversity of biological species of the Jizzakh Reservoir
Regulatory services	Regulation of local climatic processes (emissions of pollutants and carbon dioxide from the) Regulation of atmospheric air quality (emissions of pollutants from CCGT Power Plant) Water quality regulation (water quality control before discharge into the local ditch
Cultural services	Cultural values (architectural and cultural heritage) Scientific and educational values (new CCGT Power Plant technologies, training)

Following the list, the potential range of ecosystem services provided by the ecosystems affected by the Project, and the potential users (direct and indirect) of each service, can be identified.

As indicated in SD-1, the initial stage of identification focuses on the broadest possible scope of service users, including:

- Local users - for example, people who benefit from agricultural activities on the homestead plot near where they live;
- Regional users - e.g. people living near the canals that have a connection to the Jizzakh Reservoir who benefit from the use of water for irrigation purpose (farmers)
- National users - e.g. tourists from Uzbekistan visiting the area for cultural/recreational purposes (Jizzakh Reservoir, [27]cultural heritage of the region);
- global users - e.g., individuals around the world benefiting from greenhouse gas emission reductions.

[27] Need a special permission to use the camera.

Users of ecosystem services are residents, landowners, and businesses that directly or indirectly benefit from or depend on services provided by Project-impacted ecosystems.

Table 11.4: Users of ecosystem services

Location of users	**Definition**
Local users	Jizzakh town and Sharaf-Rashidov District
Regional users	The wider Tashkent region (e.g., irrigation from Jizzakh Reservoir)
National users	Republic of Uzbekistan
Global users	Other countries

At this point it is important to determine the type of user, as different types of users are evaluated differently with respect to mitigation requirements.

This assessment includes all clear-cut types of users, since the operation of the CCGT Power Plant will have some impact on air quality and climate by the emission of pollutants and greenhouse gases.

Wastewater discharges of CCGT Power Plant into the local ditch, covers two types of users (local and regional), because local ditch then connects to the magistral ditch. Identifying users at this stage identifies specific groups or individuals who currently benefit from each particular ecosystem service.

Once the highest possible range of ecosystem services and their users has been identified, each service is systematically analyzed and evaluated according to the criteria specified in the criteria to Table 8.4.2 determine which ecosystem services will be subjected to a more detailed impact assessment and which will not.

The initial step in determining the scope of work establishes the ecosystem services that may be impacted by the project, determines their relevance and how likely those impacts are to occur.

Subsequently, a list of ecosystem services that were studied as part of the baseline information collection was prepared and assessment sections were developed.

Since this task involves determining the scope of work, the potential impact estimates included in Table 8.3.4, should not be regarded as a final determination of the level of impact; rather, they serve as an indicator that there is a possibility of impact on the service, as well as an indicator of the possible level of service.

The potential relevance of ecosystem services to the CCGT Power Plant project is given in Table 8.3.3.

The task of determining the scope of work is performed by analyzing the information and data collected for other sections of the ESIA, including site visits and consultations with stakeholders. A review of published literature was also conducted to bolster existing data and to obtain more detailed baseline data if necessary.

The scope of work resulted in the identification of 9 ecosystem services, which were subjected to a more detailed assessment. They include:

- provision of water resources ;
- regulation of atmospheric air quality;

- regulation of water quality;
- diversity of biological species:
- regulation of local climatic processes;
- regulation of global climatic processes;
- cultural values (archaeological and cultural heritage)
- scientific and educational values.

Table 11.5: Relevance of ecosystem services

Relevance of ecosystem services	**Characteristic**	**Assessment**
Negligible	The service does not exist or is unlikely to be affected No additional assessment required	0
Minor	Project may have an insignificant impact on the service / may be insignificantly affected by the service No additional assessment required	1-4
Moderate	The project may have a significant impact on users of the service or may depend on the service Further assessment required	5-8
Strong	The project may have a significant impact on users of the service or may depend on the service Further assessment required	9–10
Benefit	The project can have a favorable impact on service delivery No additional assessment required	>10

A brief overview of the rationale for including or excluding each ecosystem service is provided in the table (Table 11.6).

