**TECHNICAL DESIGN WAS TAKEN FROM THESE DOCUMENTS:**

Stage I.:

- Diaľnica D3 Žilina (Brodno) – Kysucké Nové Mesto; DSP; Geoconsult, spol. s r.o.; 2007-2011
- Diaľnica D3 Žilina (Brodno) – Kysucké Nové Mesto - privádzač; DSP; Geoconsult, spol. s r.o.; 02/2020
- Diaľnica D3 Žilina (Brodno) - Kysucké Nové Mesto, zmena DÚR od km 16,880 do km 19,280"; DÚR; Dopravoprojekt, a.s.; 04/2020
- Diaľnica D3 Žilina (Brodno) - Kysucké Nové Mesto; Koncept dokumentácie na stavebné povolenie v podrobnosti dokumentácie na realizáciu stavby; Dopravoprojekt, a.s.; 2021-2022

COORDINATE SYSTEM S-JTSK, ELEVATION SYSTEM Bpv

| | | | |
|---|---|---|---|
| CLIENT: NÁRODNÁ DIAĽNIČNÁ SPOLOČNOSŤ<br>NÁRODNÁ DIAĽNIČNÁ SPOLOČNOSŤ, a.s.<br>DÚBRAVSKÁ CESTA 14,<br>841 04 BRATISLAVA | | CONTRACTOR: AFRY<br>AFRY CZ s.r.o.<br>MAGISTRŮ 1275/13<br>140 00 PRAHA 4<br>tel.: +420 277 005 500<br>www.afry.cz | |
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NAME OF THE PROJECT:

# MOTORWAY D3 ŽILINA (BRODNO) - ČADCA

| | |
|---|---|
| STAGE: | STAGE I. |
| PART: | SUMMARY IN THE ENGLISH LANGUAGE |
| SUPPLEMENT: | STAGE I. SUMMARY IN ENGLISH LANGUAGE |

| | | PART: | PART NUMBER: | COPY: |
|---|---|---|---|---|
| DISTRICT: | ŽILINSKÝ KRAJ | E.1 | 1a | |
| DATE: | 01/2023 | | | |
| PHASE: | FEASIBILITY STUDY | | | |
| SCALE: | - | | | |
| ORDER NUMBER: | 2021/0197 | | | |

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AFRY CZ s.r.o.

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# FEASIBILITY STUDY FOR MOTORWAY D3 ŽILINA (BRODNO) – ČADCA

# I. STAGE: ŽILINA (BRODNO) – KYSUCKÉ NOVÉ MESTO

# TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES

# 1 FEASIBILITY STUDY AREA OF INTEREST

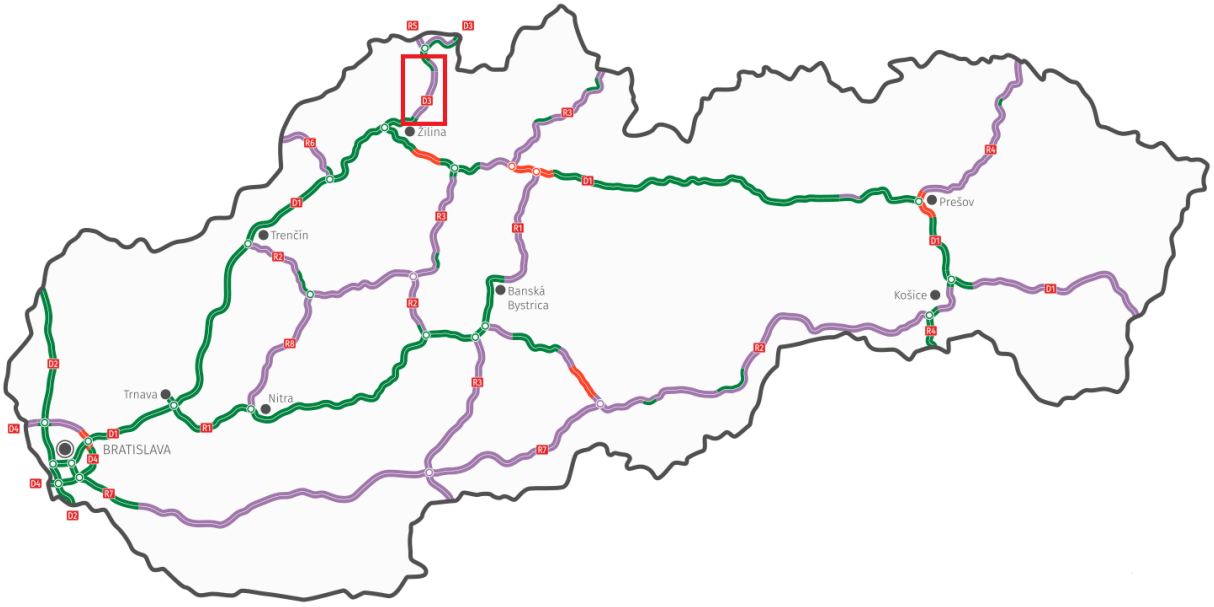
Subject of the study is a missing part of D3 highway between Slovak cities Žilina and Čadca on the northwestern part of the country. Whole study is divided into 4 stages:

- I. stage: section D3 Žilina (Brodno) – Kysucké Nové Mesto
- II. stage: section D3 Oščadnica – Čadca (Bukov)
- III. stage: section D3 Kysucké Nové Mesto – Oščadnica
- IV. stage: complete section D3 Žilina, Brodno – Čadca (Bukov)

This document discusses I. stage: section Žilina (Brodno) - Kysucké Nové Mesto. Following stages are III. and II. stage. IV. stage is evaluation of the entire new section of the highway D3.

