Critical Mitigation Measures Envisaged/Planned by Environmental Impact Assessment Reports (EIAR) and Attached Documentation regarding Namakhvani HPP Project

Background

On 25 December 2015, the Ministry of Environment and Natural Resources Protection of Georgia issued an Environmental Impact Statement on the location of the hydroelectric power plants cascade (Tvishi HPP - 100 MW installed capacity and Namakhvani-Zhoneti HPP - 333 MW installed capacity) on the Rioni River of JSC "Namakhvani".

Certain changes were planned in both the Zeda Namakhvani and the Qveda Namakhvani project when establishing the detailed design of the project. A screening application was submitted to the Ministry for the changes (changes in operating conditions) made to the Namakhvani HPP cascade construction and operation project to determine the need to conduct an environmental impact assessment by JSC Namakhvani. The activities envisaged by the project were subjected to environmental impact assessment.

In 2019, the Environmental Impact Statement was given to "Clean Energy Group Georgia" LLC, which, in turn, changed its name and was established under the name of "ENKA Renewables" LLC. On 13 June 2019, in order to obtain a scoping report by "Enka Renewables" LLC, a scoping report was submitted to the Ministry on the change of operating conditions (Qveda Namakhvani) in the construction and operation project of a cascade of two hydropower schemes (Tvishi HPP - 100 MW installed power and Namakhvani-Zhoneti HPP - 333 MW installed power) on the Rioni River in the territory of Tskaltubo and Tsageri municipalities. On 1 August 2019, the Ministry sent a written notification to Enka Renewables LLC asking to provide additional information, on which the company presented additional documentation on 19 August 2019. As a result of the scoping procedure, the list of studies, information to be obtained and studied was determined and established for the preparation of the EIA report, issues to be studied in detail in the EIA process and the scoping report was issued under the Minister's order of 1 October 2019.

To render an environmental decision in the municipalities of Tskaltubo and Tsageri, the environmental impact assessment report regarding changes in operating conditions (Qveda Namakhvani) in the construction and operation project of the cascade of two hydropower schemes on the Rioni River (Tvishi HPP - 100 MW installed capacity and Namakhvani-Zhoneti HPP - 333 MW installed capacity) and the attached documentation stipulated by the law were submitted by "Enka Renewables" LLC to the Ministry on 8 November 2019. Proceeding from the activities planned on 21 January 2020, in order to fully assess the impact on the environment, within the framework of the administrative proceedings initiated for the purpose of issuing an environmental decision, the Ministry requested additional information and clarifications, including the issues raised at the public hearing. The mentioned information and

clarifications were submitted to the Ministry in the form of attachments by "Enka Renewables" LLC on 28 January 2020. In order to review the specified information/documentation, the order of the Minister of Environment Protection and Agriculture of Georgia of November 15, 2019 was amended and the expert commission was assigned to review the updated information/documentation and present the expert opinion.

By Order of the Minister of Environmental Protection and Agriculture of 28 February 2020, an environmental decision was issued on the changes to the operating conditions (Qveda Namakhvani) in the construction and operation project of a cascade of two hydropower schemes (Tvish HPP with 100 MW installed power and Namakhvani-Zhoneti HPP - with 333 MW installed power) on the Rioni River of "Enka Renewables" LLC in the municipalities of Tskaltubo and Tsageri. The environmental decision issued by the Minister's Order of 28 February 2020, in accordance with the requirements of the Law of Georgia on Environmental Assessment Code and on the basis of expertise, includes mandatory conditions.

I. Mitigation Measures (2015-year EIA Report)

On 25 December 2015, the Ministry of Environment and Natural Resources Protection of Georgia issued an Environmental Impact Report on the location of the hydroelectric power plants cascade (Tvishi HPP - 100 MW installed capacity and Namakhvani-Zhoneti HPP - 333 MW installed capacity) on the Rioni River of JSC "Namakhvani". According to the EIA report submitted for the purpose of obtaining the ecological expert opinion, for determining the value of mitigation measures given in the environmental impact assessment report, an approximate evaluation method is used, namely a three-point formula: low value <$25,000, medium value $25,000-$100,000 and high value >$100,000. Using the mentioned method, the approximate amount of compensatory measures for the damage caused to the physical and biological environment is 3.5 mln $. Furthermore, according to the EIA report, a detailed economic assessment of the damage caused to the natural and social environment will be possible, after receiving the construction permit, in the process of preparing the detailed construction project, when the plan of compensatory measures for the damage caused to the natural and social environment and the biodiversity management plan will be drafted.[1] EIA Report, Volume II covers mitigation measures for both construction and operational periods.

1. Ambient Air Pollution Reduction Measures

According to the EIA report, the following mitigating measures will be implemented during the

construction phase of the HPP in order to minimize the emissions of harmful substances into the ambient air[2]:

- Ensuring technical serviceability of construction equipment and vehicles;
- Switching off vehicle engines or running them at minimum speed when they are not in use;
- Placing generators and other equipment-mechanisms away from sensitive receptors;
- Managing the optimal traffic speed (especially on unpaved roads);
- Regular implementation of necessary measures to reduce dust emission in dry weather (e.g. spraying work areas and road surfaces with water, observing the rules of storage of bulk construction materials, namely: in order to prevent easily dusty materials from being transported by the wind, using a special coating in their storage areas or spraying surfaces with water;
- Taking precautions to prevent excess dust emission during earthworks production and loading and unloading of materials (for example, prohibition of dropping material from a great height during loading and unloading);
- Providing personnel with personal protective equipment (respirators) as needed;
- Staff briefing before the start of the works and periodically every 6 months thereafter;
- In case of receiving complaints, ensure registration and appropriate response.
- In order to reduce the expected emissions during the repair work during the operation of the HPP, it is necessary to take measures similar to the construction phase.

[1] p. 474, Vol. I
[2] 6.2.2.8 Mitigation measures, p. 3

2. Noise Reduction Measures

According to the EIA report, the following mitigating measures should be implemented during the construction and operation stages in order to minimize noise propagation levels (6.3.3 Mitigation Measures, p. 42.)

- Ensuring technical serviceability of machinery;
- Conducting noisy works only during the daytime, if possible;
- Warning the nearby population and giving appropriate explanations before the start of noisy works;
- Determining the period of noisy works taking into account social issues (holidays and days off);
- Placing generators and other noisy devices-mechanisms away from sensitive receptors (vegetated area, residential houses);
- Reducing traffic operations through populated areas as much as possible;
- Keeping to the optimal traffic speed;
- Placing noise barriers (screens) between the significant noise source and sensitive receptors, if possible. These screens can be arranged using different constructions (for example, shields made of wooden strips).
- Providing personnel with personal protective equipment (earmuffs);
- Frequent changing of personnel employed in noisy jobs;
- Staff briefing before the start of work and once every 6 months thereafter;
- In case of receiving complaints, ensure registration and appropriate response.

3. Erosion Prevention and Maintenance of Soil Fertility

According to the EIA report, in order to prevent the destruction of the fertile layer of the soil, the construction contractor must ensure the implementation of the following mitigation measures[3]:

[3] 6.4.3 Mitigation measures, p. 47

- Removal of the topsoil and temporary assembling in pre-selected areas before construction works. Land works must be carried out in compliance with the requirements of the Resolution N424 of the Government of Georgia "On the Removal, Storage, Use and Reclamation of the Topsoil" of 31 December 2013;
- Pre-removed soil and soil removed during earthworks should be stored on a separate dump. The bulk should be protected from being scattered by the wind and washed away by atmospheric precipitation. The area selected for the placement of soil/ground should be at least 50 m away from the surface water body;
- The bulk height should not exceed 2 m; The slopes of the piles should be given an appropriate angle of inclination (450); water channels should be arranged on the perimeter;
- After the completion of the construction works, the stockpiled soil should be used for reclamation works;
- Strict protection of the borders of the working areas in order to avoid damage to the fertile layer of "neighboring" areas and soil compaction;
- Protection of designated traffic roads for vehicles and machinery (prohibition of going beyond the existing roads) to reduce the probability of soil compaction;

To reduce the risk of soil pollution during construction the following measures should be taken:

- Machines and equipment should be checked regularly. If damage or fuel/oil leakage is identified, the damage must be repaired immediately. Damaged vehicles will not be allowed on the work site;
- All materials and waste should be stored on-site in such a way that prevents erosion and they are not carried away from the construction site by surface runoff;
- Proper management of generated agricultural-fecal wastewater:
- Potentially polluting areas of drainage water should be protected from atmospheric precipitation;
- When arranging a fuel storage tank, it must have a concrete or clay enclosure, the internal capacity of which will not be less than 110% of the tank volume. By limiting the reservoir, in case of an accidental spill, it is possible to prevent the spread of oil products;
- Fueling and/or maintenance of vehicles and equipment on construction sites and work sites should be prohibited;
- In case of spillage, localization of the spilled material and immediate cleaning of the contaminated area. Personnel must be provided with appropriate means and personal protective equipment;
- Contaminated soil and ground must be removed from the area for further remediation by a contractor with a permit for this activity.
- Staff briefing on environmental protection and safety issues before starting work.

To prevent soil pollution during the HPP operation phase, the operating company must take the following measures:

- The waste management plan envisages systematic supervision of the implementation of measures;
- Control over compliance with fuel/oil storage and use rules;
- In case of fuel/oil spillage, cleaning the area and removing contaminated soil and soil from the area for further remediation;
- Placement of means of elimination of the results of the spill in the substation and oil storage buildings.

