

**THE HARMONIZATION OF THE NATIONAL AND LOCAL INTERESTS DURING  
PLANNING AND DESIGNING OF HIGHWAY CORRIDORS WITH A CASE STUDY**

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***Abstract:** The basic reason for the preparation and adoption of the Spatial Plan is to create conditions for the realization of national interests in the field of transport infrastructure on the principles of sustainable development, which also included consideration of the interests of the local community. The Belgrade-South Adriatic roadway is the trans-European highway linking Serbia and Montenegro, for which the conceptual design and the spatial plan of the special purpose area are concerned. The route of the section of the highway was challenging in terms of design, as well as compliance with higher order plans and conditions of the competent authorities. During the harmonization of project and planning documentation, several variants of the route were considered, especially in order to examine the requirements of the local community. An attempt was made to harmonize and compromise between the project proposal and the Spatial Plan of the Special Purpose Area of the Infrastructure Corridor Belgrade - South Adriatic, the section Požega-Boljare (the border with Montenegro), which was achieved in a high degree during the development of the spatial plan. On this section, several undivided crossroads are planned - loops and several variants of the route are considered, especially in the Arilje area.*

***Key words:** conceptual project, spatial plan, detailed elaboration, route, variant, local community, interest.*

## **1. INTRODUCTION**

Spatial Plan of the Republic of Serbia established the long-term foundations of the organization, regulation, use and protection of the space of the Republic of Serbia in order to harmonize economic and social development with natural, ecological and cultural potentials and constraints on its territory. The concept of road traffic development and road infrastructure is defined, which is a synthesis of previously started studies and projects, under which the Republic of Serbia is a large transport centre. One of the strategic priorities, with the 2016-2020 implementation period in the Spatial Plan of the Republic of Serbia [1], are activities on the State Road of the first order (construction of highway E-763) part of Route 4 (SEETO) Belgrade-Čačak-Požega-Arilje-Ivanjica-Sjenica (Duga poljana)-Boljare (border with Montenegro). Therefore, activities have been initiated on the development of the Spatial Plan of the special purpose infrastructure corridor Belgrade – South Adriatic, section Požega-

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Boljare (Highway E-763), in accordance with the Decision on drafting the Spatial Plan ("Official Gazette of RS", no. 78/17) [2]. In conjunction with the development of the Spatial Plan, a Report on the strategic assessment of the impact of the Spatial Plan on the environment is being prepared according to the Decision on the Development of the Strategic Assessment of the Impact of the Spatial Plan of the Special Purpose Infrastructure Corridor Belgrade – South Adriatic, section Požega-Boljare (Highway E-763) on the environment ("Official Gazette of RS", no. 60/17) [3]. These activities were preceded by the development of the General Project and the previous study of justification for the construction of the E-763 Belgrade-South Adriatic highway (Sector III: Požega – border with Montenegro, Boljare). However, the Spatial Plan is prepared side-by-side with the drafting of elements of the Conceptual Project of the Belgrade-South Adriatic Highway, which raises a number of methodological issues and at the forefront highlights the need to harmonise the planning and technical documentation. Therefore, the authors in this work take from previously stated positions that it is necessary to harmonize all phases of the drafting of planning and project documentation [4,5].

For the development of the Spatial Plan of the special purpose infrastructure corridor Belgrade – South Adriatic, section Požega-Boljare, is used a methodology that includes simultaneous development of planning solutions on two levels, with a strategic level of spatial plan and detailed level of urban plan. As such, the Spatial Plan will be fully usable for issuing site conditions for further design, determining public interest and resolving property relations. Such an approach to drafting the plan, in addition to the issue of mutual compliance of the drafting of planning and project documentation, raises additional questions about how the constraints in the space and interests of the local community affect or may affect the development of planning and project documentation. This paper outlines the experience of the authors and an example of compliance with the development of the Spatial Plan of the special purpose infrastructure corridor Belgrade – South Adriatic, the section Požega-Boljare and elements of the idea project with constraints in the space and interests of the local community.