Area of interest starts on the highway at the end of „Považský Chlmec" tunnel near Žilina (Brodno) interchange. This corridor continues through Kysuca River valley upstream around Kysucké Nové Mesto to Kysucký Lieskovec and then towards Krásno nad Kysucou and finishing at the city of Čadca with second tunnel Horelica.

*Figure 1 - Slovakian road map with highlighted area of interest Žilina – Čadca*

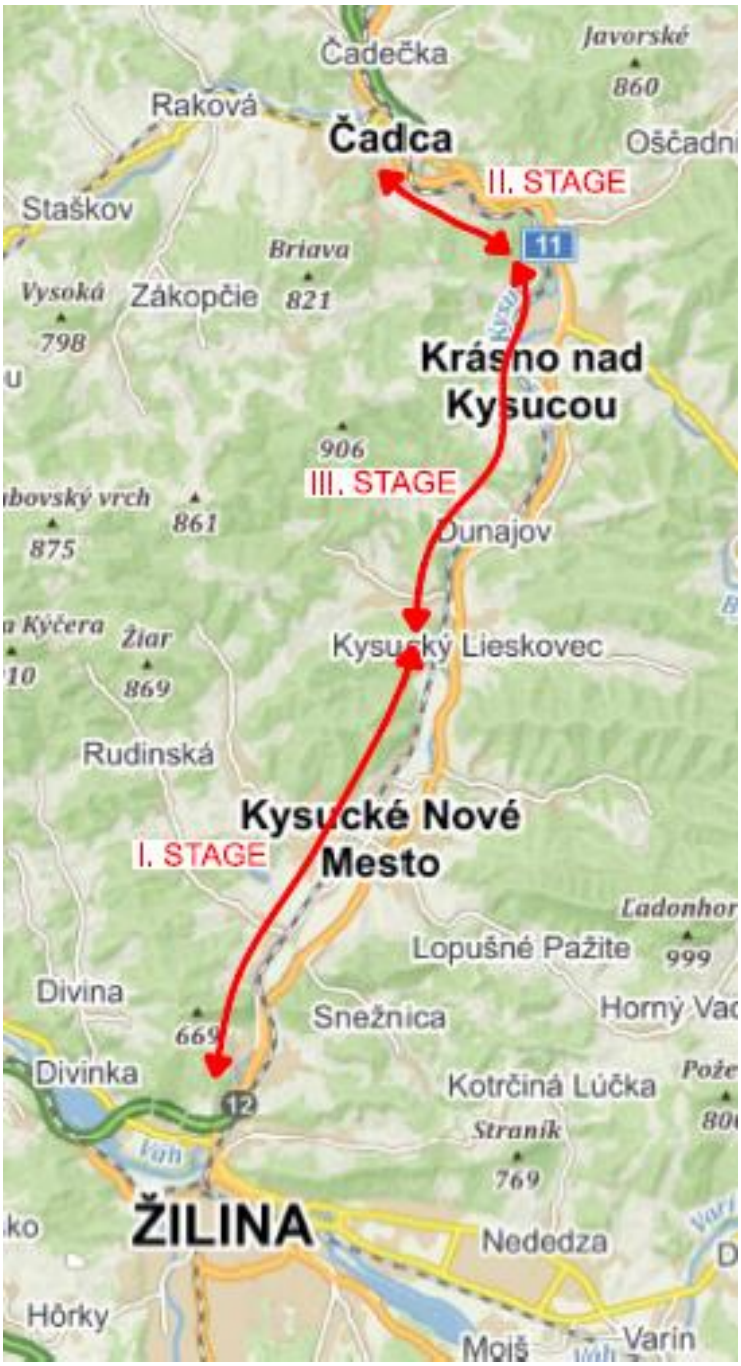


**I. stage Žilina (Brodno) – KNM**

Highway route for I. stage was set in previous documentations for zoning permit (DÚR) and documentation for building permission (DSP). This is the reason why was the stage set without any other options. It is so-called stabilized option.

Area of interest in the Žilina – Kysucký Lieskovec section is situated in Kysuca River valley in the vicinity of road I/11. Route location in section Žilina (Brodno) – Kysucké Nové Mesto was set in previous documentations by statement of the assessing authority of the Ministry of the Environment of the Slovak Republic and decision of zoning. Whole route in this section is concurrent with Kysuca river. This section is also in inundation area.