4. Reducing the Risks of Development of Dangerous Geodynamic Processes

According to the EIA report, in order to minimize the risks of the development of dangerous geodynamic processes during the construction of the HPP cascade and roads, it is necessary to implement the following mitigating measures[4]:

Measures to be taken during the building of construction and operational roads:

- Removing the formations in active dynamics on the upper slopes and giving the slopes an inclination angle corresponding to stability;
- Surface and ground water should be drained so as not to cause additional watering of the slopes below;
- Preventing the deformation of the road bed, if necessary, arranging gabions below it;
- Arranging channels (cuvettes) along the project corridor in order to prevent the development of erosive and landslide processes in the course of highway construction works.
- Atmospheric water from the canals along the roads and ground water flowing from the slopes should be discharged in an organized manner (with concrete cuvettes) into the nearby natural ravines or the Rioni River;
- The technical condition of the water pipes, pipeline bridges and other engineering structures in the road corridors should be systematically monitored and, if necessary, appropriate corrective works should be carried out;
- It is necessary to monitor the landslide and erosion processes during the construction works and, if necessary, take appropriate measures.

[4] 6.5.3 Mitigation measures, p. 54

The following should be important to arrange among the mitigating measures to be considered during the construction phase of hydroschemes:

Tvishi HPP:

- To improve the indicators of the physical and mechanical properties of the rocks at the locations of the dam and hydroelectric power plants, strengthening and bonding cementation should be performed.
- An anti-filtration curtain should be arranged in the alignment of the dams/schemes, so that the slopes do not become waterlogged in the lower reaches. Landslide processes provoked by them should not occur.
- When building a dam/scheme and hydroelectric power plant (as well as during operation), it is necessary to clean unstable areas, fix some large-sized blocks in place and arrange protective fences and nets to protect the construction polygons from rocks from the adjacent slopes. The following anti-filtration measures are recommended to prevent contact filtration and suffusion in the neocomic limestones at the dam leveling area:

  o Reinforcing cementation of the entire area of the dam base to a depth of 5 meters, which will act as an equalizer of deformation data in the area of the junction of the rock and the dam.

  o Arranging an anti-filtration cement curtain, on the entire perimeter of the dam base, with a depth of 20-30 m.
- To maintain the stability of limestones and prevent geological processes, the following recommendations will be taken into account when building a diversion tunnel:

  o For rocks with small cracks, anchor reinforcement, cracked concrete in places.

  o Arch reinforcement for fissured and highly fissured rocks.

  o Reinforcement and repair of tectonic fracture zones should be calculated for high mining pressures.
- The foundation of the HPP building (option I) will be dug into alluvial sediments and placed on limestones, where it is recommended:

  o Removal of the surface part of the limestones to at least 0.5 meters.

  o Determining the flow of water in the calcareous basin in order to avoid the development of geological processes.
- The main indicators of the evaluation of the reservoir pit are as follows: the stability of the slopes, and during operation, the extent and quality of the processing of the banks, as well as filtration events, which are recommended to eliminate and soften the process (necessary):

  o A preliminary report on the estimated volume and intensity of the landslide masses descending into the reservoir.

o Study report on reworking of reservoir banks and related geodynamic processes.

- Before starting the construction, in the process of developing the detailed project, it is necessary to study the karst processes in the reservoir pit and their manifestations - karst caves, and determine appropriate mitigating measures according to the obtained results.

Namokhvani-Zhoneti HPP:

- To improve the indicators of the physical and mechanical properties of the rocks at the locations of the dam and hydroelectric power plants, strengthening and bonding cementation should be performed.
- An anti-filtration curtain should be arranged in the alignment of the dams/schemes, so that the slopes do not become waterlogged in the lower reaches. Landslide processes provoked by them should not occur.
- Bayos lava breccias and tufobreccias in the area of the dam alignment are characterized by a high index of strength, as well as fissures, which leads to different indicators of their deformation properties, for which it is recommended:
  - Cleaning the surface area, after which the rocks will be useful as a base.
  - In the same area, up to a depth of 10 m, extensive reinforcing cementation will be performed.
  - Arranging an anti-filtration cement curtain in the sides at a depth of 30-35 meters, and in the part of the bed at 20-30 meters.
  - Arrangement of drainage systems.
- The area where the diversion tunnel is located is built from the sediments of the Bayos porphyritic sequence. Portals will also be opened in similar rock formations. Therefore, the following should be considered and recommended:
  - Strengthening and cleaning of the areas adjacent to the portals (removal of insignificant slope sediments).
  - A complete engineering-geological survey of the derivation tunnel track will be necessary (including geophysical works). The same applies to the locations of water intake and pressure pipelines.
  - The location of construction sites (if they exist) and access roads should be specified so that mitigation measures can be properly assessed.
- In the case of both options, the powerhouse will be located on the main rocks (tuff sandstones), partly by digging into the sediments of the floodplain terrace, for which the following will be considered and recommended:
  - Increased water flow in the pit.

- Depending on the height of the terrace step, to protect the powerhouse from expected floods, it will be necessary to arrange an embankment dam. In order to reduce the risk of activation of landslide processes on the slopes of reservoirs, the following mitigating measures should be taken:

- When preparing the water reservoir pits, the active dynamic formations on the slopes of the reservoirs should be removed and the slopes should be given an angle of inclination corresponding to stability;
- Hydraulic washing of the bottom of the reservoirs will be necessary from time to time to mitigate the landslide processes, and to block or partially limit the action of landslides, deep closed drains should be arranged on the landslides and their adjacent slopes, and ground water will be collected and thrown into the adjacent ravines and the main water channel.
- To protect the vegetation on the slopes of the reservoirs, within the water protection zone, uncontrolled cutting of trees should be prohibited, and in the areas where there is a lack of vegetation, groves of varieties adapted to local conditions should be planted;
- During the entire life cycle of the HPP cascade, monitoring of dangerous geological events on the perimeter of reservoirs should be ensured and, if necessary, appropriate preventive measures should be taken (geological study, project development and implementation).

5. Reducing the Impacts on Surface Water

According to the EIA report on the construction phase 5 of the HPP cascade, in order to reduce the negative impact on surface waters, it is mandatory to observe the following conditions[6]:

- Placing equipment at least 50 m away from the surface water body (if this is not possible, constant control and security measures to prevent water pollution);
- Avoiding river bed penetration while working in and near the river bed;
- Ensuring that machinery is in good condition to minimize the risk of fuel/oil spillage;
- Segregated collection and temporary storage of waste generated during work in a specially designated area, removing it from the water body;

[5]6.6.3.1. Construction phase. p 62.
[6] 6.6.3 Mitigation measures p.62

- Prohibition of fueling and/or maintenance of vehicles and equipment at construction sites. If there is an urgent need for this, it should be done at a distance of at least 50 m from the water, taking the specified safety measures to avoid spillage (and therefore soil, water pollution).
- In case of fuel/oil spillage on the ground, localize the spilled material and immediately clean up the contaminated area to prevent the contamination from entering the water.
- Prohibition of washing cars in the vicinity of riverbeds;
- Prohibition of discharge of wastewater without treatment. This is very important in the process of operation of the construction camp;
- Arrangement of a drainage system and temporary cleaning sediments for surface runoff;
- Prohibition of fueling and/or maintenance of vehicles and equipment at construction sites. If there is an urgent need for this, it should be done at a distance of at least 50 m from the water, taking the specified safety measures to avoid spillage (and therefore soil, water pollution).
- In case of fuel/oil spillage on the ground, localize the spilled material and immediately clean up the contaminated area to prevent the contamination from entering the water.
- Prohibition of washing cars in the vicinity of riverbeds;
- Prohibition of discharge of wastewater without treatment. This is very important in the process of operation of the construction camp;
- Arrangement of a drainage system and temporary cleaning sediments for surface runoff;

To minimize the impact on surface waters during the operation phase of the HPP cascade, the following mitigating measures should be implemented:[7]

- Systematic control of the implementation of the measures provided for in the waste management plan;
- Arrangement of compact biological purification facilities for agricultural and fecal waste water for all power units and control of their efficiency;
- Systematic supervision of fuel/oil storage and use rules compliance;
- In case of accidental fuel/oil spillage, localization of pollution and implementation of measures to prevent it from entering surface waters;
- Staff briefing on environmental protection and safety issues;
- Monitoring the water quality of Rioni River in the downstream reaches of the HPPs. Sampling for laboratory research should be done at a distance of at least 200 m from the point of water discharge.

Measures to minimize the impact on the hydrological regime of the river::

  - Systematic control over sanitary expenditure in the tail bays of dams;
  - It will be possible to minimize the impact on the hydrological regime of the River Rion, only in case of coordinated work with the operating companies of Gumati and Vartsikhe HPPs.
- Measures to minimize the impact on solid sediment transportation:

[7] 6.6.3.2 Operation Phase (p.64)

- Systematic washing of reservoirs during the period of abundance of water and conveying the accumulated sediment to the tail bays of the dams within the limits of the possibilities (as it is known, it is possible to clean the reservoirs from solid sediment only partially, because the river cleans only the area of the bed necessary for it, and solid sediment is not transported from the rest of the reservoir area);
- Stopping the HPPs during the period of water abundance will be economically beneficial for the operating company, because the accumulation of a large amount of solid sediment in the reservoirs will significantly reduce the energy efficiency of the HPPs and, accordingly, the amount of generated electricity;
- Together with the interested state agencies and the self-governing Poti Municipality, it is necessary to take appropriate measures in order to carry out dredging works of the southern branch of Rioni River (city channel) so that it is possible to cover the costs of project water and solid sediment;
- Placing the material removed during the dredging process of the entrance channel of Poti seaport on the underwater slope of the coastline south of the port. In the case of the implementation of the Poti new sea port project, the material extracted during the deepening of the inner harbour should be placed in the same way.