## **2. RESEARCH ELABORATIONS - METHODOLOGICAL FRAMEWORK**

Spatial plan of the special purpose area is a basic instrument in the process of planning the infrastructure corridor of the highway. The aim of the plan is to define the planning basis and ensure spatial conditions for the construction and operation of the highway, as well as for the development of other infrastructure systems in the corridor. Development of spatial plans of the special purpose area for infrastructure corridors of highways is determined by the basic legal and planning framework consisting of the Law on Planning and Construction, Law on Roads, Law on Spatial Plan of the Republic of Serbia, Law on Strategic Environmental Impact Assessment and The Rulebook on Content, Manner and Procedure of Drafting Documents of Spatial and Urban Planning [6,7,8,9]. The fact that almost all existing and planned highway corridors in Serbia have been done and spatial plans for the special purpose area indicate significant experiences in their planning.

In previous practice, it has been possible to single out two types of such spatial plans. One, for existing sections of highways, where the emphasis is on defining spatial layout and rules of regulation and construction for accompanying amenities, determining protection belts and prescribing modes of use and landscaping, looking at how to connect to the environment, etc. Second, for new sections of highways planned for construction, which defines the highway corridor and the system of binding rules for further development of technical and planning documentation with the above-mentioned elements. In recent years, planning and design teams have come up with ways to overcome the underlying problem, which is

mutually aligning the process of planning and designing the highway corridors. It seeks simultaneous planning on two levels and resolving almost all issues in a single planning document, in conjunction with the development of conceptual projects, i.e., conceptual solutions of the highway route. In order for such a concept of planning of the highway corridor area to survive, it is necessary, ranging from legislative regulation to proof in practice, meaningfully and procedurally harmonize all stages of drafting planning and project/technical documentation.

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In meaningful terms, the emphasis in developing a spatial plan for the special purpose area is: looking at and defining the ways and conditions of fitting the system into the wider space; integral planning of spatial development (protection and use of natural resources, demographic trends, functioning of the network of settlements, economy, tourism, protection of natural and cultural goods etc.); defining protective belts and zones; how to make connections to the environment; connecting to a network of roads of regional and local significance in a broader context; verification and confirmation of solutions through inter-sectoral cooperation and coordination (conditions, opinions, consents); ensuring the public and democratisation of the proceedings (professional discussions, public insights); strategic environmental impact assessment and creating grounds for resolving property relations on land. In this case, the emphasis in the development of project/technical documentation is: implementation of previous works (data collection and processing); determining the macro location of an object (corridor); defining, evaluating and selecting variant spatial and technical solutions; viewing traffic, technical and technological and economic justifications; determining the micro location of an object (route); looking at construction and maintenance costs; environmental impact assessment and creating the basis for construction.

In addition, the experience of drafting the Spatial Plan of the special purpose infrastructure corridor Belgrade – South Adriatic, section Požega-Boljare, at the forefront highlighted the active implementation of policies, public participation in the process of drafting, especially in terms of the impact on the selection of certain planning solutions. One of the main goals of long-term development, use and regulation of the Spatial Plan area highlights the determination of guidelines for deployment and support for the development of population, settlements and activities, while respecting social criteria, as well as enabling the achievement of sustainable development of agricultural production in the corridor impact zone and maximum preservation of the existing quality of agricultural land.

### **3. FINDINGS BASED ON THE CASE STUDY**

The spatial plan limit is determined on the basis of the corridor of the E-763 motorway, a section of Požega-Boljara, in the width of 700 m (350 m from the axis of the highway corridor) which includes the highway belt, protective belt and belt of controlled construction, in total length of about 106 km. The spatial plan covers the existing and planned corridors of other main infrastructure systems with route and protective belts (immediate and

wider) that are in the planning area. European Road E-763 (SEETO route 4) along the direction of the State Road Belgrade-Čačak-Požega-Arilje-Ivanica-Sjenica (Duga Poljana)-Boljare has a traffic function and order that involves connecting state (macroregional) traffic routes, i.e. cross-border linking of centres of similar importance. The subject section of the highway belongs to the specified international road, whose function is to remotely connect major traffic hubs.

An analysis of the development of the existing road network showed that the density of the State Roads I and II network in the region is below average in the Republic of Serbia, while the density of the local road network is below average (General Project Traffic Study), suggesting that the function of serving the existing road network is also compromised in the subject area. Therefore, it is necessary to pay special attention to the fact that the future path of the highest functional rank does not jeopardise the possibility of developing a local road network, especially in settlement zones. The corridor of the E-763 motorway, a section of Pozega-Boljare, starts from the "Prilike" loop on the section of the Požega-Kotroman highway near Pozega, while ending in the zone of the planned Boljare border crossing.