Table 11.6: Defining the scope of work: a rationale for the consideration of ecosystem services

Ecosystem Services	Relevance	Included in Impact Assessment	Justification
Supply of water	Moderate	Yes	At the stage of determining the scope of work, it was established that in the area of work there are resources of surface and groundwater, which are used for industrial purposes, irrigation. The availability of water resources affects the welfare of potential users
Regulation of local climatic processes	Minor	No	Because of the small size of the work area compared to the surrounding ecosystems, the likelihood that the area affected by the Project will play a significant role in the management of local climatic processes, i.e. the regulation of precipitation, cooling, shading, etc. is low
Regulation of global climatic processes	Negligible	No	The impact of the CCGT Power Plant project compared to global greenhouse gas emissions and the effects of those emissions on the well-being of populations affected by climate change is considered insignificant
Regulation of atmospheric air quality	Moderate	Yes	Air quality regulation is an important service to the town's residents. During the scoping phase, it was determined that the project could have an impact on air quality regulation due to emissions from construction activities and equipment, during the construction phase, and during the operation of the CCGT Power Plant
Regulation of water quality	Moderate	Yes	Water quality is important for domestic and industrial needs of CCGT Power Plant, the population, as well as the overall functioning of ecosystems. The project may impact surface and groundwater resources due to spills, leaks, wastewater disposal, etc. during the construction phase. Wastewater discharge will not have a significant impact on the quality of water of the Magistral Canal (Conditionally clean effluents will be discharged from cooling tower purging, equipment cooling after the constant monitoring and control).
Science and education values	Benefit	No	For the construction of the CCGT Power Plant, scientific and technical studies were carried out to select the optimal technology for the electricity production. The company will conduct training, professional development of personnel
Cultural values (archaeological and cultural heritage)	Minor	No	During the construction of the associated facilities installed support in the protective zone of the monument of architectural heritage.
Diversity of biological species	Minor	No	The CCGT Power Plant should not have a significant impact on the flora and fauna of the planned activity area, because the main risks are controlled by measures to protect the air and other components of the environment, provided in accordance with national legislation and the IFC PS (see Sections 9.1, 9.4)

c. Baseline Conditions

i. Methodology and Data

A baseline analysis is an examination of the current state of the ecosystem and the services it provides in the absence of the Project, taking into account external factors (unrelated to the Project) that may affect future service provision, including, for example, climate change, population growth and land use change. Ultimately, the background information is the baseline against which the nature of the Project's impact can be determined.

The data used for the baseline assessment came from a variety of sources, including published and stock data and data from surveys, field surveys, and stakeholder engagement activities.

ii. Baseline Survey

Additional research has been conducted to confirm and verify data from published and foundational sources and to address gaps.

Initial data on ecosystem services were obtained during the 2022 survey of the project footprint areas. Surveys of CCGT Power Plant impact areas included meetings with stakeholders, observation of conditions, meetings and negotiations with local authorities, representatives of local businesses, including local land users.

Table 11.7 summarizes the background of key ecosystem services and their importance to users.

Table 11.7 Brief summary of the baseline state of ecosystem services

Service	Characteristic	Relevance	Possible drivers of change	Key users
Supply of water	Ground and surface water use	Moderate	Changes in the production program increase in water consumption by the population	Water consumers
Regulation of atmospheric air quality	Emission quality is regulated by dust and gas treatment plants	Moderate	Industrial emissions, emission control	Population
Regulation of water quality	Water quality is regulated by effluent treatment systems	Moderate	Eutrophication, climate change, legislation, control of pollutants	Water consumers

iii. Ecosystem Services Impact Assessment

The assessment of impacts on ecosystem services is based on the methodological approach outlined in Section 3 of the Volume 1 of the ESIA.

Table 11.8 provides an overview of the project's potential impacts on ecosystem services during the construction and operation phases.

Table 11.8 Ecosystem services impact assessment

Stage of the life cycle: construction

Recipient: Jizzakh Reservoir

Recipient sensitivity: medium

Impact		Focus	Genesis	Mechanism

	Provision of water resources (water supply)		Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High
Consequences	Indirect impacts on the population, economic entities				
Events	• Increasing the use of wastewater and drainage water at the plant to 90% of the total volume of fresh and reused water used for production needs				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High

