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ENVIRONMENTAL IMPACT ASSESSMENT DUE TO WATER SUPPLY WORKS OF ARMENIŞ COMMUNITY, CARAŞ-SEVERIN COUNTY

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Abstract: Since at present the national policy is geared towards the sustainable development of the country, which is made possible only through the qualitative progress of economic and social relations and their harmonious interaction with environmental factors, the implementation of new tools and mechanisms is absolutely necessary, one of these tools/mechanisms being the strategic environmental assessment. Strategic environmental assessment is first and foremost a tool that contributes to diminishing the negative impact on the environment as a result of the proposed strategic actions, it makes decision-making more efficient and improves the quality of the administration structure, being considered a mandatory mechanism that contributes to the sustainable development and to ensuring the ecological security.

Any economic activity is closely related to the exploitation of the environment, whether we refer to the exploitation of soil or subsoil resources for heavy and processing industries, the exploitation of fauna and flora for tourist and spa-climatic purposes or of certain works such as the construction of a system of water supply meant to contribute to raising the living standard of the respective locality. Any imbalance in the environment can lead to huge losses in that economic area, sometimes even to the collapse of that economic branch. If economic development depends on environment protection, then it is necessary to say that the latter is more important as it conditions the former.

Keywords: environment, water supply, environmental factors, water, soil

1. INTRODUCTION.GENERAL DESCRIPTION OF CARAŞ SEVERIN COUNTY

The assessment of environmental impact identifies, describes and evaluates, as appropriate for each case, in accordance with the provisions of the present decision, the direct and indirect effects of a project on the following factors: human beings, fauna and flora; soil, water, air, climate and landscape; material goods and cultural heritage; as well as the interaction between these factors.

The county of Caras Severin is located in the southwest of Romania, in the West 5 Development Region, and has an area of 8,519.76 km2, representing 26.59% of the total area of the region. Caras-Severin county borders with Timis county to the northwest, Hunedoara county to the northeast, Gorj county to the east, Mehedinti county to the southeast and the Republic of Serbia to the southwest - the state border, with length of 134 km, of which 65 km is the border represented by the Danube river.

The map in figure 1 shows visually the location of Caras-Severin country in the Development Region 5 -West. There are 77 basic territorial-administrative units in the county: 2 municipalities, 6 cities and 69 municipalities (having a variable number of villages), totalling 309 settlements.

Figure 1. County map CARAŞ - SEVERIN (administrative boundaries, geography, localities)
Source: Territorial Planning Plan of Caras-Severin County

The region benefits from various natural resources, with potential for development for many types of socio-economic activities [1].

Water resources play an important role in the development of the economy; there are hydro technical arrangements with energy production, water supply for the population and other uses.

2. GENERAL CHARACTERISTICS OF THE LOCATION STUDIED

Armeniş country (Figure 2) has a population of about 2000 inhabitants and is located in the east of Caraş-Severin county, located in the Timiş - Cerna corridor, a corridor that connects the depression of Caransebeş and the depression of Orsova, at a distance of approx. 25 kilometres from the town of Caransebeş, in the valley that separates the Semenic Mountains from the Tarcului Mountains. The locality

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is crossed by the Timiş river. The access to the locality is made on the national road number.

The area is characterized by thick and deep keys (Armeniş and Teregovei) through massive and old forests, through tumultuous waters with great energy potential (Feniş, Timiş, Hideg rivers) on that, over the years were build artificial accumulations (Tree Rivers Dam) Water, and now in work, Rusca-Teregova Dam).

Figure 2. Image of Armeniş

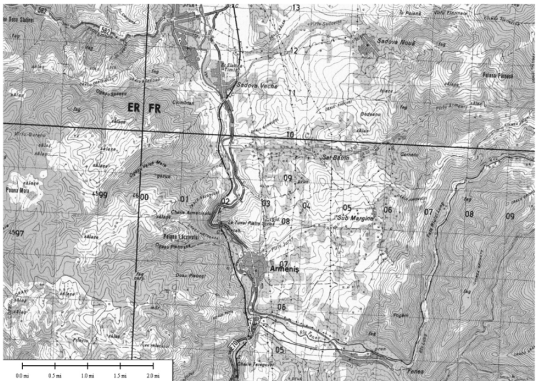

Figure 3. Armeniş – location

3. WATER RESOURCES

UNDERGROUND WATER

The groundwater from the perimeter of the locality is confined to the coarse sedimentary layers sediment at the base of the fluvial terrace, with the source of infiltration of the meteoric water falling on the slopes developed towards E.