6. Reducing the Impact on Groundwater

According to the EIA report, in order to reduce the probability of groundwater contamination, the following mitigation measures should be implemented during the construction phase[8]:

- Machines and equipment should be checked regularly. Damage and fuel/oil leakage must be repaired immediately. Damaged vehicles will not be allowed on the work site;
- Proper management of generated agricultural-fecal wastewater;
- Potentially polluting areas of drainage water should be protected from atmospheric precipitation;
- Fuel storage tanks must have a waterproofing layer and a concrete or clay enclosure, the internal capacity of which will not be less than 110% of the tank volume. By limiting the reservoir, in case of an accidental spill, it is possible to prevent the spread of oil products;

[8] (6.7.3 Mitigation measures, p.69)

- Fueling and/or maintenance of vehicles and equipment on construction sites and work sites should be prohibited;
- In case of spillage, localization of the spilled material and immediate cleaning of the contaminated area. Personnel must be provided with appropriate means (adsorbents, shovels, etc.) and personal protective equipment (PPEs);
- Contaminated soil and ground must be removed from the area for further remediation by a contractor with a permit for this activity.
- Cleaning of the area after completion of construction works and preparation for reclamation.
- Staff briefing on environmental protection and safety issues before starting work.

During the HPP operation phase, the operating company must ensure that the following measures are taken:

- The waste management plan envisages systematic supervision of the implementation of measures;
- Control over compliance with fuel/oil storage and use rules;
- In case of fuel/oil spillage, cleaning the area and removing contaminated soil and ground from the area for further remediation;
- Placement of liquidation means of the results of the spill in the substation and oil storage buildings;
- Staff briefing on environmental protection and safety issues upon hiring and once a year thereafter;
- Implementation of mitigating measures provided for the construction phase during the repair works.
- An important environmental measure to reduce the impact on the groundwater discharge at the operational stage is to carry out an ecological charge in the lower water of the head node, which will be systematically controlled.

7. Reducing the Impact on Flora

As a result of a detailed botanical study, populations of species with high conservation value were identified in the project corridor, and negative impacts caused by the construction and operation of the project on the botanical receptors (flora and vegetation) of the project area were determined, after which any type of conservation/restoration and compensation measures will be finally identified and appropriate bioremediation specifications and compensation plans will be developed, as well as a monitoring plan for the botanical component of biodiversity.

In addition, a conservation program for rare species of flora should be developed, which includes the following species: *Laurocerasus officinalis* (a relict species of Tertiary flora), *Hedera colchica* (Caucasus subendem in Asia Minor (Chaneti, Artvin) with irradiation) (species whose numbers are decreasing), *Tilia caucasica, Pyrus caucásica, Quercus iberica, Punica granatum* (rare plants), *Ficus carica, Diospyros lotus* (species that occur). Endemic plants grow on exposed limestone rocks, the slope of which reaches 900 degrees in some places: *Peucedanum adae* - West Caucasus limestone endemic, Seseli petraeum - West Caucasus limestone subendem, *Pachyphragma macrophyllum* - Caucasus subendem in Asia Minor (Netia) with radiation, *Campanula letschchumensis* - West Caucasus south Endemic of limestone slopes, Scabiosa colchica-endemic of limestone of Rioni River basin, Paracynoglossum imeretinum-endemic of Georgia, Alyssum trichostachyum-endemic of Caucasus-Crimea, Galium valantioides-endemic of Caucasus, Rhododendron ponticum-relict of the oldest Tertiary period, Hypericum xylosteifolium-relict species of Tertiary flora, Ilex colchica-species with Caucasus-Balkan (Stranja)-small Asian (Chaneti) area; Also, populations of Cyclamen vernum, which is a species protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal). In addition, recording the background situation will help to restore the compensatory areas of the project and monitor the botanical component of biodiversity after the completion of the construction.

When conducting the botanical survey, a quantitative and qualitative assessment of the populations of endemic and rare species affected by the project was carried out, and specific mitigation measures were developed, the specifications of which will be given in the complex restoration, bioremediation and compensation measures plans. As a result of their implementation, the protection and conservation of those populations of plant species with high conservation value, which will be directly or indirectly affected during the construction of the project, and the restoration of the vegetation cover of the project corridor will be ensured.

The following measures are recommended to ensure plant conservation: transfer of live plants to conservation centers and propagation of plants with seeds collected from young plants in the natural environment. Since the transplanting of live plants is always associated with a high risk, it is necessary to propagate the target plants by seeds, which increases the probability of success of conservation measures and ensures that the necessary number of plants is bred for their subsequent reintroduction into the relevant habitats.

Plants transplanted from their natural habitats and grown from seed will form living plant collections in their respective conservation centers. Reintroduction of transplanted and seed-grown plants into the project corridor or their relevant natural habitats should be carried out after the completion of project construction.

It is essential that in other project-affected areas, including forested areas, it is practically impossible to restore and maintain the former natural forest stands as they were before the construction. Therefore, in such cases, it is recommended and mandatory to implement offset or eco-compensation measures, which implies the restoration of equivalent forest habitats. As for wetland areas, during the residual impact on them, the surface water space increases significantly, and such an area is forever lost from the fund of useful lands. It is true that wetland vegetation is re-developing on such shallow water ecotops and peat accumulation begins, but it takes thousands of years to fill such hollows with organic mass.

Damage to forest ecosystems can be calculated using an accurate proportionality ratio based on modern methodology and international best practices. In particular, according to the "net profit principle" and "habitat-hectare" approaches.

The habitat-hectare valuation method is a common approach to quantifying the value of vegetation in non-monetary terms. The environmental proxy (i.e. "money" used to express the value of vegetation) is "habitat-hectare". A habitat assessment is done to estimate the number of habitat areas and landscape components relative to an appropriate pre-defined “baseline” (benchmark). Benchmarks are defined for different vegetation ecological classes (mek).

Habitat area (ha) X habitat score = habitat-hectares

Since the habitat-hectare approach is not systematically used in Georgia, it is necessary to define mek and benchmarks. Based on information on representative sample areas that will be presented in the environmental and social impact assessment of the planned project (bsgzS).

After the approval of the environmental impact assessment document, a list of the works to be implemented, including the amount of timber to be cut, should be determined and a detailed forest inventory of the section included in the relevant state forest fund should be carried out.

8. Reducing the Impact on Fauna

According to the EIA report, there are measures to mitigate the impact on terrestrial animals during the construction phase[9]:

[9] 6.1.1.1. Mitigation measures

- The period of construction works near the river is selected as much as possible so that it does not coincide with the breeding period of otters (it should be noted that otters breed more in February-April. Babies are born at different times - in April-May, June-August, and often in December-February as well;
- Before construction works, access roads, river crossings (especially near sensitive sections) will be inspected for nests of resident birds of prey and footprints of predatory mammals;
- Detected nests and burrows will be recorded and access to them will be prohibited from April to July;
- Vegetation will be preserved as much as possible in the corridors of the access roads and in the areas where the construction infrastructure is located, in order to minimize the risk of the destruction of hollow trees;
- The building personnel will be instructed and given appropriate warning. A code of conduct prohibiting hunting/fishing will be developed;
- The construction corridor will be protected so that earthworks do not go beyond the marked area and do not cause additional damage to otter nests, bird nests and bat shelters. Earthworks will be controlled by personnel with relevant knowledge;
- The traffic route will be protected;
- Optimal movement speeds will be selected to reduce the probability of direct impact on animals (collision);
- Pits, trenches, etc. will be fenced off with some resistance to prevent animals from falling into them - brightly colored tape for large species, any flat material for small animals - tin, polyethylene, etc. Long planks or wooden logs will be lowered into the trenches and pits at night to allow small animals to climb out. Pits and trenches are inspected before filling with earth;
- There will be minimal use of directed light (the light beam will be directed to the ground surface as much as possible);
- Works that cause excessive disturbance to animals will be carried out in the shortest possible time (eg blasting works), if possible during the non-breeding period;
- After the completion of the construction works, up to 2500 artificial shelters of different types (in accordance with the established methodology) will be arranged in order to compensate the damage caused to the bats;
- After the completion of the construction works, the areas adjacent to the HPP communications and access roads will be recultivated, which will significantly reduce the impact related to habitat fragmentation.
- Water, soil and atmospheric air pollution, noise propagation, etc. will be conducted. Mitigation measures (see relevant subsections).

Furthermore, it will be necessary to carry out the following measures:

- to appoint an environmental manager for the construction;
- to develop and implement an environmental management plan (WMP);
- Separately from the environmental management plan (WMP), or together therewith, an invasive Species Management Plan (ISMP) should be developed and implemented;
- to develop and implement a career management plan (QMP);
- to develop and implement a water management plan (WWMP);
- to develop and implement a solid waste management plan (SWMP);
- The reservoir tank should be cleared of trees and shrubs;
- On the slopes surrounding the reservoir, fertile soil should be preserved for conservation and further greening of the area;
- Prohibit hunting in the project's impact area long-term;
- Procedures should be carried out to determine the causes of animal deaths (mammals may die on roads, and birds may die on power lines and substations);
- To develop and implement a complete monitoring program.