Stage of the life cycle: construction

Recipient: local communities

Recipient sensitivity: high

Exposure characteristics

Impact	**Regulation of air quality**		**Focus**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Local	Short-term	Reversible	Average	High
Consequences	Disturbance of living conditions of the population (impact on respiratory organs), indirect impacts on flora and fauna, soils				
Events	• Planning solutions (removal of the construction site from residential areas) • organization of construction in strict accordance with the planning, technological and technical solutions of the project • carrying out the work in accordance with good practice, compliance with the rules of the work, engaging qualified personnel to carry out the work • control of technical condition of engines and exhaust systems of cars, bulldozers, excavators, cranes to exclude operation of equipment with increased emission of pollutants • excluding the operation of vehicle engines and construction equipment at times when work is not in progress implementation of measures for technical modernization of existing sources of emissions of pollutants into the atmosphere				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Local	Short-term	Reversible	Small	Moderate

Life cycle stage: Operation

Recipient: local communities

Recipient sensitivity: high

Exposure characteristics

Impact	**Regulation of air quality**		**Focus**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High
Consequences	Disturbance of living conditions of the population (impact on respiratory organs), indirect impacts on flora and fauna, soils				
Events	• organisation of a sanitary protection zone, planting of trees. • organisation of the production process using the latest combined cycle gas plant.				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High

Life cycle stage: Operation

Recipient: ditch where treated water is discharged

Recipient sensitivity: medium

Exposure characteristics

Impact	Regulation of water quality		**Focus**	**Genesis**	**Mechanism**
			Negative	Direct	Cumulative
Primary impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High
Consequences	Indirect impacts on public health, business entities				
Events	• prevention of uncontrolled flow of wastewater into the ditch				
Residual impact	**Scale**	**Duration**	**Reversibility**	**Value**	**Significance**
	Region	Long-term	Reversible	High	High

Measures to prevent and/or mitigate adverse impacts on ecosystem services during the construction and operation phases of the CCGT Power Plant are provided by the solutions justified in Sections 9.1, 9.4, and 9.5.

d. Conclusions

A total of eight different ecosystem services were considered in the assessment procedure in this chapter.

According to the level of relevance (Table 8.3.3), ecosystem services are characterized as follows:

- moderate relevance: regulation of water quality; provision of water resources, regulation of atmospheric air quality;
- low relevance: regulation of local climate processes; regulation of global climate processes; species diversity; and
- minor relevance: scientific, educational values and cultural values.

The most relevant ones included in the ecosystem services assessment procedure are the following: provision of water resources, regulation of atmospheric air quality; regulation of water quality; the results of the ecosystem services impact assessment are presented in (Table 8.4.2).

- drilled well- water supply for household and drinking needs.

The level of impact from project activities during the construction and pre-start-up phase on air quality regulation before mitigation is medium; after mitigation is low. At the same time, the impact during the operational phase is evaluated as high.

There is no impact on water quality regulation during the construction phase (ditch that is close to the facility). The impact at the stage of operation is high for the ditch.

During the biodiversity baseline studies (August and September 2025), all details of the ecosystem services were elaborated and assessed by the biodiversity experts who are members of Hacettepe University in Türkiye.

Aquatic Ecosystem Findings

Hydrobiological surveys of the Jizzakh Reservoir and its irrigation canals show a generally healthy aquatic habitat with high species diversity. Researchers recorded ~162 algae, 36 zooplankton, 50 benthic macroinvertebrates, and 22 fish species, indicating a rich but typical freshwater community. Water quality at sampling sites appeared good, and importantly no endemic

or rare aquatic species were found – the algae, plankton, invertebrates, and fish present are all widespread cosmopolitan species with no special conservation status. Several invasive alien fish (eight species) have been identified, introduced historically via aquaculture. These include the Silver Carp (Hypophthalmichthys molitrix, globally Near Threatened) and the Prussian Carp (Carassius gibelio), as well as Mosquitofish, which now thrive in the reservoir–canal system. Such invasives can out-compete native fish and alter food webs, though no native fish of high conservation value occur in the area. Benthic fauna is similarly common; an invasive Asian clam (Corbicula fluminalis, listed Vulnerable in Uzbekistan) was noted, but no other rare aquatic invertebrates were observed. The presence of certain bloom-forming algae (e.g. Microcystis) and temperature-sensitive mollusks signals that any changes in water flow, nutrient levels, or temperature from the plant's cooling water system could affect water quality. In particular, warmer or nutrient-rich discharges could trigger algal blooms or stress aquatic life. Overall, baseline studies indicate a resilient aquatic ecosystem of mostly common species, which will require careful management of water use and discharges to avoid degradation.