The level at which the infiltration is stabilized in a stable hydro structure ranges from 4-6 m from the morphological surface, quotas can be found in the wells in the perimeter.

In the meadow areas, the western slope has a double supply, which is achieved both by infiltration phenomena in the riverbed and by the infiltration of meteoric waters.

WATER SURFACE

The intra-urban perimeter of the locality is located on the right bank of Timiş, on the upper terrace developed piecemeal in the area, on the basis of terraces with terraces with flattened ridge, deforested.

The river meadow develops on both banks of the river, constituting its major riverbed from which with a deviation of the order of 15-20 m, the upper terrace of the river develops. The connection is made after a bend of the slope line of the order of 15 to 25 degrees, downstream of the locality. In the perimeter of Armeniş is included the reception area of the Timiş river, whose collecting surface on the territory of Romania amounts to 5248 km^2 [2].

CLIMATE ELEMENTS

AIR QUALITY

From the point of view of the climate rayon (according to the climatological atlas of Romania), the Armeniş area is part of the climatic province of Piedmont hills, the support of the climatic zones of steep slopes sheltered.

Armeniş locality is characterized by absolute maximum temperatures 38.1ºC (17.08.1952) and absolute minimum temperatures - 23ºC (8.01.1947), while the average annual precipitation is around 700 mm, with the maximum absolute amount in 24 hours of 76.6 mm in 24.08.1951.

For this area the first day of frost is in the range 1.10 - 11.10, and the last frost is between 21.04 - 1.05. Also, the annual number of days with snowfall is 25-30 days, and those with snow cover of 60-80 days.

The prevailing wind direction is from SE to NV, with a speed of 1-2 m / s.

CLIMATE ELEMENTS

TECHNOLOGY SCHEME OF WATER SUPPLY

The water provided by this system is collected upstream from the locality of Fenesti in the Dragota stream.

CAPTURE

The catch will be located in the locality of Feneş, a village belonging to the commune of Armeniş on the Dragota stream, a tributary to the left of the Feneş river (White River). It is proposed to make a seizure through the drain, at 1.5 m below the watercourse.

Water capture is achieved by gravitational flow.

This catches from time to time and especially after large waters, must be cleaned. This operation consists in removing the alluvium from the drain filter (dragged solid flow) and uncovering at least 5 cm of sand and replacing another layer of clean sand, instead of the clogged one.

All the objects of the capture (capture by drainage) will be fenced, ensuring the sanitary protection and thus respecting the provisions of the instructions of the Ministry of Health.

The catchment has been sized so that even in small waters the flow necessary to satisfy the water consumption in the commune is ensured.

The water of the Dragota stream is infiltrated through the riverbed and through the reverse filter, directly into the drainage pipe. Due to the longitudinal slope, the water will be transported to the pipeline,

and thereby to the filtration container.

Between the drain and the pipeline there will be installed a visiting fireplace that allows the sampling of water for monitoring its quality. Both the quality of the water captured and the quantity will be monitored.

When the amount of water captured is noticeably small, the reverse filter should be applied, as the filter has become clogged and the sand layer should be replaced.

The clogged sand is transported to the local garbage dump, it is not a polluting factor. The capture cycle is resumed until another snack.

The capture will be fenced with a protective fence that will ensure the perimeter of severe regime. The length of the protection will comply with the rules in force.

The adduction of the water from the capture to the treatment station is gravitationally carried out by a pipe with a length of about 4.5 km and the diameter Dn = 200 mm.

TREATMENT STATION

To clean the water, it will be located near the storage tank of Armeniş, a platform on which the Eurocontainer containing the filters and the water disinfection apparatus will be placed.

The container represents the water treatment station. It, as well as the storage tank of drinking water will be surrounded by a fence that will ensure (according to the sanitary norms) the sanitary protection regime.

The fencing will be made of prefabricated concrete fence (columns of b.a. and prefabricated panels 5 rows).

The access to the tank and the filtration station will be through a road with l = 3.5 m.

The road will be of broken stone, over which a double bituminous treatment will be poured. The drainage channels for the discharge of rainwater with discharge into the street channels of the locality will be established [2] .