*Figure 2 - Area of interest with highlighted stages*



# 2 DOCUMENTS AND DATA FOR THE DESIGNED OPTIONS

For conducting feasibility study transit-engineering, area-planning and traffic model were used as source documentation.

## 2.1 ACTUAL TRAFFIC SITUATION

In area of interest in I. stage between Žilina and Kysucký Lieskovec is I/11 the main road in the length of 15 kilometers. Width arrangement of this road is C 11,5 category. For the first 2 kilometers (starting from interchange Brodno) the width arrangement is dual carriageway C 22,5 category. Road serves both long distance transit and local traffic. I/11 road also serves as accessing road to residential buildings and there are bus stops placed on edges of the road as well as pedestrian crossings.

Current unsuitable condition is characterized by following problems:

- Insufficient capacity of the road, often causing congestions (overall traffic volume aprox. 17-25 thousand vehicles per day),
- High accident rate,
- Deteriorative traffic service for near areas, concurrence of long distance transit, local traffic and pedestrian traffic on I/11.

## 2.2 TRAFFIC MODEL

A complex model of traffic relations and a forecast of the future development of traffic in the wider vicinity of the addressed corridor D3 were secured and provided to the client for the purposes of this study. The contractor of the traffic model is Traffic-visions s.r.o. The accompanying administration with a detailed description of the creation and calibration of the traffic model and the assumptions of the forecast of future development is the subject of a separate appendix in part C.1.4.1

The data from the transport model are used as a basis for the analysis of the transport solution (mainly the capacity assessment of sections and intersections). As well for the analysis of environmental impacts (noise, emissions) and the analysis of costs and benefits as part of the economic evaluation of the project.

Basic outputs of the model for the long-term horizon of 2050, in which the highest volumes of traffic from the monitored forecast period are generally achieved, and thus also the highest potential effects, are shown below. Given cartograms of all-day traffic intensities describe only the state after the implementation of the first stage: section D3 Žilina (Brodno) – Kysucké Nové Mesto, i.e. without the implementation of following subsequent stages in the section Kysucké Nové Mesto – Oščadnica – Čadca (Bukov).