Pre-construction study - sensitive area N1 and N2 needs additional study to determine its significance and develop specific mitigation measures.

During the construction period, it is necessary:

- to include in the construction contractor's contract those sensitive areas that include specific faunal complexes and species included in the red list;
- No mating (nesting) area (unless it is far from the construction site) should be damaged without study and permission from experts of the Ministry of Environment and Natural Resources Protection. In order to mark breeding and nesting areas that pose a threat to species, it is necessary to make a detailed inventory of them before starting the works. This should be taken into account in the detailed construction project;
- Before starting the work, the contractor must mark all the areas mentioned in the construction program;
- Habitat areas of protected animals should not be disturbed or damaged without prior study and expert permission. In order to determine the boundaries of the habitat areas of individual animals and sensitive communities (vertebrates and invertebrates), it is necessary to carry out field studies only after the construction sites are marked. This should be done before the start of preparatory work (cleaning work). Relevant requirements should be written in detail in the construction program;
- To mitigate the temporary impact of construction activities, the developer should take into account the phenological characteristics of sensitive species (such as breeding, nesting, migration and hibernation periods, especially hibernation). It is necessary to recommend that construction works in sensitive areas be carried out in July-August and at the end of October-December;

- Blasting in these areas should be prohibited from the end of March to the end of July;
- Additional field and camera observations by an ornithologist are needed to assess the impact in more detail (after the power lines are designed).

Designation of certain types of protected areas in the project area will be important to protect animal biodiversity.

It is possible to arrange a protected area (IUCN protected area category IV), within the boundaries of which should include the first sensitive area - between the left bank of the Rioni River, the northern border of the right bank of the Lekhidari River and Kudoti Village, the upper reaches of the Lekereti River, as well as the southern areas of the village of Zhoneti (Mamatsminda) along the western border of the Rioni River and the eastern border of the Sormoni-Odzola-Lekhidaristavi road.

Sensitive area N2 - Zogishi Hill, near Zogishi Village, the massif of the forest on the left bank of the Rioni River can be considered a protected landscape (IUCN protected area category V). Rioni River forms the northern and western border of this area. The southern border may fall on the crest of the small mountain of Zogishi Hill, and the eastern border will pass along the power lines, in the longitudinal direction of Zogishi Village and Tsagera.

Forests are vital for maintaining a constant flow of water for electricity generation. Thus, the creation of this protected area (on Khvamli Mountain - Khvamli prevented), even in part of this area, will make a significant contribution to nature protection and sustainable use of water resources.

At the operational stage, a mandatory environmental charge will be carried out in the lower reaches of the dams. Furthermore, in order to compensate for the damage caused to the vegetation cover, forest groves will be planted. As mentioned, up to 2,500 units of artificial shelters will be arranged for the bats. It is planned to raise the awareness of the population and service personnel regarding illegal hunting/fishing and monitoring will be established.

Zoological monitoring:
- Mortality of birds on power lines and substations (especially during migration) - record and collect together the electrical incidents that occurred in a certain area.
- Mortality of animals on displacement roads (especially large mammals) - to record and collect together electrical incidents that occurred in a certain area.
- Factors disturbing the peace of nature in the main areas, e.g.: in the breeding area of construction sites (birds, bats, mammals). This clause must be in accordance with the contractual obligations.

- Wildlife (mammals and amphibians) - use of green bridges and tunnels (if constructed) on diversion roads to ensure suitable environmental conditions and prevent poaching in such areas. Check and improve the effectiveness of these measures.
- To check and record the status of local populations of brown bear, otter, European elk between Lekhidari and Lekereti Rivers. Banks of Namokhvani Reservoir - check and record possible adverse effects on the local population of these species in the project impact area.
- Migration of birds through the plain of Rioni in the area of influence between the village of Zhoneti and Alpana. Determine the positive effect of the new reservoir.
- Breeding of birds (waterfowl and raptors) in the impact area between the village of Zhoneti and Alpana. Determine the positive effect of the new reservoir.

9. Reducing the Impact on Ichthyofauna

Measures to mitigate the impact on ichthyofauna during the construction and operation of the cascade of hydroelectric power stations

1. Assessment of the need to arrange fish protection devices at water diversions

Pursuant to the applicable environmental laws of Georgia, it is necessary to arrange fish protection structures at the water diversions of all hydrotechnical structures. This measure reduces the risk of fish (including protected species) entering the turbine intake and being killed or injured. The establishment of a fish protection facility is mandatory according to Article 17 of the Regulation N7 "On the rules, deadlines and the list of weapons and devices allowed for the extraction of objects of the animal world, according to their species" approved by the order of the Minister of Energy and Natural Resources of 6 April 2011, in particular, water intake facilities with a water intake of at least 5000 cubic meters per day must be equipped with fishing equipment.

Fish protection structures will be installed at the water diversions of Tvishi HPP and Namokhvani-Zhoneti HPP. According to international experience, the most rational system of fish protection equipment is the fish protection structures that use pressure balancing systems, in the form of a bottom trap directed obliquely to the dynamic axis of the flow. In contrast to mechanical types of fish protection (fenced nets, bars), pressure balancing systems are more effective and safer means. And compared to acoustic, electrical and optical methods, the proposed method is cheaper and more reliable.

2. Ecological Flows

To minimize the impact due to the change in the river flow, ecologically important water releases should be implemented during the most important period of the life cycle of the species living in the project section of the Rioni River (migration). If we take into account that the breeding season of the fish living here mostly coincides with the period of water abundance of the river, it will be possible to systematically provide the necessary amount of water for the fish.

In addition, it is planned to build a so-called ecological HPP at the Namakhvani-Zhoneti dam, which will work on the ecological cost of the dam's lower reach, and accordingly, the established flow quantity will be systematically spent.

According to the technical and economic reasoning, the minimum ecological flow quantity to be released into the lower reach of the Tvishi HPP dam is 7.9 m^3/s, and 16 m3/s for the Namakhvani-Zhoneti dam. The arrangement of the Tvishi HPP power station is planned directly next to the dam, and therefore the environmental flow is necessary only during the period of a few hours of filling the reservoir in the period of low water. The established ecological flow quantity of 7.9 m^3/year for the Tvish HPP is within the minimum flow rate of the river in the design alignment, and accordingly, the minimum conditions necessary for the existence of the biological environment will be ensured.

As for the environmental flow of 16 m^3/s established for Namakhvani-Zhoneti HPP, this amount of water will be completely sufficient for the biological environment of the water inhabiting the 7.5 km section of the lower reach.

According to the EIA[10] report, **as one of the important compensatory measures for the damage caused to the ichthyofauna, it is necessary to establish a powerful fish farm, where 2-3 million pieces of larvae should be received. From which it will be possible to get up to 700 thousand pieces of 4-5 grams of whitebaits and release them into the river. The mentioned volume of discharged whitebaits will reduce the negative impact on the ichthyofauna to a certain extent**.

10. Reducing the Visual-Landscape Impact

The visual-landscape impact will be mitigated by implementing the following measures[11]:

- The color and design of temporary and permanent buildings will be selected in a way that matches the environment, both during the construction and operation phases;
- As far as possible, inconspicuous places will be selected for placement of temporary constructions, materials and waste;
- Sanitary-ecological conditions will be protected both during the construction and operation phases;

[10] p. 88

[11] 6.10.3 Mitigation measures, p.100)

- After the completion of the construction works, reclamation works will be carried out (especially within the framework of the construction camp and waste rock dump);
- After the completion of the construction, cultural and decorative trees and plants will be planted around the power junction.

Conditions for Environmental Impact Assessment Report

According to the Environmental Impact Assessment Report, the operator of the activity should ensure the fulfillment of the conditions provided for in the Report, including:

1. Ensuring the implementation of mitigating measures, environmental monitoring plan, conclusions and recommendations presented in the Environmental Impact Assessment Report;
2. Developing and submitting to the Ministry of Environment and Natural Resources Protection of Georgia the action plans for preventive measures of natural disasters and response to accidents within a period of 3 months after receiving the construction permit;
3. Carrying out the necessary works for the detailed study, evaluation and forecasting of the geodynamic processes developed in the area of flooding of the planned reservoirs (including the engineering-geological sections of the landslide bodies with the layout of the climbing plane and taking into account their "viability" should be presented). Materials about the performed works should be presented to the Ministry of Environment and Natural Resources Protection of Georgia for consideration before the start of the planned cascade construction works. Furthermore, the mentioned issue should be reflected in the monitoring plan;
7. Ensuring, at both HPP dams, constant monitoring of the environmental cost. Monitoring results were presented to the Ministry of Environment and Natural Resources Protection of Georgia once a quarter. In the event that it is determined that the existing ecological expenditure will lead to irreversible degradation of biodiversity, the activities shall be carried out in accordance with the new increased expenditure established as a result of monitoring;
8. During the operation phase, observing the filling of reservoirs with sediment. The mentioned information should be submitted once a year to the Ministry of Environment and Natural Resources Protection of Georgia for consideration. Based on the results of the mentioned observations, develop and implement appropriate mitigating measures.