4. THE IMPACT PRODUCED ON THE ENVIRONMENT

IMPACT PRODUCED IN THE PERIOD OF EXECUTION

The activity of arrangement, construction of the objective involves the modification of the ground surface with a certain extension to the underground layers with the possibility of affecting the groundwater.

The groundwater from the two villages is partially affected by the constructions for water supply works. Imputation of groundwater and surface water can occur due to possible accidental leakage from construction machinery and equipment, leaks that can be avoided by using high-performance machinery and equipment.

Surface water is not affected during the execution period.

THE IMPACT PRODUCED ON THE AIR

In order to achieve the objective, excavation works, earth transport, concrete, machinery, etc. will be performed which involves the use of heavy means of transport, bulldozers, excavators, cranes, etc. The resulting damages will be: NOx, CO, SO2, volatile organic compounds (VOCs), smoke, particles, etc.

During the execution of the works, by manipulating the building materials, air pollution can be realized, mainly with dust-like nooks. Therefore, the main pollutant will be the dust that will be released during the execution of the excavation, loading and transportation of the earth.

THE IMPACT PRODUCED ON VEGETATION AND FAUNA

During the execution phase of the works, because the water farms designed for the two localities are located in green spaces, the vegetation on these sites is temporarily affected, on a relatively small area.

THE IMPACT PRODUCED ON THE SOIL AND THE SOIL

Through the activities undertaken during the execution period, both the soil and the subsoil will not be affected because there will be a modification of a restricted surface of the soil, with a certain insignificant extension to the underground layers.

During the execution period will result in wastes that will be temporarily deposited, being evacuated immediately by the builder in the areas with pronounced slopes indicated by the town hall of Armeniş.

THE IMPACT OF THE PRODUCT ON HUMAN AFFAIRS AND OTHER OBJECTIVES

The projected water supply works are not important sources of pollution for the inhabitants of the immediate vicinity of the water management.

During the execution of the works, the impact produced by the construction machinery is below the limits allowed by the norms in force (noise, vibration, etc.).

Pollutants that can affect human settlements:

- emissions of pollutants into the air;
- noise level.

Noise has negative effects on the body depending on the intensity, frequency, duration, age, physical condition and sensitivity of the person.

Analysing the level of noise and pollutants in the emission, the impact on human settlements is minimal, without negative effects.

During the period of execution these sources of pollution will not significantly affect the population of the two localities [1,2].

EVALUATION OF THE RISK OF THE INITIATION OF ANY ACCIDENTS OR MAJOR IMPACT DAMAGES ON THE POPULATION HEALTH AND THE ENVIRONMENT

When executing the works, to minimize the risk of accidents or damage with an impact on the environment, the manufacturer will comply with the provisions of the regulations in force.

5. IMPACT PRODUCED IN THE OPERATING PERIOD

THE IMPACT PRODUCED ON THE WATERS

The waste water from the washing of the installations and of the tanks will be evacuated by means of open channels in the watercourses that cross these localities or near them respecting the quality conditions imposed by NTPA 001/2002.

The purpose of this regulation is to establish the conditions under which the wastewater discharge takes place in the natural receivers so as to ensure their protection and normal functioning, as well as the protection of the environment from the adverse effects of the wastewater discharges.

In the case of proper maintenance and exploitation, the waters from the washing of the component parts of the water management will not have special loads, and the impact of these washes on the environment will be insignificant.

THE IMPACT PRODUCED ON THE AIR, VEGETATION AND TERRESTRIAL FAUNA

The objective will not have a significant impact on the quality of the air, in case of a proper operation.

During the period of operation, the vegetation and terrestrial fauna on the commune's hearth, respectively of the localities will not be affected by the projected objectives.

IMPACT ON SOIL AND SUBSOIL

The exploitation of the projected objectives will not affect the quality of the soil, or the quality of the subsoil, if the legislation in force is respected.

ASSESSING THE RISK OF TRIGGERING ACCIDENTS OR DAMAGE WITH MAJOR IMPACT ON THE HEALTH OF THE POPULATION AND THE ENVIRONMENT

The projected objectives do not represent potential sources for the production of accidents or damages with major impact on the health of the population and the environment, thus respecting the norms of environmental protection and sanitary hygiene.

In order to avoid a risk with a major impact on the health of the population, it is necessary to carry out periodic analyses regarding the quality of the water from the source, in compliance with the provisions of STAS 1342-91.