*Figure 3 - Traffic volume changes after completing I. stage (year 2050)*

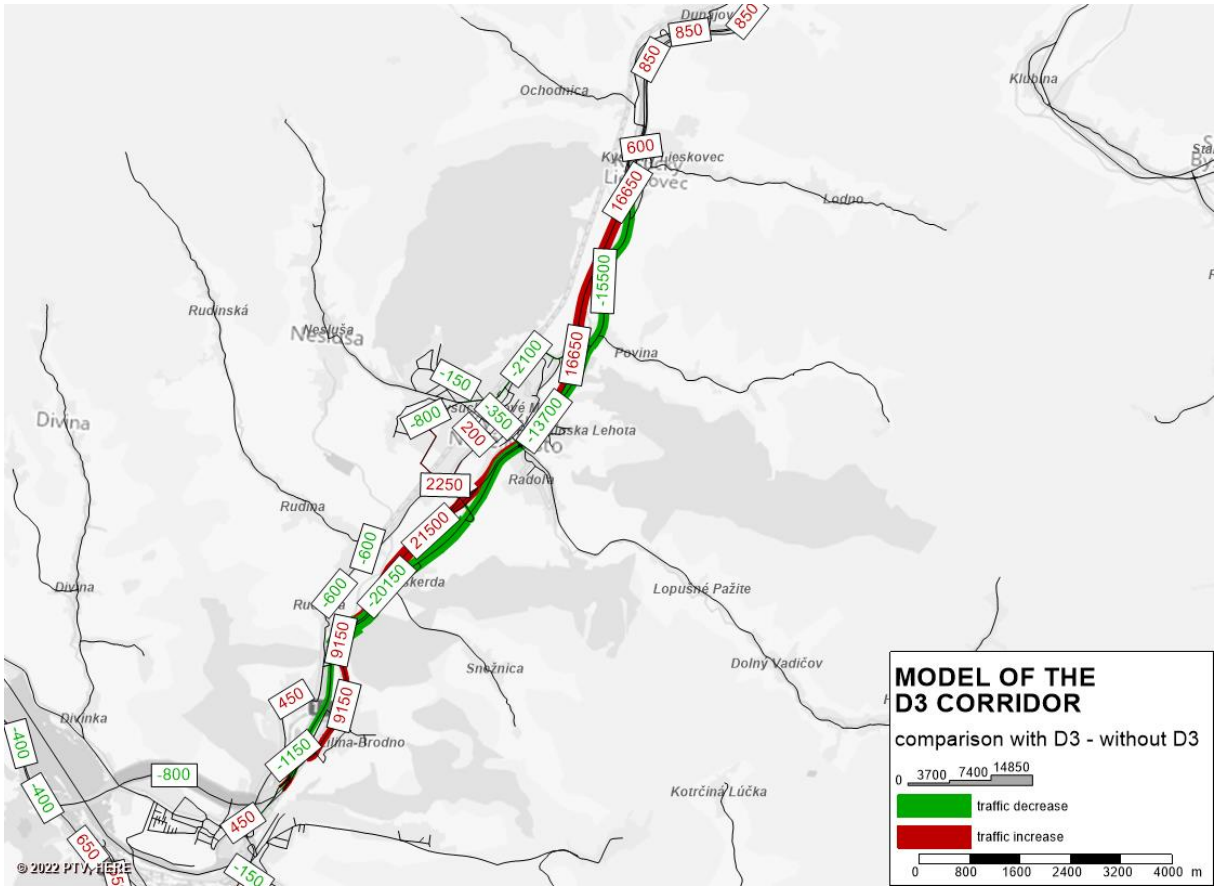



*Figure 4 - Traffic volume in section Žilina - Kysucké Nové Mesto for I. stage (year 2050)*

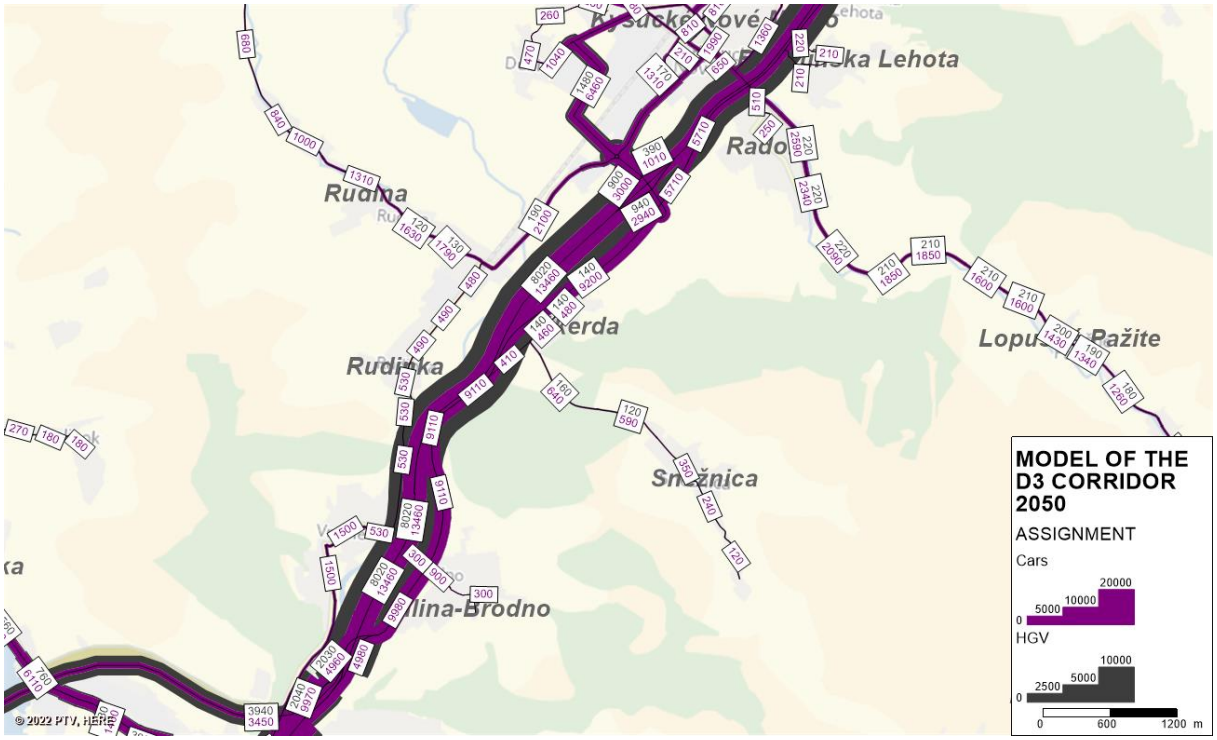


*Figure 5 - Traffic volume in section Kysucké Nové Mesto - Kysucký Lieskovec I. stage (year 2050)*


*Figure 6- Traffic volume in vicinity of Brodno interchange for I. stage (year 2050)*

*Figure 7 - Traffic volume in vicinity of Kysucké Nové Mesto interchange for I. stage (year 2050)*


*Figure 8 - Traffic volume in vicinity of Kysucký Lieskovec interchange for I. stage (year 2050)*


From cartograms above results conclusion that the highest load of the proposed I. stage D3 can be expected in the southern section of Brodno interchange – Kysucké Nové Mesto interchange (a total of approx. 21.5 thousand vehicles per day in the long-term horizon of 2050). The northern section between Kysucké Nové Mesto and the completion of the first stage of D3 shows a lower load at the level of approx. 16.5 thousand in the 2050 horizon. vehicles per day. The dominant part of the load of the new highway sections is transferred from the parallel road I/11.