Terrestrial Fauna Findings

Field studies of amphibians, reptiles, birds, and mammals around the project site documented a typical assemblage of species, mostly common to the region. Two amphibians – the Green Toad (Bufotes viridis) and Marsh Frog (Pelophylax ridibundus) – were observed (and an Oriental treefrog is likely present); all are categorized as Least Concern on the IUCN Red List. Among reptiles, a desert lizard (Ablepharus deserti) was found, and others are expected (e.g. Greek Tortoise, Testudo graeca). The Greek Tortoise is notable as it is Vulnerable (VU) and internationally protected, underscoring the area's sensitivity for reptiles. The bird community is diverse – over 40 species were recorded – predominantly waterfowl, waders, and farmland birds. Most are Least Concern, but the Northern Lapwing (Vanellus vanellus) stands out as Near Threatened (NT), indicating regional conservation concern. The reservoir and wetlands attract ducks, herons, grebes, and other waterbirds that are protected under international conventions, highlighting the ecological importance of these wetlands as feeding and stopover habitat. Mammals in the area include common species like the European Hare (Lepus europaeus) and Red Fox (Vulpes vulpes), observed during surveys. Additionally, evidence from literature and local records suggests small rodents (voles, gerbils), insectivores (e.g. Long-eared Hedgehog, Hemiechinus auritus), and carnivores like the Golden Jackal (Canis aureus) and Steppe Polecat (Mustela eversmanii) utilize the area. A few bat species are also present (e.g. Myotis, Pipistrellus, and the Greater Horseshoe Bat Rhinolophus ferrumequinum). Notably, several of these mammals – the hedgehog, ground squirrel (Spermophilus fulvus), polecat, and horseshoe bat – are listed as protected in Uzbekistan's Red Data Book, though they are not globally threatened. These fauna not only include species of conservation concern but also perform valuable ecosystem functions. For example, amphibians and bats naturally regulate insect populations, helping control agricultural pests, while predators like foxes and birds of prey keep rodent numbers in check. The presence of a balanced assemblage of herbivores, insectivores, and predators indicates an intact food web, contributing to pest control and overall ecosystem health.

Flora and Habitat Conditions

The flora survey found that the project area is largely a disturbed agro-ecosystem with few natural vegetation features. Approximately 80 plant species were recorded in the study area, the majority being common wild grasses and herbs, along with some cultivated crop species and ruderal weeds typical of farmland. No endemic, rare, or protected plant species were identified; in other words, none of the vegetation is listed on national or international Red Lists. This absence of sensitive flora reflects the high level of habitat modification – the site has experienced significant long-term human use (cultivation, grazing, infrastructure). Most of the land is actively farmed or recently developed, indicating a degree of habitat degradation and low naturalness. Only a small patch on the western edge of the reservoir retains characteristics of natural habitat (a semi-natural meadow used for livestock grazing), and importantly this particular patch lies outside the direct

project footprint. Overall, the vegetation in the project footprint is dominated by cosmopolitan species and agricultural land cover, with low ecological sensitivity and no protected plant communities. However, maintaining remaining green cover and preventing further unnecessary vegetation loss will be important to avoid erosion and to support any wildlife using these areas.

Ecosystem Services

The project area's ecosystems currently provide several valuable services to local communities and the environment. Key provisioning services include the supply of water for irrigation and livestock: the reservoir and connected canals are an important water source sustaining the productivity of surrounding farmlands. There is also potential for local fishery resources, although fishing is restricted at the reservoir. Regulating services are notably provided by the wetlands and species present. For example, marshes and reed-beds help filter water and regulate water quality, and vegetated soils around the site aid in controlling erosion and maintaining soil stability. Native fauna contribute to natural pest control – amphibians and bats feed on insects, helping to reduce agricultural pests and thereby supporting crop health without pesticides. These natural regulatory functions are crucial for local agriculture and quality of life. As supporting services, the mosaic of wet meadows, canals, and fields creates habitat for wildlife, serving as breeding, foraging, and migratory stopover areas for numerous species. In particular, the reservoir's wetlands support food and refuge for waterbirds and amphibians, underpinning the region's biodiversity. Lastly, the area holds cultural and recreational value. The presence of diverse waterbirds and a scenic wetland landscape offers opportunities for birdwatching, nature tourism, and education about local wildlife. While not formally a park, the natural elements contribute to the community's natural heritage and sense of place. In summary, these ecosystems provide provisioning (water), regulating (water purification, pest control), supporting (habitat), and cultural (recreation/nature appreciation) services, all of which are considered in project planning to ensure they are sustained or enhanced.