12. Since the trees and plants in the territory of the State Forest Fund are affected in the project area, before starting the construction works, ensure that the procedures stipulated by the legislation are passed with the National Forestry Agency of the State Forestry Agency.
13. To carry out an additional pre-construction zoological survey, especially in relation to the highly sensitive fauna areas described in the environmental impact assessment report. Based on the research results, ensure the preparation of a package of impact prevention and, if necessary, compensatory actions, which should be submitted to the Ministry of Environment and Natural Resources Protection of Georgia before the start of construction;
14. Before the start of construction, provide information about plans for complex restoration of biodiversity, bio-restoration and compensatory measures and mitigating measures to the Ministry of Environment and Natural Resources Protection of Georgia;
15. Prior to the construction works, ensure submission of the information regarding the need to cut Red List plants (within the volume of plants to be cut, according to species) to the Ministry of Environment and Natural Resources Protection of Georgia;
16. In the package of compensatory actions, the measures should also be reflected - in relation to the loss of habitats due to flooding or other impacts - fragmentation, the destruction of plants and the impact on animals for this reason;
17. In the monitoring plan, reflect the issues of monitoring and observation of all sensitive habitats and endangered species, as well as monitoring the effectiveness of mitigation measures, in order to introduce and implement new mitigation or compensatory actions, if necessary;

Ⅱ. Mitigation Measures (2020-year EIA Report)

On 28 February 2020, according to Order N2-191 of the Minister of Environment Protection and Agriculture of Georgia, an environmental decision was issued on the changes to the operating conditions (Qveda Namakhvani) of the operation project of a cascade of two hydropower schemes (Tvishi HPP - 100 MW installed power and Namakhvani-Zhoneti HPP - 333 MW installed power) on the Rioni River of "Enka Renewables" LLC in the territory of Tskaltubo and Tsageri municipalities.

1. Ambient Air Pollution Reduction Measures

According to the EIA report, the following mitigating measures will be implemented during the construction phase of the HPP in order to reduce the spread of emissions and dust[12]:

- Ensuring technical serviceability of machinery and stationary facilities. Vehicles and equipment, the emissions of which is significant (due to technical malfunctions) will not be allowed on the work sites;
- Switching off vehicle engines or running them at minimum speed when they are not in use

(especially for the equipment operating on the construction camp);

- Managing the optimal traffic speed (especially on unpaved roads);
- Vehicles and equipment-mechanisms will be located as far as possible from sensitive receptors (populated area, forest area);
- The use of roads passing through settlements will be restricted as much as possible (the population will be informed in advance about the intensive movement of vehicles);
- Appropriate measures will be taken to reduce dust emission in dry weather (e.g. irrigation of work areas, compliance with storage rules for bulk construction materials, etc.);
- Precautionary measures will be taken to prevent excess emission of dust during earthworks production and loading and unloading of materials (for example, it will be prohibited to drop material from a great height during unloading);
- Before starting the works, the staff will be instructed;
- In case of receiving complaints, ensure registration and appropriate response, taking into account the measures listed above.

2. Noise Reduction Measures

The following mitigation measures will be implemented during the construction phase to minimize noise propagation levels[13]:

- Ensuring technical serviceability of machinery. Before the start of each working day, the technical condition of the machinery will be checked.

[12] 6.2.3 Mitigation Measures, p 283

[13] 6.4.3 Mitigation Measures, p 296

- Vehicles and equipment, the noise level of which is high (due to technical malfunction) will not be allowed in the working areas;
- Noisy works are carried out only during the daytime. In case of making a decision to carry out works at night, the population will be informed to this effect;
- Before the start of noisy works in the vicinity of the residential area (this means traffic movements), the population will be warned and relevant explanations will be given;
- Noisy equipment-mechanisms will be located as far as possible from sensitive receptors (residential houses);
- If necessary, the staff will be provided with protective equipment (earmuffs);
- If complaints are received, they will be recorded/recorded and appropriately responded to, taking into account the measures listed above.
- During the operation phase:
- During the large-scale maintenance/repair, the mitigating measures provided for during the construction stage will be planned and carried out;
- Staff will be provided with special headphones;
- The operating rooms of the powerhouse will be equipped using special noise insulation material;
- Trees and plants will be gradually planted around the powerhouse.

3. Reducing the Impacts on Surface Water

3.1. To reduce the negative impact on surface waters, it is mandatory to ensure compliance with the following conditions during the construction phase[14]:

- Placing equipment at least 50 m away from surface water body (if this is not possible, constant control and security measures to prevent water pollution);
- Avoiding river bed penetration when working in and near the river bed;
- Ensuring that machinery and equipment are in good condition to minimize the risk of spilling fuel and oil into water;

[14] 6.6.2.3.1 Construction phase, p. 317

- Separate collection and temporary storage of waste generated during work at a specially designated area in the territory, removing it from the water body;
- Prohibition of fueling and/or maintenance of vehicles and equipment at construction sites. If there is an urgent need for this, it should be done at a distance of at least 50 m from the water, taking the specified safety measures to avoid spillage (and therefore soil, water pollution).
- In case of fuel/oil spillage on the ground, localize the spilled material and clean up the contaminated area immediately to prevent the contamination from entering the water.
- Prohibition of washing cars near riverbeds;
- Prohibition of discharge of waste water without purification;
- Arrangement of a drainage system and temporary cleaning sediments for surface runoff;
- Staff briefing on environmental protection and safety issues.

3.2. To reduce the impact on surface waters during the operation phase of the HPP cascade, the following mitigating measures should to be implemented[15]:
Measures against deterioration of water quality:

- Regular control of the implementation of the measures provided for in the waste management plan;
- Arrangement of a compact biological treatment facility for agricultural-fecal waste water for the power station and control of their work efficiency;
- Regular supervision of fuel/oil storage and use rules compliance;
- In case of accidental fuel/oil spillage, localization of pollution and implementation of measures to prevent it from entering surface waters;
- Staff briefing on environmental protection and safety issues;
- Monitoring the water quality of Rioni River in the lower reaches of the HPPs. Sampling for laboratory research should be done at a distance of at least 200 m from the point of water discharge.

3.3. Measures to minimize the impact on the hydrological regime of the river[16]:

- Regular control of the environmental cost in the lower reaches of the dams;

[15] 6.6.2.3.2 Operation phase, p. 318

[16] 6.6.2.3.2 Operation phase, p. 318

- Designing the delivery channel and determining the cost of washing the reservoir in such a way that the sediment washing operation does not cause an increase in flooding in the Zhoneti area.
- Risk assessment will be done in accordance with internationally recognized industry guidelines [Guidelines for Public Safety Around Dams].
- It will be possible to reduce the impact on the hydrological regime of the River Rion, only in case of coordinated work with the operating companies of Gumati and Vartsikhe HPPs.

3.4. Measures to reduce the impact on solid sediment transportation:

- As per the project, the reservoir will be washed from sediments regularly, and the washing works will coincide with the period of spring water abundance. The washing process of the water reservoir will be launched in the lower reach of the dam with a flow rate of 350 m3/s. It is on the record that it is possible to clean reservoirs of solid sediment only partially, because the river flow will clean only the area of the bed necessary for it (not more than 200 m wide), and solid sediment is not transported from the rest of the reservoir area);
- Stopping HPPs during the period of water abundance will be economically beneficial for the operating company, because the accumulation of a large amount of solid sediment in reservoirs will significantly reduce the energy efficiency of HPPs and, accordingly, the amount of generated el. power;

4. Groundwater Impact

4.1. Construction Phase

According to the EIA report, in order to reduce the risks of negative impact on groundwater, it is necessary to implement the following mitigating measures[17]:

- Machinery and equipment should be inspected regularly. If damage or fuel/oil leakage is identified, the damage must be repaired immediately. Damaged vehicles will not be allowed on the work site;

[17] 6.7.3 Mitigation measures, p.325

- Proper management of generated agricultural-fecal wastewater:
- Potentially polluting areas of drainage water should be protected from atmospheric precipitation;
- Fuel storage tanks must have a waterproofing layer and a concrete or clay enclosure, the internal capacity of which will not be less than 110% of the tank volume. By limiting the reservoir, in case of an accidental spill, it is possible to prevent the spread of oil products;
- Prohibition of fueling and/or maintenance of machines and equipment on construction sites and work sites;
- In case of spillage, localization of the spilled material and immediate cleaning of the contaminated area. Personnel must be provided with appropriate means (adsorbents, shovels, etc.) and personal protection means; Contaminated soil and soil must be removed from the area for further remediation by a contractor with a permit for this activity;
- After completion of construction works, the area should be cleaned and prepared for reclamation;
- Before starting work, staff briefing on environmental protection and safety issues;
- During the entire period of construction, the water quality and discharge of the spring of Mamatsminda village should be monitored once a quarter, and the water discharge of the nearby ravines should be monitored;
- In case of a change in the source water quality or debit, it will be necessary to arrange an alternative water supply system for the rural population.

4.2 Operation phase:

- The waste management plan envisages systematic supervision of the implementation of measures;
- Control of compliance with fuel/oil storage and use rules;
- In case of fuel/oil spillage, cleaning the area and removing contaminated soil and soil from the area for further remediation;
- Placement of means of liquidation of spill results in substation and oil storage buildings;
- Staff briefing on environmental protection and safety issues upon hiring and once a year thereafter;
- Implementation of mitigating measures provided for the construction phase during the repair works;
- Ensuring continuous management of the lower reach ecological cost of the dam;
- During the first 3 years of operation, the water quality and debit of the spring of Mamatsminda village will be monitored once a quarter, and the water debit of the nearby ravines will be monitored;
- In case of a change in the source water quality or debit, it will be necessary to arrange an alternative water supply system for the rural population.