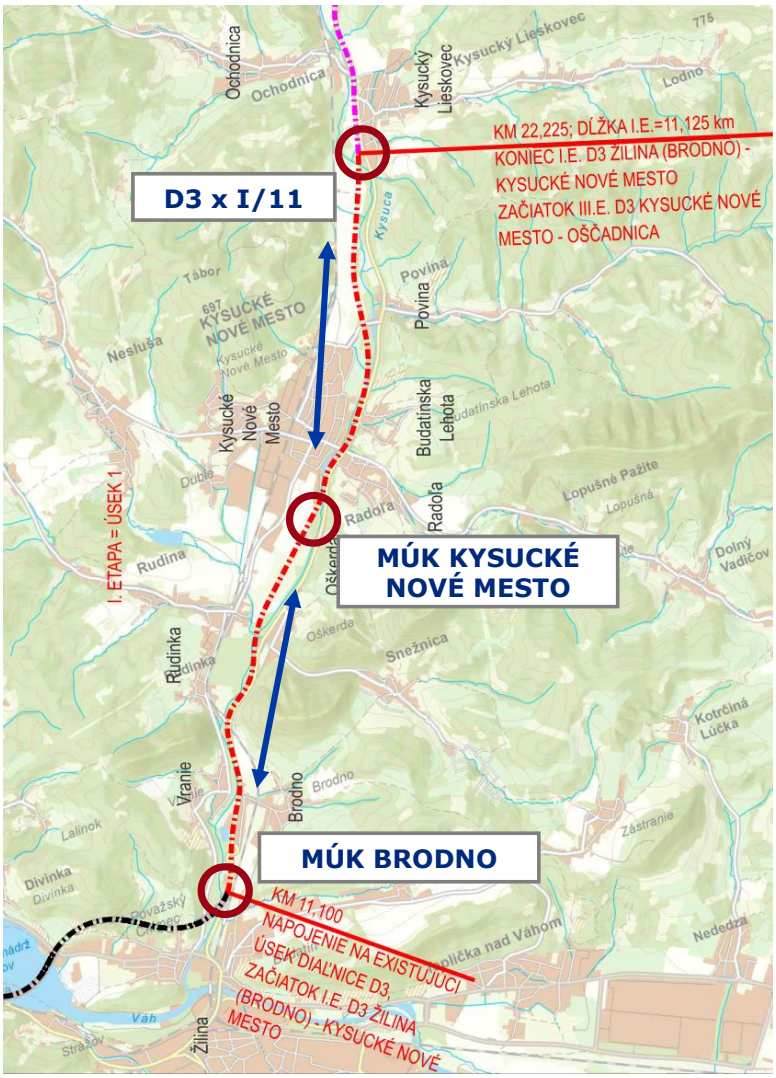
Impact of the implementation of the I. stage of D3 on the wider area has the most significant effect on the change in the nature of traffic in the area of Kysucké Nové Mesto. Part of the traffic volume is redirected to the new interchange. Due to the involvement of the newly designed highway section and the accompanying communication, there is a local change in the load in the area of Brodno interchange as well. In case of the impact of the implementation of the I. stage D3 on the traffic load of the following sections D3, or I/11 in the southwest, or in the north, less significant effects are expected (maximum in the order of hundreds of vehicles per day), which is mainly related to the absence of other sections II. and III. stage D3 between Kysucké Nové Mesto and Čadca.

## 2.3 CAPACITY ASSESSMENT

As part of the study, a capacity assessment of intersections and sections of the proposed road was processed according to TP102/16 "Výpočet kapacít pozemných komunikácií" (Calculation of the capacities of roads). Base data was the maximum future traffic volume on the interested network from the traffic model and the provided outputs from the conducted surveys and traffic census (data on variations and composition of traffic flows).

An overview of assessed sections and intersections within the I. stage of D3 Žilina (Brodno) – Kysucké Nové Mesto is shown in the figure below.

*Figure 9 - Diagram of sections and interchanges - I. stage*



Detailed table outputs of capacity calculations are the subject of a separate appendix in part C.1.4.2. The conclusions of the completed capacity assessments of all sub-sections and intersections are summarized in the following table.

*Table 1 - Capacity assessment summary - sections and interchanges*

<table>
<tr><td rowspan="2"></td><td colspan="3">Achievable level of service at the designed traffic volume</td></tr>
<tr><td>Interchange</td><td>Connection to network</td><td>Section (one way/other way)</td></tr>
<tr><td>Brodno interchange</td><td>B</td><td>-</td><td rowspan="2">A/A</td></tr>
<tr><td>Kysucké Nové Mesto interchange</td><td>A</td><td>B (western interchange.)<br>A* (eastern interchange)</td></tr>
<tr><td>End of I. stage D3</td><td>-</td><td>D</td><td>A/A</td></tr>
</table>

** applies for roundabout, in case of uncontrolled intersection is service level value **E***

All sections and interchanges achieved level of service A-B based on the results of the capacity assessment of the designed road. Thereby meeting the required functional level. In the case of the intersection at the eastern connection point of Kysucké Nové Mesto interchange, a potential capacity problem was identified on the left turn from the south direction (quality grade E). Recommended solution is a roundabout which is capacity-sufficient. In the case of other level crossings in the area of Kysucké Nové Mesto (western connection of the interchange) and Kysucké Lieskovec (end of I. stage D3), the achieved level of service is in the range of grades B-D, which is an acceptable level for uncontrolled intersections. It is possible to foresee a significant improvement in the traffic situation due to the completion of all stages of the D3 highway. This will allow the routing of heavy transit traffic completely outside the area of the temporary level intersection.