Mitigation and Monitoring Measures

Aquatic Biodiversity: The project includes targeted measures to mitigate impacts on aquatic ecosystems. Construction works in or near water will be timed to avoid the peak fish breeding season (approximately April–June), preventing disturbance to spawning periods. If in-stream work or pipeline crossings are necessary, the plan is to temporarily divert flow and work "in the dry", then restore the channel to its natural state to minimize turbidity and habitat loss. Existing macrophyte-rich bank areas (which serve as fish spawning and nursery habitat) will be left intact as much as possible; any disturbance to river or canal banks will be followed by rehabilitation with native vegetation to rapidly restore habitat and prevent erosion. In operation, the cooling water intake will be designed with a fish-friendly system – a wide, low-velocity intake and fine mesh screens – to significantly reduce entrainment or impingement of fish, plankton, and other aquatic organisms. Similarly, discharge structures will dissipate flow to avoid scouring habitats. Water quality safeguards (such as treatment of any process water if needed) will be in place to prevent pollution. These measures, alongside restrictions on harmful chemical use near waterways, aim to protect aquatic life and maintain the current good water quality.

Terrestrial Biodiversity: A suite of measures will protect fauna and habitats on land during construction and operation. The project footprint will be kept as compact as possible, with a buffer zone (≥100 m) around sensitive wetlands and reedbeds so that core habitat (e.g. wet meadows by the reservoir) is untouched. Critical habitats like the reservoir shore will thus remain available for wildlife. To prevent animal injuries or mortalities, the site will be secured: temporary fencing will deter fauna from entering active work areas, and any open trenches or pits will have sloped escape ramps so that small animals can climb out if they fall in. Wildlife rescue procedures are in place – for example, if any tortoises or other slow-moving reptiles are found in the construction zone, qualified biologists will relocate them to safe nearby habitat before work proceeds. Habitat connectivity will be maintained by retaining corridor vegetation (field edges, hedgerows) so animals can still move across the landscape. The timing of activities will also reduce impacts: during the

bird breeding season (approx. April–July), pre-construction nest surveys will be conducted and any active nests will trigger a no-work buffer until the young have fledged. Similarly, to avoid disturbance, the heaviest noise and machinery use will be scheduled outside of peak nesting and breeding periods. Lighting at night will be minimized and directed away from natural areas to prevent disorienting nocturnal species (like bats and migratory birds), and the use of pesticides or harmful chemicals on site will be strictly limited to protect insect populations (which are food for many species). During operation, key habitats will be managed: for instance, reservoir water levels will be kept stable (avoiding sudden drawdowns that could dry out wetlands) to preserve amphibian and bird habitat. Overall, these mitigation measures are designed to avoid or reduce habitat loss, wildlife disturbance, and pollution, ensuring the terrestrial ecosystem remains functional.

Monitoring Program: To ensure the effectiveness of these measures, a robust biodiversity monitoring plan will be implemented for both aquatic and terrestrial resources. Aquatic monitoring (water quality and biology) will occur at least twice a year – typically in spring and autumn – to capture seasonal variations in plankton, fish, and habitat conditions. This will help detect any changes in the aquatic ecosystem (e.g. algal bloom trends or fish population shifts) early. On the terrestrial side, annual or semi-annual wildlife surveys will be conducted: amphibian call counts and wetland surveys in spring, reptile and bird surveys (e.g. breeding bird point counts) during appropriate seasons, and camera trapping for mammals year-round. Particular attention will be given to indicator or sensitive species (such as tortoises, lapwings, bats) to verify they remain unharmed. The monitoring results will be reported to regulators and used in an adaptive management process – if unexpected impacts are observed, the project will adjust its mitigation measures accordingly. This ongoing monitoring and reporting ensure that biodiversity protection is a continuous commitment throughout construction and operation, not a one-time effort.