5. Reducing Soil and Ground Pollution

To avoid additional soil damage and soil/ground pollution, the following environmental requirements will be taken into account when working on the work sites[18]:

- Removal and reclamation of the fertile soil layer will be carried out according to the requirements of the Resolution N424 of the Government of Georgia "On the Removal, Storage, Use and Reclamation of the Topsoil" of 31 December 2013";
- The removed fertile layer will be stored in places protected from water impact as much as possible, separated from the non-humous layer. After the completion of the works, the humus layer will be used for reclamation works;
- The boundaries of the working areas are strictly defined in order to avoid possible contamination of adjacent areas, additional damage to the fertile soil layer and soil compaction;
- Motorway routes will be determined for vehicles and equipment and it will be prohibited to cross the road;
- When a fuel/oil leak is detected, the damage will be repaired immediately. Damaged vehicles will not be allowed on the work site;
- Materials and waste will be placed in such a way that there is no place for erosion and they are not carried away from the construction site by surface runoff;
- The generated agricultural-fecal wastewater will be properly managed;
- In case of a spill, the spilled material will be localized and the contaminated area will be cleaned immediately. Personnel will be provided with appropriate means (adsorbents, shovels, etc.);

[18] 6.9.3 Mitigation measures, p.249

- In case of a large amount of contamination, the contaminated soil and ground will be removed from the area for further remediation by a contractor licensed to do so;
- Staff briefing before starting work;
- After the completion of the construction works, the areas will be cleaned and recultivated.

During the operation phase of the HPP, the following events will be held:
- In the territories of power nodes liquidation means of the results of the spill will be placed;
- Control over fuel/oil storage and usage rules will be established;
- Control will be established over the implementation of the measures provided for in the waste management plan;
- In case of fuel/oil spillage, the area will be cleaned and contaminated soil and soil removed from the area for further remediation;
- The personnel will be instructed upon hiring and once a year thereafter.

6. Reducing the Risks of Development of Dangerous Geodynamic Processes

According to the EIA report, in order to avoid or minimize the risks of the development of dangerous geodynamic processes during the construction of the HPP project facilities and access roads, the following mitigating measures should be implemented[19]:

Measures to be taken during the building of construction and operational roads:
- Removing the formations in active dynamics on the upper slopes and giving the slopes an inclination angle corresponding to stability;
- Surface and ground water should be drained so as not to cause additional watering of the slopes below;
- Preventing the deformation of the road bed, if necessary, arranging gabions below it;
- Arranging channels (cuvettes) along the project corridor in order to prevent the development of erosive and landslide processes in the course of highway construction works);

[19] 6.5.3 Mitigation measures, p. 301

- Atmospheric water from the canals along the roads and ground water flowing from the slopes should be discharged in an organized manner (with concrete cuvettes) into the nearby natural ravines or the Rioni River;
- The technical condition of the water pipes, pipeline bridges and other engineering structures in the road corridors should be systematically monitored and, if necessary, appropriate corrective works should be carried out;
- It is necessary to monitor the landslide and erosion processes during the construction works and, if necessary, take appropriate measures.

The following measures will be taken into account during the construction phase of the hydroschemes:

- To improve the indicators of the physical and mechanical properties of the rocks at the locations of the dam and hydroelectric power plants, strengthening and bonding cementation should be performed;
- An anti-filtration curtain should be arranged in the alignment of the dams/schemes, so that the slopes do not become waterlogged in the lower reaches. Landslide processes provoked by them should not occur;
- Lava breccias and tufobreccias of the Middle Jurassic Baiosian floor in the dam leveling area are characterized by a high index of strength, as well as fracture, which causes different indicators of their deformation properties, for which:
  - the surface area will be cleaned, after which the rocks will be useful as a foundation;
  - in the same area, to a depth of 10 m, extensive reinforcing cementation will be performed;
  - for anti-filtration purposes, a cement curtain will be arranged at a depth of about 30-35 meters, and at a depth of 20-30 meters in the bed part;
  - drainage systems will be arranged;
- The main indicators of the reservoir pit assessment are: the stability of the slopes, and during operation, the scale and quality of the processing of the banks, as well as filtration events, to eliminate and stop the processes, the following will be implemented (developed):
  - A preliminary report on the estimated volume and intensity of the landslide masses descending into the reservoir.

- Study report on reworking of reservoir banks and related geodynamic processes.

- The area where the diversion tunnel is located is built from the sediments of the Bayos porphyritic sequence. Portals will also be opened in similar rock formations. Therefore, it will be performed:
  - strengthening and cleaning works of the areas adjacent to the portals (removal of insignificant slope sediments);
  - Where the tunnel track crosses the arched part of the Namokhvani anticline and the risk of faulting arises, which is manifested by the increased mining pressure in the arched part of the tunnel, the collapse of layers (which are almost horizontal) and the emergence of depressions. Therefore, in order to clarify the mitigating conditions and give additional recommendations, a complete engineering-geological survey of the diversion tunnel route (including geophysical works) will be necessary. The same applies to the locations of water intakes;
  - the location of the intermediate entrance to the tunnel will be determined and the trajectory of the access road will be specified in order to correctly determine the mitigation measures;
  - during the open-pit processing of the tunnel and underground excavation works, contour drilling and so-called "smooth blasting" methods will be used in order not to disturb the rock masses in the last contour;
  - immediately after the rock extraction and removal, a geological map is made, which represents a necessary part of the work in order to determine the reinforcement class and, based on this, to use the necessary reinforcement elements in a timely manner;
- According to the draft project, the water receiving facility will be located on the left side of the dam site, where the area is covered by dense forest. Rare rock outcrops are observed along the river, bearing the same characteristics as the rocks on the left bank. The mentioned rocks belong to "andesite porphyrites". From the environmental and technical point of view, the following measures will be taken during the open excavation near the water intake structure:
  - A careful blasting technique will be used, in particular, a drill-blasting method effectively developed in terms of staged blasting, which will prevent rock scattering and noise;
  - The pre-crushing method will be used. In modern blasting techniques, it is inevitable to use this method, which ensures the integrity of the slopes, stability and economy of the project;
  - After the explosion, a geological map will be prepared. In case of open excavation, measures necessary for stability will be used.

The following mitigating measures will be implemented to reduce the risks of activation of the landslide processes on the slopes of the water reservoirs:

- A modern instrumental monitoring system (including a network of inclinometers and piezometers) will be arranged in the contour of the N6 landslide. The monitoring system ensures the fixation of deformations in different directions with millimeter accuracy, and the data will be collected automatically. If significant landslide deformations are detected, appropriate measures will be taken.
- A stone gabion will be arranged at the base of the N8 landslide body, which will reduce the erosive action of river bank washing and the related dynamics of the landslide process;
- On the road passing near the N8 landslide body, as well as on the entire landslide body, visual monitoring will be periodically carried out by engineer-geologists and, if necessary, appropriate strengthening works will be carried out along the road, and in extreme cases, the said road section will be moved to high points of the slope;
- In the process of preparation of the water reservoirs, the active dynamic formations on the slopes of the reservoirs will be removed and the slopes will be given an angle of inclination corresponding to

stability;

- To mitigate landslide processes, periodic hydraulic washing of the bottom of the reservoir will be carried out, and to block or at least partially limit the action of landslides, arrange deep closed drainages on landslides and their adjacent slopes and collect ground water together and throw it into the nearby ravines and the main water channel;
- In order to protect the vegetation on the slopes around the reservoirs, uncontrolled cutting of trees will be prohibited within the water protection zone, and groves consisting of varieties adapted to local conditions will be planted in the areas where there is a lack of vegetation;
- During the entire life cycle of the HPP cascade, it will be ensured to monitor dangerous geological events on the perimeter of reservoirs and, if necessary, take appropriate preventive measures (geological study, project development and implementation).

7. Reducing the Impact on Flora and Vegetation

According to the EIA Report[20], as a result of a detailed botanical study, populations of species with high conservation value were identified in the project corridor, and negative impacts caused by the construction and operation of the project on the botanical receptors (flora and vegetation) of the project area were determined, after which any type of conservation/restoration and compensation measures will be finally identified and appropriate bioremediation specifications and compensation plans will be developed, as well as a monitoring plan for the botanical component of biodiversity. Moreover:

- Access roads within the selected territory for the planned warehouse with coordinates: X 313440.61; Y 4698437.50 should be cut along the banks of the river (in the flood zone) in order not to fragment the almost intact natural vegetation in the valley of the Lekereti River.

- In the case of removal of individuals of red-listed plants during the construction stage of the HPP, the relevant norms established by the law of Georgia will be observed; In case of cutting red list trees, their wood should be stored in a safe place and the compensation value of the removed resource should be determined according to its cubic volume;

- The Red-listed tree and shrub individuals with a trunk diameter smaller than 8 centimeters should be transplanted to safe areas from areas where construction activities will be carried out and areas where vegetation cover will be removed to create access roads. Replanting should be done in compliance with safety rules in a similar habitat from which the mentioned individuals will be uprooted.

[20] 6.8.2.3 Mitigation measures

- To reduce the risks of fragmentation of habitats, especially within the linear construction corridor, artificial crossings should be organized as much as possible;
- Before starting the works, the staff should be briefed on the issues of vegetation protection and species identification;
- Endemic, relict and red list species existing in the project corridor should be avoided as much as possible.
- Where it is possible to work with manpower, no machinery should be used.
- There should be no violation of established boundaries and arbitrary expansion of the boundaries of the tunnel corridor, road or HPP construction.
- The plan for the extraction of plant resources and the impact on the vegetation cover should be developed in such a way that the number of trees to be cut and the number of individuals of bushes to be uprooted from the understory is minimized;
- Preventive measures should be taken to prevent arbitrary, illegal cutting of forests by the population in cooperation with the municipality and community management and forestry department;
- The vegetation cover must be restored artificially or naturally on the roads created during the construction works, as well as on the areas cleared of vegetation, the maintenance of which will no longer be necessary after the completion of the works (e.g.: the territory of construction camps, secondary access roads);
- Environmental polluting materials: oil products, asbestos and substances containing heavy metals should be controlled and their spread in the environment should be avoided during the construction process.