# 3 BRIEF DESCRIPTION OF THE OPTIONS

Only one option, the so-called "stabilized option" was proposed in the first stage which represents the most socially acceptable option of the design.

The alternative design was not examined regarding:

- High state of project readiness for the stabilized option
- The land purchase process for stabilized option has already started, in 2022 approximately 89% of the land required for the implementation has already been purchased
- The stabilized option is included in the area planning documentation
- Kysucké Nové Mesto feeder, is already under construction in 2022

This stabilized option is designed on the basis of previous documentation already processed at a higher level of documentation. This option was also assessed from the point of view of the Construction Act and standard requirements.

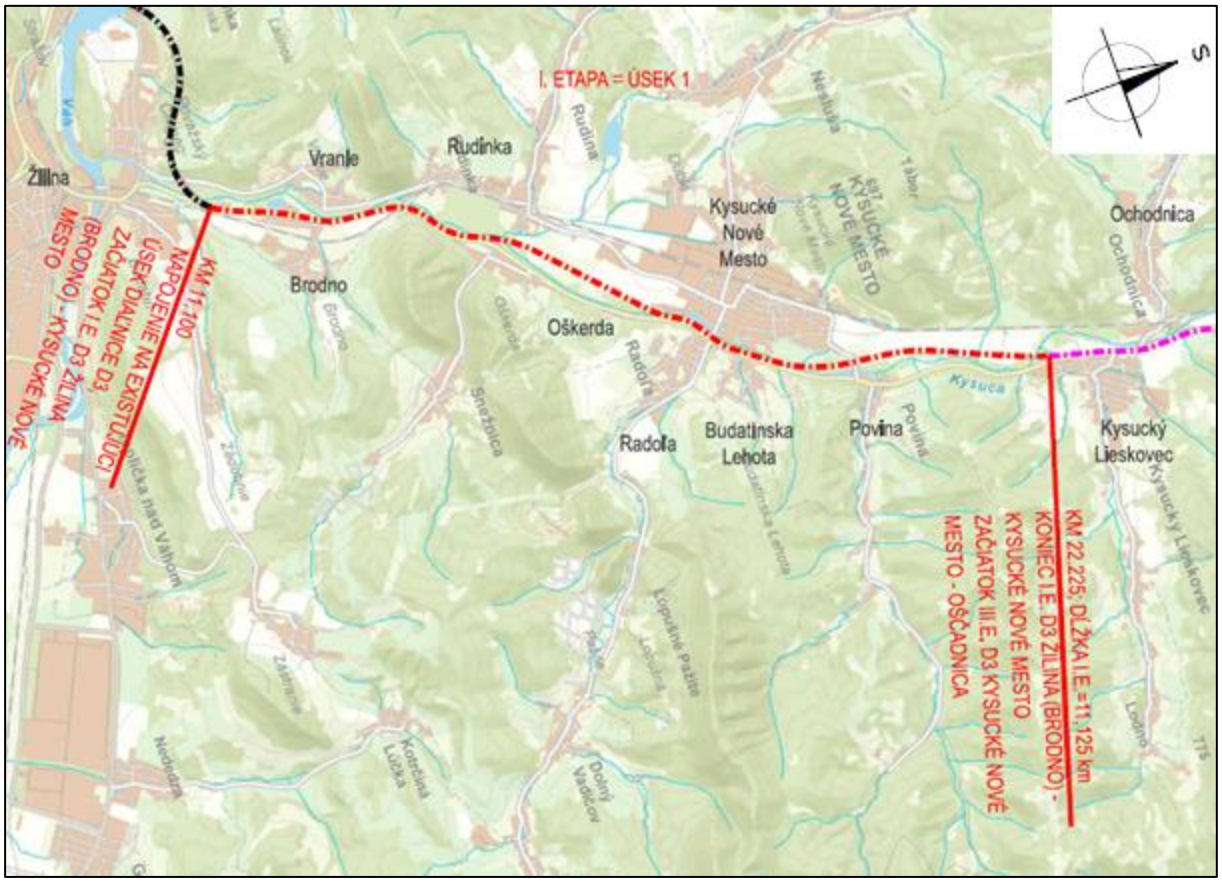
The relevant section of the D3 highway begins with the connection to the Žilina (Brodno) highway intersection and continues along the route of the I/11 road through the Kysuca river valley. The highway continues along the western edge of Brodno as far as Kysucká Brána in this route. There it crosses railway line No. 106D Žilina – Čadca on a bridge. Then it runs concurrently with road I/11 and the Kysuca river. River is crossed in the area of the village of Oškerda. It crosses to the right bank of the Kysuca River and runs parallel to it. Subsequently the Kysucké Nové Mesto interchange is proposed in the vicinity of the Skalka roadhouse.