IFC PS6 Compliance and Biodiversity Status

In line with IFC Performance Standard 6 (PS6) on biodiversity conservation, a Critical Habitat Assessment was performed. The findings confirm that the project site does not qualify as Critical Habitat at the global or regional level. No species listed as Critically Endangered or Endangered (IUCN) are present, and although a few species of conservation concern are noted (e.g. the VU Greek Tortoise and NT Northern Lapwing), their presence is not enough to trigger a Critical Habitat designation under IFC criteria. However, the area is recognized to contain Priority Biodiversity Features (PBF). These are significant biodiversity values of regional or national importance that merit special attention. In this case, the PBFs include the assemblage of Vulnerable and Near-Threatened species (such as Testudo graeca and Vanellus vanellus), several nationally protected mammals (e.g. hedgehog, ground squirrel, steppe polecat, and a rare bat) that are present in the broader area, and the wetland habitats (reservoir and wet meadows) that serve as vital foraging and stopover sites for migratory waterbirds. Even certain ecosystem processes like natural pest control by amphibians and bats are noted as contributing to these priority features. While none of these triggers global critical habitat status, they do require the project to apply robust mitigation and management measures to align with PS6. In other words, under IFC PS6 the site's biodiversity must be safeguarded through species- and habitat-specific conservation actions and ongoing monitoring, commensurate with its PBF designation. The project has incorporated these requirements into its Biodiversity Management Plan, as summarized above. Compliance with IFC PS6 is therefore achieved by avoiding impacts to critical biodiversity values and actively managing the priority features present. With the planned mitigation and monitoring fully implemented, the residual impacts on both aquatic and terrestrial ecosystems are expected to remain manageable and acceptable at the local scale. In conclusion, the 550 MW Jizzakh Power Plant project is being developed in a manner that meets international biodiversity standards (IFC PS6) – the site is not a Critical Habitat, but its identified Priority Biodiversity Features will be protected and monitored to ensure no net loss of biodiversity values and the continued provision of essential ecosystem services.

Sources

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12. CONCLUSIONS

The environmental and social impact assessment for the project “Construction of a combined-cycle power plant with a capacity of 550 MW” was carried out in accordance with national requirements and applicable requirements of the International Finance Corporation for attracting project financing.

The work within the framework of the integrated ESIA of the project was carried out by the company “Encompass”.

The results of the impact assessment of the combined-cycle power plant construction project on the environment and social environment indicate the fundamental possibility and admissibility of implementing the planned activity, taking into account the implementation of the proposed measures and recommendations for monitoring.

1. Possible alternatives to the implementation of technical solutions (including the location of the facility, the choice of technologies and /or others) do not have fundamental differences in terms of environmental impact. There are no grounds for abandoning the planned activity.
2. Based on the totality of the considered technical characteristics of the main (electricity production) and auxiliary (water supply, wastewater treatment, organization of recycling cycles) equipment of the project, it can be concluded that the planned activity, in general, complies with the requirements of EU BAT.
3. As a result of the studies, the characteristics of the expected impacts of the planned activity on the natural and social environment have been determined, which are characterized mainly by medium or moderate significance, local scale.
4. An overview of the results of the impct assessment of the planned activities for the construction and operation stages of the project is presented in Table 12.1

Table 12.1 Results of the assessment of the impact of planned activities on the environment and social environments

Item	Impacts	Stage	Orientation	Scale	Significance 58
1.	Impact on atmospheric air quality	C	–	Local	Negligible
		E	–	Domestic	Low
2.	Impacts related to GHG emissions and Climate Change	E	–	Regional	Low
3.	Acoustic and vibration effects	C	–	Local	Negligible
		E	–	Local	Low
4.	Impacts associated with waste generation	C	–	Local	Negligible
		E	–	Domestic	Low
5.	Impact on surface waters	C	–	Domestic	Low
		E	–	Domestic	Low
6.	Impact on soil cover	C	–	Local	Low
		E	–	Local	Negligible
7.	Impact on the flora	C	–	Local	Negligible
		E	–	Local	Negligible
8.	Impact on terrestrial wildlife	C	–	Local	Low
		E	–	Domestic	Low
9.	Impact on the labor market	C	+	Regional	Moderate
		E	+	Domestic	Moderate
10.	Impact on economic development	C	+	Domestic	Moderate
		E	+	Regional	Moderate