Mitigation Measures at Operational Measures

Effects on flora and habitats

- Adjusting the mode of hydropeaks within the bounds of possibility
- Planting trees and plants in damaged areas (if available).
- Monitoring of trees and plants within the perimeter of the reservoir;
- A mandatory environmental charge will be carried out in the lower reaches of the dam;
- To compensate for the damage caused to the vegetation cover, forest stands will be planted/enlivened;

8. Reducing Impact on the Terrestial Animals

The following measures should be taken to mitigate the impact on terrestrial animals during the construction phase[21]:

[21] 6.8.3.4 Mitigation measures, p. 336

- The period of construction works near the river is selected as much as possible so that it does not coincide with the breeding period of otters (it should be noted that otters breed more in February-April. Babies are born at different times - in April-May, June-August, and often in December-February as well);
- There will be an instruction of the personnel employed on the construction and a corresponding warning regarding the prohibition of illegal hunting and fishing;
- Before starting the construction works, it will be checked whether there are otters in the project area;
- Detected nests and burrows will be recorded and access to them will be prohibited from April to July;
- The construction corridor will be protected so that earthworks do not go beyond the marked area and damage the otter burrows. Earthworks will be supervised by personnel with appropriate knowledge.
- Before construction works, access roads, river crossings (especially near sensitive sections) will be inspected for nests of resident birds of prey and footprints of predatory mammals;
- The detected nests and burrows will be registered and access to them will be prohibited from April to July;
- Vegetation will be preserved as much as possible in the corridors of the access roads and in the areas where the construction infrastructure is located, in order to minimize the risk of the destruction of hollow trees;
- In case of damage to the habitats of bats, the creation of a new, artificial habitat will be ensured (eg a bat house). Houses can be used as temporary shelters, it takes time (in many cases years) to use them for breeding and wintering. When using a bat house, it is necessary to monitor their use. It is better to place houses in advance. When using wooden houses, they need to be replaced every 3-5 years. The use of houses is a temporary mitigation measure until new habitat is created. Among the species, representatives of the genus *Pipistrellus* most often use bat houses.
- In order to preserve bat habitats, it is also possible to move a part of a tree trunk with an existing habitat. This method can be used as a temporary solution. The method involves moving a piece of cut wood and attaching it to another tree or burying it in the ground. In order to make it easier to find the entrance during relocation, it is important that the shape and position of the entrance is close to the old one. If moving to a bat abode, it is necessary to temporarily block the entrance. Transfer should be done with utmost care. It is preferable to use the method only if there is no possibility to keep the tree in the existing place. It is important to prepare the new residence before canceling the old one. However, the best thing is to preserve the existing habitat, because it takes a long time to establish an acceptable habitat for bats, and it also takes a long time to find new food and roosting areas;

● The construction corridor will be protected so that earthworks do not go beyond the marked area and do not cause additional damage to otter nests, bird nests and amphitheater shelters. Earthworks will be controlled by personnel with relevant knowledge;

● The traffic route will be protected;

● Optimal movement speeds will be selected to reduce the probability of direct impact on animals (collision);

● Pits, trenches etc. will be fenced off with some sort of resistance to prevent animals from falling in – brightly colored tape for larger species, any flat material for smaller animals eg. Tin, polyethylene, etc. Long planks or wooden logs will be lowered into the trenches and pits at night to allow small animals to climb out. Pits and trenches are inspected before filling with earth;

● There will be minimal use of directed light (the light beam will be directed to the ground surface as much as possible);

● Work that causes excessive disturbance to animals will be carried out in the shortest possible time (eg blasting works), if possible during the non-breeding period;

● After the completion of the construction works, in order to compensate the damage caused to the birds, up to 2,500 units (as determined by the EIA report of the base project[22]) of different types (in accordance with the established methodology) of artificial shelters will be arranged;

● After the completion of the construction works, the areas adjacent to the HPP communications and access roads will be recultivated, which will significantly reduce the impact related to habitat fragmentation.

● Water, soil and atmospheric air pollution, noise propagation, etc. will be conducted. of mitigating measures (see relevant subsections).

In addition to the above, it will be necessary to carry out the following measures:

● to appoint an environmental manager for the construction;

● to develop and implement an environmental management plan;

● to develop and implement a solid waste management plan;

● to clear the reservoir tank of trees and shrubs;

● On the slopes surrounding the reservoir, fertile soil should be preserved for conservation and further greening of the area;

● to prohibit hunting in the project's impact area for a long time;

● to carry out procedures to determine the causes of animal death;

● to develop and implement a complete monitoring program. During the construction period, it is necessary:

[22] In the areas of the changes included in the project, there were no favorable housing places for the Chiroptera.

- A pre-construction study should be conducted;
- Those sensitive areas, which include specific faunal complexes and species included in the red list should be included in the construction contractor's contract
- No mating (nesting) area (unless it is remote from the construction site) should be damaged without study and permission from the relevant experts. In order to mark breeding and nesting areas that pose a threat to species, it is necessary to make a detailed inventory of them before starting the works. This should be taken into account in the detailed construction project;
- Before starting the work, the contractor must mark all the areas referred to in the construction program;
- Habitat areas of protected animals should not be disturbed or damaged without prior study and expert permission. In order to determine the boundaries of the habitat areas of individual animals and sensitive communities (vertebrates and invertebrates), it is necessary to carry out field studies only after the construction sites are marked. This should be done before the start of preparatory work (cleaning work). Relevant requirements should be written in detail in the construction program;
- To mitigate the temporary impact of construction activities, the developer should take into account the phenological characteristics of sensitive species (such as breeding, nesting, migration and hibernation periods, especially hibernation). It is necessary to recommend that construction works in sensitive areas be carried out in July-August and at the end of October-December;
- Blasting in these areas should be prohibited from the end of March to the end of July;

Operation Phase:

- The lower reaches of the dam will be subject to a mandatory environmental charge;
- In order to compensate for the damage caused to the vegetation cover, forest groves will be planted/enlivened;
- Awareness raising of the population and service personnel regarding illegal hunting/fishing is also envisaged and monitoring will be established.

During the construction and operation of the project, constant monitoring is required, namely:

- Management of infrastructure of solid waste and labor camps at the construction site;
- management of inert waste at landfills in order to protect the water ecosystem of the reservoir from pollution;
- Control of water quality in the reservoir during reservoir emptying and filling to comply with water pollution control regulations and monitor reservoir emptying.
- Provision of water pollution control regulations in the waste water catchment and monitoring of changes in the water ecosystem of the district.
- Ensuring the coordination of environmental monitoring in the construction area according to the obligations stipulated in the contract.

Zoological monitoring:

- Mortality of animals on displacement roads (especially large mammals) - to record and collect together cases that occurred in a certain area;
- Breeding areas on construction sites (birds, bats, mammals) - the mentioned point must be in accordance with the contractual obligations.
- The use of green bridges and tunnels (if any) on local roads to ensure appropriate environmental

conditions and prevent poaching in such areas. Check and improve the effectiveness of these measures.

- Check and record the status of local populations of brown bear, otter, European elk between Lekhidar and Lekereti rivers. Banks of Namakhvani Reservoir - check and record possible adverse effects on the local population of these species in the project impact area.
- Migration of birds through the plain of Rioni in the area of influence. Determine the positive effect of the new reservoir.
- Breeding of birds (waterfowl and raptors) in the affected area. Determine the positive effect of the new reservoir.

Furthermore, it will be necessary to carry out the following measures:

- to appoint an environmental manager for the construction;
- to develop and implement an environmental management plan (WMP);
- Separately from the environmental management plan (WMP), or together therewith, an invasive Species Management Plan (ISMP) should be developed and implemented;
- to develop and implement a career management plan (QMP);
- to develop and implement a water management plan (WWMP);
- to develop and implement a solid waste management plan (SWMP);
- The reservoir tank should be cleared of trees and shrubs;
- On the slopes surrounding the reservoir, fertile soil should be preserved for conservation and further greening of the area;
- Prohibit hunting in the project's impact area for a long time;
- Procedures should be carried out to determine the causes of animal deaths (mammals may die on roads, and birds may die on power lines and substations);
- To develop and implement a complete monitoring program.

9. Reducing the Impact on Ichthyofauna

To reduce the expected impact on fish, the following mitigation measures should be implemented[23]:

[23] 6.8.4.3 Mitigation measures, p. 343

- Change of the river bed should be carried out with the participation of relevant specialists, and in case of exclusion of fish in the bed left without water, they should be collected and released into the watery river bed.
- After washing the reservoir, adjustment of the closing speeds of the shut-off valves should be ensured. Generally acceptable rate is 30 to 50 m3/hour.
- In the lower side of the dam, the established ecological flow should be ensured, namely 16 m3/s.
- Downstream of the power house, river habitat management measures such as river channel engineering or creation of artificial ponds used as refuges during peak loads should be considered.
- As determined by the EIA Report of the base project, during the operation phase, whitebait of local species (bred locally, not purchased) will be introduced into the upper and lower buffets of the dam. Specific conditions for launching whitebait are determined by monitoring results planned for the operational phase.
- As it is known, the arrangement of fish ponds on high dams is not effective and therefore unacceptable. In order to compensate the damage caused to ichthyofauna, artificial reproduction is appropriate, artificial reproduction measures will be carried out in the amount determined within the framework of the base project;
- Systematic control of the implementation of the measures provided for in the waste management plan;
- Arrangement of a compact biological treatment facility for agricultural-fecal waste water for the power station and control of their work efficiency;
- Systematic supervision of fuel/oil storage and use rules compliance;
- In case of accidental fuel/oil spillage, localization of pollution and implementation of measures to prevent it from entering surface waters.