The route of highway D3 then passes between the waste water treatment plant in Kysucké Nové Mesto and the Kysuca river, crosses the Kysuca river, reaches the left-side inundation area of the Kysuca river between the river and road I/11 and above the gas station in Radola. The gas station remains preserved. Highway then crosses the road III/2053 Radoľa – Kysucké Nové Mesto, passes over the area of the former car club in Radoľa, over the area of road maintenance depot of the Žilina Autonomous Region, continues along the left-side inundation area of the Kysuca River and behind the former football field in Budatínská Lehota crosses the Kysuca River again and reaches the right bank. The route continues along the Kysuca inundation area to the village of Kysucký Lieskovec, where it crosses the river again. Just beyond the river crossing is the end of the I. stage of the designed construction of the D3 highway.

Section specification:

- Category D 24,5/80
- Beginning of construction 11,100 km
- End of construction 22,225 km
- Length of D3 highway 11,125 km
    - Current four lanes on I/11 1,900 km
    - New structure 9,225 km
    - Interchange ramps 2,108 km
- Number of interchanges 2
- Length of noise barriers 19,237 km
- Initial investment costs 497,754 mil. € excluding VAT

*Figure 10 - I. stage route: Žilina (Brodno) - Kysucké Nové Mesto*



# 4 PROJECT ENVIRONMENTAL IMPACT

The project environmental impacts were evaluated based on identified conflicts and effects on soil, Natura 2000 system conservation areas, Territorial System of Ecological Stability and water, and also noise impacts, dispersion of produced emissions and effect on rock environment and natural resources were evaluated.

**Passability of the territory impact**

The current state of the size and position of migration objects does not meet sufficient parameters to ensure the migration permeability of the territory and the protection of animals migration. Road I/11 and the railway line currently represent a fundamental migration barrier in the assessed area. By building the D3 highway in the assessed section causes a strong assumption that the implementation of the proposed measures will improve the passability of the landscape for wild species of animals.

**Conservation areas impact**

The impact on protected areas declared in accordance with Act No. 543/2002 Coll. on nature and landscape protection in the current version represented in the area of interest by small-scale protected areas is not expected.

**Natura 2000 system conservation areas impact**

The construction of the D3 Žilina (Brodno) - Kysucké Nové Mesto – I. stage highway will have zero or slightly negative impact for most objects of protection. In neither case is it established that a significant negative impact is expected. Integrity of the territory of the Natura 2000 system would not be threatened, and therefore the implementation of the completion of the highway section in question would be recommended.

**Air quality impact**

The impact on air quality was assessed using a mathematical model, which evaluates the target state of the emission situation in 2050 by comparing air quality without the implementation of the project and in the case of implementation of the project according to the proposal. Based on the contribution of road transport to the local level of air quality, it can be concluded that the implementation of the construction of the D3 highway - I. stage Žilina - Kysucké Nové Mesto will have a positive effect on the level of air quality.

**Noise situation impact**

The implementation of the plan will change the spread of noise emissions in the location of the construction site. Measures were proposed as a part of the construction plan, so that the limits given by legislative requirements were not exceeded.

# 5 COST-BENEFIT ANALYSIS

An economic cost benefit assessment was carried out for the proposed design. The goal of the economic assessment was to evaluate the legitimacy of the investment costs incurred by comparing them with the benefits of the designed D3 highway. The cost-benefit analysis (CBA) was processed in accordance with the Methodological Guide to the Creation of Cost-Benefit Analyzes (CBA), Operational Program Integrated Infrastructure 2014 - 2020, version 3.0 issued by the Ministry of Internal Affairs and Communications of the Slovak Republic in May 2021.

For the economic evaluation, one project variant is considered, including 2 structures:

- D3 highway I. stage: section Žilina (Brodno) – Kysucké Nové Mesto
- Highway feeder Kysucké Nové Mesto

which for the purposes of economic evaluation form a set of structures. Together, the structures form an operational and functional unit.

## 5.1 PROJECT IMPLEMENTATION OBJECTIVES

The project is aimed to construct D3 highway in an optimum route in terms of free-flowing and safe traffic as well as the construction and operation effect on the inhabitants and natural environment. The primary purpose is construction of high-quality road with sufficient capacity which will serve the concerned area in respect of the local inhabitants and activities and also conflict-free transit transport. After relieving from transit transport the existing road network will continue fulfilling the regional transport function – provision of transport connection between urban units in the region.

