

THE LANDSCAPE IMPACT OF THE CONSTRUCTION OF THE CALAFAT-VIDIN CROSS – DANUBE BRIDGE

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The construction of the road and railway bridge will be performed over Danube River in the Vidin (Bulgaria) and Calafat (Romania) area situated 796 km North from the two cities. This transport infrastructure represents a component of the European system of international motorways as well as of the Southern sector of the Pan-European Fourth Corridor (Berlin-Salonic). The importance of tackling this subject mainly refers to providing a clear image of the positive and negative effects that result from the construction of this bridge over Danube, from Calafat to Vidin, taking into account the initial environmental conditions. Therefore, an assessment of the landscape characteristics is proposed, being established the current situation and being determined the types of impact resulting from the construction of the bridge.

The Landscape Characteristics

Considering the construction area of the future transport infrastructure, we can state that the Danube River is its dominant landscape element. In this respect, at the proposed chainage of the bridge at kilometer 796 one may notice that the river is 1300 m wide. In the middle of the river there is situated an island covered by poplars and willows. Currently, the small forest on the island is subject to clearing for building purposes. However before the present period the clearing action was illegally performed. The ferry harbors on both Danube shores are situated north east of Vidin and west of Calafat respectively.

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Generally speaking, the relief on both shores is plain, without well defined positive or negative forms. The Bulgarian shore's quote is 25m lower than the Romanian one, under these conditions the river forming a wider valley on the Bulgarian shore.

The holm of the river is on the Bulgarian shore where it reaches up to 1700 m width, the quotes of the soil varying between 30,0 and 31,5 m from the sea level. The first easily flooded terrace is on both Bulgarian and Romanian shores close to the river bed and the quotes of the land vary between 35,0 and 48,0 m above the sea level on the Bulgarian shore, growing toward the interior and between 53,0 and 56,0 m on the Romanian shore.

According to the Bulgarian classification (Georgiev, 1977) the site belongs to the area of moderately continental steppe, holm steppe and forest steppe; the chernozem steppe and the loess horizon having a wide agricultural use.

The access area on the Bulgarian shore is made through the old holm which has been recently protected by a dyke. The shore line is situated on a narrow area with poplars, between the river and the protection dyke. Behind the dyke there is a narrow service corridor including meadows and forest plantations. In the past, the Bulgarian side of the studied territory has been occupied by numerous humid areas with running and stagnat waters. One of these marshes, Balta Lata was situated between Antimo and Pokraina villages, on the Danube's shore. In the '50s, this marsh has been drained and it is currently used as agricultural soil. On the alignment corridor there was also located a vineyard. The Vidin commercial free zone is located South of the future bridge. The villages Antimovo and Pokraina are situated in the vicinity of the investigated corridor, both of them having a rural character.

The Bulgarian shore of the Danube is affected by erosion processes caused by the retention of the sediments in Porțile de Fier reservoirs. The Romanian shore is formed of a steep wooden slope having its upper side 30 m above the river shores and being also used for agricultural purposes. On this agricultural surface which will be crossed by the future alignment there are also small military installations (buildings, antennas). The alignment corridor (DN56 Craiova-Calafat) crosses an industrial area and a tree plantation on whose location a custom point will be installed. The railroad alignment crosses several smaller orchards and connects with the existing railroad. The connection between the landscape units is made by surface and deep waters. Under normal conditions, the deep waters run towards the Danube but during high floods the waters of the river trickle into the aquifer. The phreatic aquifer is comprised on the alluvial terrace of the Danube.

The images below present a general view on the landscape in the analyzed area on which this paper focuses on.



Fig. 1.1. The area of the future bridge west view from the dyke to the alignment
(Source: EIA Calafat-Vidin Bridge – Final Report, ERM GmbH, Neu-Isenburg, 2004)



Fig. 1.2. Area on the Bulgarian border where the bridge end will be positioned – Image from the dyke on the holm. Poplar plantation. Danube River (km 796) – situated on the spot where the tree line is interrupted (Source: EIA Calafat-Vidin Bridge – Final Report, ERM GmbH, Neu-Isenburg, 2004)



Fig. 1.3. View of the Romanian shore towards Calafat from the future alignment's location. The tall buildings belong to the hospital
(Source: EIA Calafat-Vidin Bridge – Final Report, ERM GmbH, Neu-Isenburg, 2004)



Fig. 6.34. View from the Romanian shore towards Bulgaria – The shipping channel and the island (the arrow indicates the location of the future bridge)
(Source: EIA Calafat-Vidin Bridge – Final Report, ERM GmbH, Neu-Isenburg, 2004)

The construction of the cross Danube bridge from Calafat to Vidin has the potential to generate an unfavorable impact on the environment as a result of its physical structures, of construction activities and exploitation of infrastructure. In the following lines, the effects and the impact of this infrastructure on the landscape are presented, as well as the measures for avoiding and diminishing the negative impact generated by the construction of the bridge over Danube, from Calafat to Vidin.