10. Reducing the Impact on the Microclimate of the Vineyards

According to the microclimate impact assessment report[24] attached to the EIA report, although no significant impact is expected on the microclimate of the vineyards in the Rioni River valley, the following measures will be planned and implemented within the framework of the project at the construction stage[25]:

- Microclimate characterization and monitoring of the existing vineyards will be carried out in Tvish Village, Mekvena Village and Derchi Village at a distance of 100 m from the project reservoirs.

[24] 1.2.4 Mitigation Strategy, p. 40
[25] 6.3.3 Mitigation measures, p.290

- In terms of the specific quality (taste) of Tvish grapes, the main parameters of grape quality will also be monitored within the project, which provides a quantitative analysis to assess whether there has been a noticeable change in the quality/composition of the grapes. The results of the monitoring may further enable the village. Assessing the level of adverse effects on Twish and other vineyard operations affected by the project.
- In addition, it will be considered to include activities in the community investment program to help winemakers. A microclimate and grape quality monitoring plan will be developed, which includes the following issues:

○ Appropriate consultation will be obtained to develop the details of the monitoring plan and, as necessary, to conduct detailed socio-economic research focusing on winegrowers.

○ The draft monitoring plan will be discussed with the local vineyard owners and will be revised based on the data provided by them.

○ Vineyards within 100m of the reservoirs will be mapped and each plot will be surveyed to document the quality and conditions of grape production.

○ A network of weather stations and temperature/humidity sensors will be installed to monitor and characterize the local climate of vineyards in the project area, as well as to assess whether the reservoir and construction activities affect grape quality and production rates by affecting the local climate. 2 years of measurements are considered for the operation period.

○ Field surveys will be conducted during construction and during the 2-year operation phase to document grape quality.

○ Local growers will be invited to participate in monitoring.

○ If, as a result of monitoring, the negative impact of changes in microclimatic parameters on the quality of grapes in the vicinity of the reservoir area is determined, mitigating and compensatory measures will be discussed and implemented with the owners of the affected vineyards.

11. Reducing the Visual-Landscape Impact

The visual-landscape impact will be mitigated by implementing the following measures [26]:

[26] 6.10.3 Mitigation measures, p.353

- The design of permanent buildings will be selected in a way that is compatible with the environment, both during the construction and operation stages;
- As far as possible, inconspicuous places will be selected for placement of temporary constructions, materials and waste; Sanitary-ecological conditions will be protected both during the construction and operation stages;
- After the completion of the construction works, reclamation works will be carried out (especially on the waste rock dump);
- After the completion of construction, trees and plants of local species will be planted in the vicinity of the power unit.

Conditions for Environmental Impact Assessment Report

The environmental decision issued by the Minister's order of 28 February 2020, in accordance with the requirements of the Code and on the basis of expertise, includes mandatory conditions.

Furthermore, according to Paragraph 4 of the decision, "Enka Renewables" LLC must ensure the implementation of its activities on the location of the hydroelectric power plants cascade (Tvishi HPP - 100 MW installed capacity and Namakhvani-Zhoneti HPP - 333 MW installed capacity) on the Rioni River in accordance with Environmental Impact Report N73 approved by Order Ni-1014 of the Minister of Environment and Natural Resources Protection and under the conditions stipulated by the order regarding changes in operating conditions (Qveda Namakhvani) in the construction and operation project of the cascade of two hydropower schemes on the Rioni River (Tvishi HPP - 100 MW installed capacity and Namakhvani-Zhoneti HPP - 333 MW installed capacity)

This means that the mitigating measures given in the first part of the above-mentioned document, as well as the conditions of the Environmental Impact Report, must be fulfilled.

Furthermore, the company was ordered to fulfill the following conditions related to mitigation measures:

5. "Enka Renewables" LLC shall, within a period of 20 months from the issuance of the environmental decision, ensure a study of the dynamics of the formation of the shore of the so-called "Big Island" in Poti, consider coastal protection/engineering and compensatory measures with the involvement of relevant agencies/organizations and present the relevant research results, taking into account the existing studies, to the Ministry for agreement .
7. "Enka Renewables" LLC shall present the conditions for extinguishing the energy of the flow carried by deep spillways before the construction of the dam.

8. "Enka Renewable" LLC presented the project and program of the filtration water monitoring system from the derivation-pressurization tunnel during the operation period before the start of the construction of the tunnel.
9. A list of the inventory and equipment needed for the preventive and liquidation measures of accidental spillage of turbine oils into water will be presented within two months from the issuance of the environmental decision by "Enka Renewable" LLC.
10. Before the construction of the dam by "Enka Renewables" LLC, the conditions for transforming the flood in the reservoir and the regimes (quantity, periodicity) of water releases into the lower reaches of the river will be presented to the Ministry. Taking into account the marginally permissible discharge norms in the lower reaches of the river.
11. "Enka Renewables" LLC shall ensure the submission of the reservoir filling (first filling) schedule to the Ministry for agreement, indicating the amount of water discharge into the lower reaches within 2 months from the issuance of the environmental decision.
12. Before the start of construction and during the construction-operation stage, "Enka Renewables" LLC should provide periodic visual monitoring of the layout of the infrastructural facilities of the HPP and adjacent landslide areas (especially in order to control their influence on the reservoir's stability) and submit the results to the Ministry for consideration once in 6 months.
13. "Enka Renewables" LLC should ensure the establishment of an instrumental monitoring system on the N6 landslide (Goni Massif) and to this end conduct relevant preliminary studies and present the results to the Ministry. The implementation of the mentioned studies is allowed in parallel with the construction of the HPP, and the installation of the monitoring system must be ensured before the reservoir is put into operation. Taking into account the fact that the arrangement of piezometers and inclinometers on the landslide body is planned (for which it will be necessary to drill wells), in order to determine the capacity of the landslide body (climbing plane or the location of the weakening zone in depth), it should be ensured that the information obtained as a result of drilling wells should be presented to the Ministry for agreement.
14. "Enka Renewables" LLC should ensure a detailed engineering-geological survey of both the derivation and the lead tunnel route (parallel to the construction of the tunnel) and present the results to the Ministry (an internationally recognized requirement is simultaneous evaluation and observation during tunneling).

15. "Enka Renewables" LLC should provide a detailed monitoring plan for agreement in the Ministry, where it will be considered to create a monitoring system for the spread of emissions and dust generated during the construction process. If necessary, develop additional mitigating measures and agree with the Ministry.
16. "Enka Renewables" LLC should provide the results of hydrogeological monitoring of sources in the project area to the Ministry (once a year). Special attention should be paid to the water supply facilities of populated areas and the possible reduction or loss of their debit due to the influence of the HPP infrastructure. In this case, the population should be provided with alternative water supply.
17. Before putting the HPP into operation, Enka Renewables LLC should present to the Ministry, in agreement with the existing HPPs on the Rioni River, information prepared based on additional detailed studies regarding the impact of the change in the water regime and increased turbidity of the Rioni River caused by the operation of the HPPs, where it reflects the impact caused by the operation of the HPPs, the prevention of this impact and, if necessary, information on compensatory measures in relation to aquatic biodiversity.
18. Taking into account the results of additional studies on sturgeons and water biodiversity, the regime and periodicity of washing reservoirs should be agreed between "Enka Renewables" LLC and the operators of the HPPs in the upstream and downstream of the dam Before each wash, "Enka Renewables" LLC should provide advance information to the Ministry indicating the amount of water used.
19. "Enka Renewables" LLC should ensure the arrangement of the fishing facility in accordance with the Resolution N423 of the Government of Georgia on the "Approval of Technical Regulations for the Protection of Fishing and Fish Stocks" of 31 December 2013.
20. "Enka Renewables" LLC should ensure the production of additional ichthyological studies by assessing the dynamics of seasonal quantitative changes, both before the construction of the HPP and during the operation period, and presenting the results for consideration in the Ministry.
21. "Enka Renewables" LLC shall provide monitoring of the temperature of the river water before the reservoir, on the surface and in the depth of the reservoir, the temperature of the water coming out of the dam directly near the dam and downstream of the dam. Water temperature monitoring system, reporting form and frequency should be agreed with the Ministry.
22. Through agro-meteorological stations, "Enka Renewables" LLC should provide constant monitoring of air and soil temperature and humidity, as well as wind speed, solar radiation and other meteorological parameters.

The type of agro-meteorological stations, location, frequency of data collection and frequency of presentation of results shall be agreed with the Ministry.

Based on the results of monitoring, if necessary, provide additional mitigating/compensatory measures to be agreed with the Ministry.

23. "Enka Renewables" LLC should monitor the quality characteristics of grapes and wine produced in Tvishi area provided for in the EIA report before the start of construction and continue after the commissioning of the HPP to ensure the comparison of data and to take appropriate mitigating and/or compensatory measures. Such mitigating and/or compensatory measures should be agreed with the Ministry.