The width of the exploitation belt (road land) on one side of the highway, primarily due to the complex configuration of the terrain, ranges from 35m to 70m from the highway axis. The total width of the highway corridor (highway belt, protective belt, belt of controlled construction) is an average of about 700m, which is also the final limit of the Spatial Plan. The corridor of the road to Arilje and Ivanjica is stretched in plain and slightly hilly terrain. In the area of Arilje and Ivanjica, the corridor extends through the Moravica River Valley and bypasses settlements on the eastern side, where it enters extremely hilly and mountainous terrain. After Ivanjica, the corridor enters the mountainous landscape and passes between the slopes of Javor in the west and Golija in the east, climbing the Pešter, which extends to the Border Crossing of Boljare, next to Sjenica. Loop construction is planned on the highway corridor, in order to connect the highway with the surrounding settlements and the lower-level road network. The highway corridor provides functioning and an alternative route, allowing traffic to be performed outside the toll collection system.

In relation to settlements, the subject section of the highway is mostly located outside the settlement area. In part, the corridor is located in the settlement zone, i.e. areas of Arilje and Ivanjica. The dominant function in the area of settlements is to manage transit flows and connect intersections and road networks of settlements with planned loops on the highway. The way of connecting settlements to the highway must be in line with the functional level of access road, on the one hand and the needs of the development of settlements, on the other hand. The E-763 Požega-Boljare highway is planned and designed as a state road designed exclusively for motor vehicle traffic (with a projected speed of 100-120 km/h), with physically separated circuits in directions, denied intersections, full access control, which has at least two traffic lanes and one stop lane for each direction and as such is marked by the prescribed traffic sign.

The spatial plan establishes a 700m-wide highway corridor. Highway belt (highway land) – makes the land necessary for the construction of the highway, loops, denied intersections and accompanying amenities. The highway belt is designated as public land and has a width of 70 m to 150 m, depending on the configuration of the terrain and conditions for the construction of highway facilities. The border of the highway belt is also a regulatory line. This belt establishes a regime for prohibiting the construction of all buildings that are not functional for the construction of the route and buildings of the highway, loops, denied intersections and supporting facilities of the highway; Protective belt – consists of land for which a strictly controlled mode of use (mutually) is determined in order to protect the

function of the highway. The protective belt is designated as land of other purposes and has a width of 75 m from the border of the highway belt. In loop zones, accompanying facilities and certain highway facilities, the protective belt is narrowed to a width of about 40 m. The boundary of the protective belt is also the limit of detailed regulation. This belt does not allow the construction of new buildings, except for buildings that are in operation of the highway, and the space can be used as forest and agricultural land. On construction, forest and agricultural land, reconstruction and rehabilitation of existing buildings is permitted, without the possibility of changing the volume, unless they jeopardise the function of the highway; Belt of controlled construction – makes the land in the mode of controlled construction and environmental protection (mutual). The belt of controlled construction is determined as land of other purposes and has a width of 200 m to 240 m from the border of the protective belt. The boundary of the belt of controlled construction is also the boundary of the Spatial Plan. This belt allows the development of existing and new non-collision activities with the functional and technical requirements of existing and planned transport and technical infrastructure systems of national and regional importance.

In addition to respecting the basic criteria of functionality and safety, the Spatial Plan has a number, spatial layout, surface, content and rules of landscaping and construction for the accompanying content of the highway, and: 1) functional supporting facilities – for maintenance, management and security of faster, safer, more comfortable and reliable transport of goods and people on the highway: a) road maintenance bases, b) control and management facilities; and c) toll collection facilities; and 2) accompanying content for the needs of traffic users: rest stops and service centres. A special part of the Spatial Plan is the rules for regulating and building highway facilities and accompanying amenities, which determines the model of implementation of this plan [10,11]. Unlike the practice of developing similar plans so far, this spatial plan defines rules entirely at the level of the urban plan, which means that they include all the elements necessary for issuing site conditions, such as, in addition to technical standards and normative, and the purpose and conditions for the formation of the building plot, the position of the buildings on the plot, the occupation indexes, the height of the wreath of buildings and the ground floor, architectural formatting, conditions for access to the parcel, etc.