IMPACT ASSESSMENT

The environmental impact assessment can be done both on the basis of the quality index (Ic) and the multicriteria analysis based on the martial method, and on the basis of the pollution index (Ip).

Activities with an impact on the environment during the execution and exploitation periods may have:

- the works during the drainage execution;
- damage to the pumping units;
- interruptions in the supply of electricity;
- accidental damage at different points of the water supply system; damage to the machines used during the execution period.

6. IMPACT ASSESSMENT ON QUALITY INDEX (CI)

The quality of an environmental factor or element of the environment refers to the limits allowed by STAS or Regulatory Regulations, or the effects of the project on the environment based on the size of the quality indicator obtained in relation to the regulated one are estimated.

The value of the quality index (Ic) is given by the formula:

Ic = 1 / ± E where ± E represents the magnitude of the effect established by the evaluation matrix.

The interdependence between the actions of the project and the effects on the environment (E) can be highlighted by marking in the corresponding box its size estimated by a common system for the whole set as follows:

+ positive influence;

0 null influence;

- negative influence ;

± E - positive or negative effect resulting from the quantification of the influences of the projected activity on the environmental factors, in relation to the regulatory norms.

The size of the quality indicator can highlight the following influences:

- Ic = 0 ... 1 - the influences are positive and the environment is affected within the permissible limits;
- Ic = -1 ... 0 - the influences are negative and the environment is affected beyond the allowed limits-

bile;

- Ic = 0 - the state of the environment is not affected in the project.

GLOBAL IMPACT ASSESSMENT

The evaluation of the global impact on the environment is based on the value of the quality index Ic and on the rating scale rated from 1 to 10.

GLOBAL IMPACT ASSESSMENT METHOD

It is a quantitative type analytical method based on the global pollution index (IPG), which results from the ratio between the natural state (natural) and the real state (pollution).

The ideal state and the real state are represented

graphically by a diagram inscribed in a circle with the radius of 10 units of goodness, the shape of which depends on the number of environmental factors analysed.

The ideal state (Si) is graphically represented by a regular geometric form inscribed in a circle with the radius of 10 units of goodness.

The real state (Sr) is an irregular geometric figure obtained by joining the points that represent the equivalent value of the quality index in the quality scale and which is inscribed in the regular geometric figure of the ideal state.

The global pollution index (IPG) results from the report representing the ideal state (Si) and the real state (Sr) according to the equation:

IPG = Si / Sr

if: IPG = 1 - no pollution;

if: IPG > 1 - there are environmental quality changes.

IMPACT ASSESSMENT IN THE PERIOD OF PERFORMANCE

The environmental factors that are analysed in the impact assessment study are the following:

- the water;
- the ground;
- human settlements.

With 3 environmental factors analysed, we will obtain an equilateral triangle, in the case of the ideal state and an irregular triangle, in the case of the real state.

$$Sr = S1 + S2 + S3$$

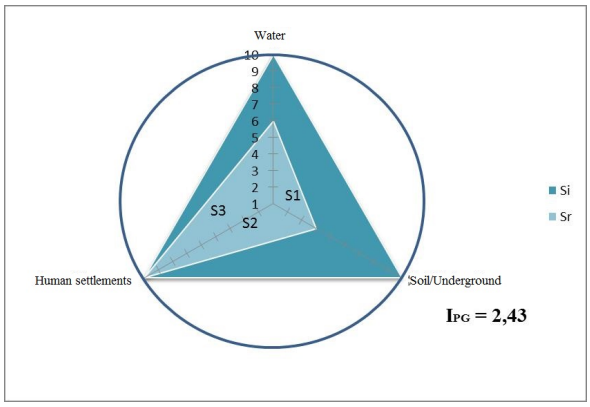

Figure 4. Assessment of the global impact during the operating period

To find out the surface of the irregular triangle, afferent to the real state, we will first divide the triangle into three smaller triangles by joining the bisectors of the three angles. We will calculate the surfaces of the 3 triangles, and their sum will give the value of the real state [4].