11.	Impact related to training, professional development	E	+	Domestic	Moderate
12.	Land acquisition, economic relocation	C	–	Domestic	Low
13.	Labor influx and population change	C	–	Domestic	Low
		E	–	Domestic	Low
14.	Child and forced labor	C	–	Domestic	Low
		E	–	Domestic	Low
15.	Impact on access to transport infrastructure	C	–	Domestic	Low
		E	–	Domestic	Low
16.	Supply chain impacts	C	–	Regional	Low
		E	–	Regional	Low
17.	Impact on cultural heritage	C	–	Local	Negligible
18.	Impacts on workers' rights, safety and labor protection	C	–	Local	Negligible
		E	–	Local	Low
19.	Impacts on public health, safety and welfare	C	–	Domestic	Negligible
		E	–	Domestic	Low
20.	Cumulative impacts	C	–	Domestic	Moderate
		E	–	Domestic	Moderate

54 The significance of residual effects is given (assessment after the implementation of recommended measures, if applicable).

5. The project for the construction of a combined-cycle power plant belongs to category A according to the requirements of the IFC:
   - the project has the potential to cause significant negative impacts on the environment and social conditions;
   - the project's area of influence includes the territories adjacent to the project;
   - the implementation of the project will require the implementation of various measures to prevent and/or minimize negative environmental and social impacts.
6. The majority of greenhouse gases are produced by the use of natural gas in production processes and energy generation.
7. Air pollution in the residential area does not exceed permissible levels for any indicator; the impact of the power plant is acceptable.
8. Cumulative impacts on the social environment are also predicted – impacts on employment and the local economy, impacts on infrastructure. The implementation of the Project will have a positive impact at the local level through the creation of jobs, the purchase of goods and services by workers during the construction phase and the improvement of the infrastructure of the Sharaf-Rashidov district. During the operational phase, positive impacts are expected at the national level (increase in the country's gross domestic product, increase in government revenues and taxes). Given that most socio-economic adverse impacts are assessed as moderate or low, the project has a limited contribution to the cumulative adverse impacts.
9. The results of the impact assessment provided the basis for developing measures to prevent/reduce their level. The justification of the measures is carried out in accordance with the hierarchy recommended by IFC Performance Standard 1: avoid impacts, minimize impacts, restore affected components/ecosystems/communities (if applicable), compensate affected components/ecosystems/communities (if applicable). Particular attention is paid to impacts whose significance is assessed as "High", but measures for other impacts are also considered.

10. The environmental protection solutions proposed in the ESIA include:
    - a set of measures to protect atmospheric air;
    - prevention of waste generation and/or reduction of waste generation volumes;
    - measures to reduce water consumption (use of drainage water in the production cycle).
11. Solutions to ensure a favorable living environment for the population include:
    - organization of a sanitary protection zone;
    - measures regarding the acoustic environment, which provide for a set of planning, organizational and technical solutions to reduce the level of noise impact.
12. As a result of the assessment, a set of measures in the area of social responsibility, interaction with stakeholders, working conditions, health and safety of personnel and the population was substantiated, including:
    - adoption of the Human Resource (HR) Policy;
    - elimination of child and forced labor;
    - training and professional development of personnel;
    - Traffic Management Plan
    - creation of an effective Grievance Mechanism (GRM).
13. Based on the results of the ESIA, an Environmental and Social Action Plan (ESAP) will be prepared. The plan sets out the activities and management measures to ensure that the project complies with national requirements and applicable IFC requirements.
14. The effectiveness (efficiency) of the implementation of the proposed measures is determined as a result of monitoring the state of environmental components and/or its individual indicators (atmospheric air, surface and ground water, soils, acoustic environment), as well as social aspects.
15. ESAP is an important part of the loan agreement; the implementation of the Plan's measures is monitored during the project implementation monitoring.
16. The environmental and related socio-economic consequences of the planned activity are assessed as acceptable, provided that the recommendations substantiated by the ESIA study materials are fully implemented.
17. As part of the ESIA, Stakeholder Engagement Plan (SEP) was prepared. The SEP provides for continuous engagement with stakeholders throughout the project life cycle.
18. Activities include consultations with community representatives, disclosure of information to local communities at key project milestones such as construction start and end, regular updates on the website and social media, updating of the SEP and annual project reporting.
19. Preliminary results of public information have shown the absence of public concerns and public preferences that require consideration when the customer makes decisions regarding the planned activity. The information and discussion processes continue.