#### **4. ELABORATION AND EVALUATION OF VARIANT SOLUTIONS OF HIGHWAY ROUTES**

During the implementation of the procedure of early public insight into the Spatial Plan and consideration of the proposed solution for the highway route in the municipality of Arilje taken from the General Project, based on the reactions and objections of the Municipality of Arilje, there was a need for correction and modification of the proposed solution of the highway route [12]. This confirms previously stated that one of the main aspects in drafting the planning documentation is public participation and democratisation at all stages of planning, which is not the case when drafting project documentation. This has further resulted in the development and evaluation of variant solutions for a section of the highway route on the territory of the Municipality of Arilje, about 16 km long, with the aim of harmonising the planning and design process with restrictions on the space and interests of the local community (Figure 1). The work further outlines the conclusions regarding variant solutions to the highway route, drawn by design and planning teams. All variant solutions were analysed for a speed calculation on a motorway of 70 miles per hour.

Variant A – is the solution of the highway route in accordance with the General Project. This variant is such that in the area of Arilje municipality, the route runs mostly through the

Moravica River Valley and the slopes of the nearby hills. In this variant, the ratio of bridge and tunnel length to the total length of the route is 25.67%, which is the most favourable compared to all three variants. The route is slightly longer than Variant B and shorter than Variant C by 157m. Because it is a valley-slope route the length of the incisions, embankments, support walls and other structures are smaller than in the other two variants. On this basis, this variant was found to have the lowest investment value. However, Variant A was also found to have obvious defects, due to its prolific agricultural land and significantly physically divide existing rural settlements. Based on objections from citizens and local administration of the Municipality of Arilje, it was pointed out that this route endangers individual and public interests and the existence of the population, and that the cost of expropriating land for the purposes of building a highway would certainly be significantly higher than in other variants.

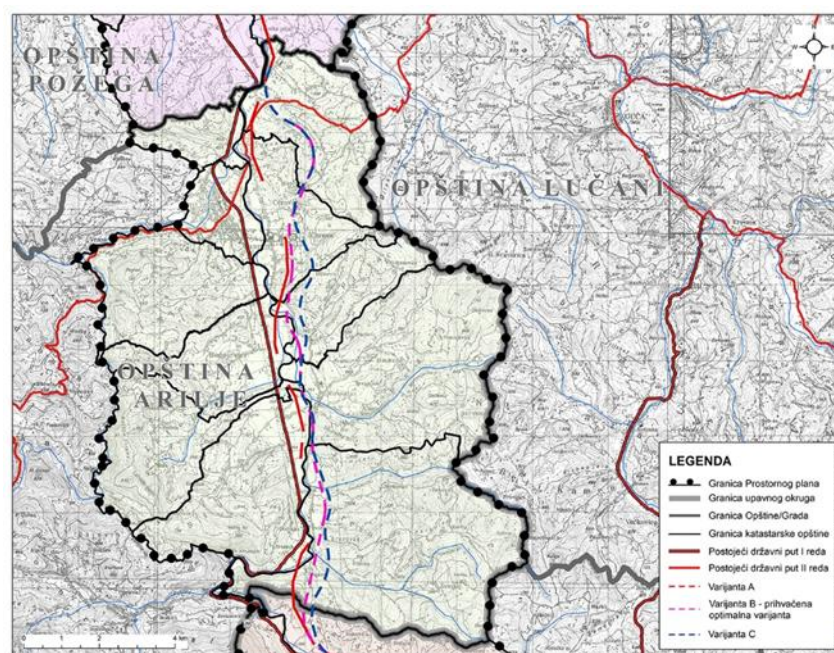


Figure 1: Variant solutions of the highway route on the territory of the Municipality of Arilje

Variant C – represents the proposal of the Municipality of Arilje, which moves the highway route east from 0.5 to 1.6 km compared to Variant A. The advantage of this variant is that it occupies significantly less quality agricultural land, is mostly provided through forest land and does not physically separate existing settlements. According to this variant, the entire route would be extended through the mountainous landscape, resulting in an increase in the number and length of investment buildings (bridges, tunnels, deep cuts, etc.) in relation to the Variant A route, which increases the overall investment value significantly. In this variant, the ratio of the length of bridges and tunnels to the total length of the route is 36.35%, which is more unfavourable than the other two variants. Besides, the limiting factor of this route is its passage through the complex of the church erected on the foundations of the 12th century and the nearby cemetery.