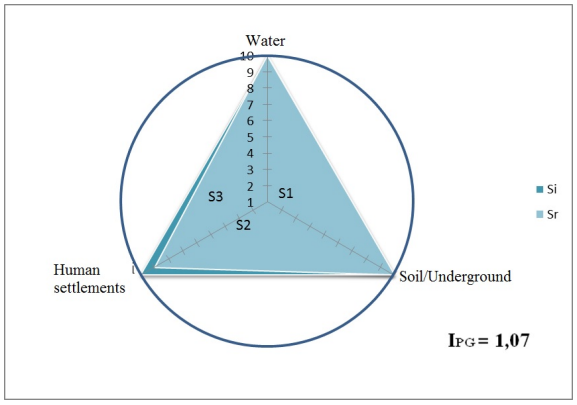

Figure 5. Assessment of the global impact during the exploitation period

POSSIBILITIES OF REDUCING OR ELIMINATING THE IMPACT ON THE ENVIRONMENT

Measures that can be taken in technology or in the activity itself

The design was done on the basis of the general requirements which mainly focused on the protection of workers, operating personnel and the environment.

Reducing or eliminating the impact produced on the environment by the designed works can be achieved by the following measures:

• the excavation is not kept open and the filling operations are carried out the same day;

• there are no special constructions or other loads that may constitute an overload within the limit of the possible breaking prism;

• the depth of the excavation is relatively small, respectively 1.0 m in volatile plastic soils and sands in thick state and 1.5 m in soils of strong consistency.

• the excavations for drainages are carried out on the maximum three sections of 4 ... 6 m long, from downstream to upstream, permanently ensuring the drainage of the water from the excavations by free fall;

• the collection and management of the water in drainages with rigid drainage is provided by gravity through channels covered with semi-round caps, dry masonry or riveted tubes;

• the ventilation wells, the hostels and the drain heads are designed and constructed in such a way as to ensure the functionality of both gravitational drainage and natural ventilation drainage;

• in the drainage filling, gravel is used sort (7 ... 40 mm) SR 667 continuous granularity, negligible rough stone, max. 200 mm ;

• Ballast is used to make the reverse filter, the sort (0-71 mm) with continuous granularity;

• for excavation drains, it is used as a geotextile reverse filter with characteristics provided by the project depending on the type of terrain in which it is laid;

• for the determination of the water quality from the physical-chemical and biological point of view, two water samples will be taken, in dynamic regime, according to the harvesting methodology;

• the samples will be transmitted to the laboratory

within a maximum of 24 hours after the harvest, for chemical analysis and 4 hours for biological analysis;

• a perimeter of sanitary protection will be set up around the body shop;

• all the projected objectives will be properly maintained;

• the maintenance and operation personnel will be trained periodically; it shall also be provided with appropriate protective equipment;

• the execution areas will be signalled with road signs;

• the treatment station will be equipped with a high-performance dosing apparatus to avoid the accidental impact on the environment and the operating personnel;

The machines used both during the execution period and during the operating period will comply with the conditions required by the environmental legislation, as well as those for the protection of the work [5].

CONCLUSIONS AND RECOMMENDATIONS

From the analysis of the final results for the two stages characteristic of the execution and exploitation of the drinking water supply of Armeniş commune, the following conclusions are drawn:

For the execution period:

- the activities generating impact on the environment are, first of all, those related to the execution of the drainage and the constructions related to the water supply system;

- soil and groundwater are significantly affected during the execution period;

- the pollution of the WATER factor during the execution period exceeds the allowed limits, and the impact is negative.

- the proposed site for achieving the objective occupies a land free of constructions, within the commune and does not affect the living areas;

- by performing the drainage with reverse filter and the auxiliary constructions, good quality water will be provided for the consumers from the localities of Armeniş and Feneş;

- the water quality will suffer during the execution period and I do not respect the drinking conditions provided by the standards in force;

-waste water and storm water will be discharged through streams in natural watercourses that cross localities or near them;

- the concentrations of pollutants in the waste water discharged will exceed the limits allowed by NTPA 001-2002 [4];

- the noise level will fall below the limits allowed by the technical norms;

- in case of damage or accidents, the health of the population may be affected, if the quality of the distributed water does not comply with the provisions of STAS 1342-91 [23].

For the operating period:

- soil and groundwater are not affected during the exploitation period except in accidental situations (earthquakes, surprises, etc.);

- human settlements will not suffer because of the project.

- the proposed site for the realization of the project occupies a free land of constructions, within the commune and does not affect the living areas;

- by making the drainage and the water treatment station a very good quality water will be provided for the consumers of Armeniş commune;

- the water quality will comply with the drinking conditions provided by the standards in force;

- wastewater and rainwater will be evacuated through streams in natural watercourses that cross localities or close to them;

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