The impact on the landscape

The modifications of the landscape are difficult to assess since they depend on the subjective perception; they only affect a limited area on both sides of the river.

The impact on the landscape can manifest itself in two ways: the impact on the physical structure and the aesthetics of the landscape and the impact on the attractiveness of the natural environment from the receivers point of view, meaning those persons who monitor the structure and the elements of the construction.

As far as the first aspect is concerned, the most obvious impact factors are represented by the scale modifications that are generated by the structures of the future infrastructure. As far as the viewers are concerned, the inhabitants of the neighboring villages and localities are considered as the most sensitive group both in terms of the value of land but also in terms of permanent exposure once the construction works are finished.

There are included here factors as the perception of the landscape, its attractiveness from the perspective of the locals and the neighboring areas (from the perspective of dwellings, public spaces, paths, personal use of land and recreational areas).

At the same time the prospective users of the road can be considered as receivers. Despite this aspect, the temporary character of the landscape's perception qualifies this group as being less sensitive than those who are permanently exposed to the afferent structures and traffic. Moreover the perception of the landscape will have positive effects on the drivers in terms of the impressive views that can be seen from the bridge.

The impact caused by the afferent structures of the future infrastructure

The construction of the bridge produces significant modifications of the landscape mostly because of the fact that important segments of the road and railway would be at a higher level than the dominant quote of the soil (bridge, pillars, platforms). Given the topographical conditions, this aspect is more

relevant for the Bulgarian side. In some sectors with high embankments, the modifications of the topography will be significant. The access structures to the bridge on the Bulgarian shore will have a more prominent character because of their height compared to the soil's quote.

The perception of the view from the Pokraina village, situated in the area where the embankment of the road turns north-west will be significantly changed since the inhabitants of the peripheral houses will be looking directly towards this structure.

The structures of the bridge will be also visible for the inhabitants of Vidin. However, the bridge will be situated at a distance, long enough so as not to have an intrusive effect on the landscape. The bridge itself will represent a reference point in the more or less plain relief.

Measures for diminishing the impact on the landscape

The impact of these structures on the landscape can be diminished in a certain measure by forest planning or by an architectural design which would integrate them in the landscape. While forest planning will have an immediate effect by covering the exposed soil surfaces and slopes, it will not generate immediate landscape effects, a period of 10-15 years being necessary for obtaining significant shielding results.

The structure and type of the autochthonous vegetal layer must also be considered as only the typical species for the region are planted excluding the agricultural plants.

In order to diminish the types of impact described above, the implementation of the following measures is necessary:

- planting the grades on the Bulgarian shore with trees and shrubs;
- planting vegetation shields of trees and shrubs around the Vidin ware train station;
- planting trees and shrubs between the transport alignment from the grade and Antimovo village;
- replacing the poplar plantation on the Bulgarian border with riparian shrubs and trees which will also have the role of a vegetation shield for the upstream recreational area;
- planting trees and shrubs on the grades on the Romanian shore;
- planting vegetation curtains made of trees and shrubs between the road and railway infrastructure and Calafat;
- planting vegetation shields for the customs point on the Romanian shore which will play a protection role for Basarabi village.

The impact of the construction works

Besides the modifications of the landscape resulting from the new structures, there are temporary modifications caused by their construction.

During the construction phase of the infrastructure, some areas will be used for arranging the construction site. Although used temporarily, they will cause losses of significant resources like shrubs and trees, for example. The temporary deposits of the excavated material will also have a negative impact on the landscape.

A significant effect on the recreational function of the landscape can occur as a result of noise and dust emissions and as a consequence of the general perturbation generated by the presence of vehicles and of the progress of the construction activities.