Variant B – is defined in order to satisfy the interests of local self-government, but also to find a more economically favourable solution than the proposed Variant C route.

The modification of this variant was done on a section of the route about 5km long, where the route is directed further west towards the partially milder terrain of the village of

Dragojevac, towards the Moravica River. Through a tunnel of about 640m, the route descends into the Moravica River Valley and crosses to its left bank. Because the river is very pronounced, the route again crosses to the right bank and continues to extend close to Variant C. This part of the route passes mostly through forestland and partially uncultivated land along the Moravica River, and is estimated to occupy less quality and arable agricultural land than the route from Variant C. Analysis of the situational solution and longitudinal profile showed that the amounts of cuts, embankments, support walls and other engineering structures are smaller than in Variant C, and that it has a more favourable ratio of bridge and tunnel length of 31.35% according to the total length of the route. Therefore, it was concluded that this variant would have a significantly lower investment value. At the same time, this variant would avoid restrictions on the sites of the church and the nearby cemetery. The above-mentioned analysis of variant solutions of the highway route was done at the level of the conceptual solution and on the available geodetic surfaces, based on data from the General Project, the proposed material of the Municipality of Arilje, the Decision on drafting the Spatial Plan, the Report on the Implementation of early public insight into the Spatial Plan and obtained the conditions and data of competent public institutions. The aim of the analysis was to provide insight into the technical and economic aspects of the highway routes, thus enabling decisions on an optimal and acceptable solution for all planning subjects.

The basic conclusions of the analysis are that: Variant A - economically best, but provided through the highest quality farmland, physically separates several rural settlements and is not acceptable to the local community; Variant B – is economically less favourable than Variant A, but for the most part it is extended through forest land and has less investment value than Variant C; Variant C – is a demanding mountain variant of the highway route economically unfavourable and in collision with restrictions on church and cemetery locations. The Ministry of Transport and Infrastructure Construction as the holder of the development of the Spatial Plan, design and planning teams, as well as the local self-government of the Municipality of Arilje have agreed and accepted Variant B as the basis for further phases of planning and highway design.

## **CONCLUSION**

Compliance of these activities, with the necessary consideration of the interdependence and conditionality of all phases of the planning and design of highway corridors, especially given the levels of elaboration, is, in the opinion of the authors of this work, the most complex issue in planning and design, not only the corridor of highways, but also all other large and significant technical systems.

Experience in the development of the Spatial Plan of the Special Purpose Infrastructure Corridor Belgrade – South Adriatic, section Požega-Boljara, which is outlined in this work, is based on such a division of activities in the development of planning and project documentation, under which the subject of planning and verification of solutions through inter-sectoral cooperation, coordination and security of the public and the democratization of the entire procedure (prior to formal public insight). The specificity of such experience is the fact that simultaneous activities are being carried out on two levels of elaboration (strategic/spatial in R 1:50.000 and detailed urban planning in R 1:2.500), drafting an idea solution and communication and compliance with the interests of the local community. In the work presented analysis of variant solutions of the planned highway route in the municipality of Arilje was done precisely out of the need to harmonize planning and design activities with the interests of the local community. This included other spatial constraints (quality of



agricultural land, urban development of settlements, protected localities, etc.), as well as uniquely expressed interest of the local community. The conclusions of such analysis of variant solutions have conditioned on reaching a compromise of all planning entities and finding new solutions for the planned highway route, which is financially and technically acceptable, while supported by the local community, thus significantly optimizing and simplifying the later processes of professional control, public insight and policy making. Some authors in literature express similar views to which the authors in this work are complemented, especially pointing out the importance of traffic as one of the most important aspects of urban development, with land use and environmental protection [13] as well as the need to perceive traffic sustainability [14] and link land use and traffic accessibility acceptable to the wider community [15].

Extensive scientific literature in the field of traffic suggests that the use of traffic analyses (and models) is not new in planning [16,17]. The authors point to this fact and their starting positions on the importance of mutually aligning the planning and design processes of highways in relation to the need for timely alignment with the local community. With dynamic development of software and geographic information systems, traffic analysis needs to be further developed continuously and even use models with elements of future traffic loads. Given the scope of spatial and urban plans for the purpose of building new road infrastructure, it inevitably imposes the need for further research into unleaded issues, which can indeed have a strong foothold in the practice of planning and designing highway corridors in Serbia so far.

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