Measures for diminishing the impact

The visible perturbation factors like dust clouds from the construction sites can be diminished by applying measures as wetting the asphalt areas. Vegetation will be planted on the excavated areas in order to prevent soil erosion. The measures of restoring the construction areas will equally serve to reconstitute the attractiveness of the landscape.

Impact caused by the exploitation/circulation

The circulation will produce visual changes at the level of the new structure because the flux of the vehicles will become noticeable and it will be emphasized by the vehicle headlights. The bridge and the customs point on the Romanian shore will have an illumination system.

Besides the visual aspects, the landscape's perception will be influenced by noise as well. Even though the noise level in the inhabited areas will be below the acceptable limits, the background noise of the traffic, more or less permanent, will become a constituent part influencing the manner of perception in the open spaces situated at approximately 350 m on both sides of the alignment

A noise level that exceeds 55 db (A)² is usually considered a factor that decreases the recreational potential of the landscape. More than this, the emissions of noxa contribute to the diminishing of the general recreational potential.

After the construction and inauguration of the bridge, the area around the Bascov recreational perimeter will be significantly developed in order to become a recreational area both for the inhabitants and tourists of Calafat and the neighboring areas. The recreational areas on the Romanian shore including the small beaches are supposed not to be substantially affected by the construction of the bridge and of the transport infrastructure.

On the Bulgarian shore, there will be some modifications in the vicinity of the bridge. Despite all these, the summer recreational areas at chainage 796 + 200 and the temporary sand island that appears during the summer season close to the shore will probably not be affected. The island is not to disappear as a consequence of the modifications of the hydraulic regime generated by bridge's construction.

Measures for diminishing the impact

The measures that envisage the plantation of the vegetation curtains described above will also contribute to the diminishing of the effects on the landscape generated by the exploitation of the bridge.

Conclusions

The construction phase of the future infrastructure has the major potential to generate a negative impact deriving from the size of the construction installations and from the duration of the construction works. The description and evaluation of the initial conditions represent the foundation of the assessment process of the impact on the landscape factor.

In this respect, there have been identified and evaluated the anticipated effects on the landscape and in the same time there have been emphasized the measures of avoiding or reducing, repairing and/or compensating the negative impact generated by the construction of the bridge over Danube from Calafat to Vidin. Specific measures to attenuate the impact are also mentioned as well as the manner in which they have been adapted to the requirements of these constructions.

The main negative effects mainly refer to the following aspects:

- The construction phase for a structure of such dimensions has a limited duration. The clearing and construction operations on the ground and in the river will represent the main issue. The proportions of the construction and the number of workers on the construction site will require a cautious environment management.
- The impact on the flora and fauna is constituted by the destruction of the habitats. The only element of national importance both for Romania and Bulgaria that is affected by the construction of the bridge is the Danube River.
- In the areas where the structures of access to the bridge will be mounted on embankments which are significantly higher than the basis level of the ground, the landscape will suffer an obvious deterioration. The bridge itself may not represent a disturbing factor from the point of view of the landscape, adding a new structural element in the predominantly natural setting. The bridge may also be regarded as an attraction or reference point, depending on the personal perception.
- The impact on other environmental factors will be controlled by applying a suitable environmental management, especially in the construction phase.

The importance of the construction of this infrastructure refers mainly to the positive effects on the socio-economic field while all the other important environmental aspects (eg. flora, fauna, soil and water) will be more or less affected, depending on the efficiency and promptness of the implementation of the measures necessary to diminish the negative effects which will appear during the execution of works and the exploitation/circulation period.

IMPACT SUR LE PAYSAGE DU A LA CONSTRUCTION DU PONT SUR LE DANUBE À CALAFAT-VIDIN

Résumé

Le futur pont du joint de la route et de la voie ferrée sera construit sur Danube, dans la région de Vidin (Bulgarie) – Calafat (Roumanie), sur 796 km, au côté nord de ces deux villes. Cette infrastructure de transport représente à la fois une composante intégrée du système international d'autoroutes et une partie de la section sud du Quatrième Couloir Pan-européen. La construction du pont est susceptible de produire un impact défavorable sur l'environnement, principalement à cause de ses structures et de l'exploitation de l'infrastructure. L'impact sur le paysage peut être perçu de deux manières: en premier lieu, l'impact sur l'esthétique du paysage et sur les structures physiques et en deuxième lieu, l'impact sur l'attrait du paysage perçu par les gens qui ont dans leur région d'observation les structures construites ou leurs éléments composants.

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