The designed section of the D3 highway Žilina – Kysucké Nové Mesto will bring significant improvement of the road network in the north-south direction. After the implementation of the project, an increase in capacity and speed is expected in the section of the road network connecting Žilina and Poland. At the same time, there will be a reduction in long distance transit traffic on the existing I/11 road in whole Žilina - Čadca section. In the adjacent villages, a reduction in traffic intensity and an increase in road traffic safety can be expected.

The implementation of this construction will contribute to increasing travel speeds and shortening the time for drivers. Another benefit is the reduced accident rate on the existing I/11 road. The goals can be broadly summarized as follows:

- Social-economic view:
    - a reduction in travel time is expected due to the transfer of long distance transit traffic from road I/11 to the new road D3 Žilina – KNM and an increase in the maximum permitted speed,
    - an increase in the safety of transit traffic and traffic on road I/11 is expected due to the diversion of transit traffic,
    - an increase in accessabilty in the region is expected,
    - a negative impact on the environment and built-up areas will be reduced,
- Technical-operational view:
    - as a result of the project, it is assumed that the administrator's operating costs for transit communication will be saved, especially in the period shortly after the implementation of the plan.

## 5.2 PRICE OF PUBLIC WORK

The price of the public work is broken down by structures in I. stage. First is D3 highway and second is feeder in Kysucké Nové Mesto. Costs are divided to already invested and future investments in the following periods.

Initial investment costs 497,754 mil. € excluding VAT

- Of which:
  - Expected construction costs of D3 455,845 mil. € excluding VAT
  - Already invested on construction of D3 25,852 mil. € excluding VAT
  - Expected construction costs of KNM – feeder 15,421 mil. € excluding VAT
  - Already invested on construction of KNM – feeder 0,636 mil. € excluding VAT

## 5.3 COMPARISON AND EVALUATION OF OPTIONS

Within the I. stage: section Žilina – Kysucké Nové Mesto, only one so-called stabilized variant was determined and evaluated, which for the purposes of CBA analysis is divided into two constructions – highway D3 I. stage: section Žilina (Brodno) – Kysucké Nové Mesto and highway feeder Kysucké Nové Mesto.

In the following table there are complete route parameters including technical parameters, costs and savings. The financial data in the following table are presented in economic discounted prices (excluding VAT).

*Table 2 - Whole construction parameters overview*

| | |
|---|---|
| **Length of new highway D3 construction [km]** | 9,2 |
| **Length of modification of the existing I/11 to four lanes [km]** | 1,9 |
| **Number of interchanges** | 2 |
| **Design category** | D 24,5/80 |
| **Organization [number of lanes]** | 4 |
| **Maximum speed on the main route [km/h]** | 130 |
| **Compliance with technical standards** | Yes |
| **Capacity compliant** | Yes |
| **Investment costs [€]** | 387 291 488 |
| **Operational costs [€]** | 14 457 813 |
| **Time saving [€]** | 64 226 553 |
| **Vehicle fuel cost saving [€]** | 18 449 189 |
| **Vehicle operation cost saving [€]** | 62 338 600 |
| **Accident rate saving [€]** | 41 007 353 |
| **Pollutants saving [€]** | 25 738 433 |
| **Greenhouse gases saving [€]** | 48 306 542 |
| **Noise pollution saving [€]** | 2 561 579 |
| **Residual value [€]** | 127 082 985 |
| **Economical net present value (ENPV) [€]** | -12 038 067 |
| **Economical internal rate of return (EIRR)** | 4.82 % |
| **B/C** | 0.97 |
| **Rate of return [years]** | - |

By economic evaluation the assessed set of buildings does not show profitable results. The results of the socio-economic assessment show following facts:

- An increase in costs can be expected in terms of operating costs of the transport infrastructure manager, as the project adds a new highway to the existing network, which will need to be maintained.
- According to the economic evaluation, benefits can be expected in all monitored societal factors (passenger time, vehicle operating costs, safety and external costs from transport).
- The investment costs of the structure sets are too high due to its technical complexity given the difficult terrain and the small differences in length between the existing route, i.e. the I/11 road and the future D3 highway.

# 6 FINAL EVALUATION

Feasibility study of the D3 highway I. stage – section D3 Žilina (Brodno) – Kysucké Nové Mesto. The area of interest of the first stage is located between Žilina and Kysucký Lieskovec in the valley of the Kysuca river and is close to the road I/11. The route of the highway was solved with respect to the already established stabilized option.

Several basic studies and surveys were processed, which serve as a basis for creating a feasibility study. Among the most important are engineering-geological research, noise and emission study, transport model - capacity assessment, passability from the environmental point of view, risk analysis and CBA analysis.

The results of the CBA analysis showed that in terms of economic and socio-economic benefits, the project does not meet profitability criteria. But at the same time it can be considered beneficial and important for ensuring safe and high-capacity transit through the given location in terms of meeting the set goals. Based on the results of socio-economic indicators, it is possible to expect an increase in the capacity of the road and highway network, a reduction in travel time due to the transfer of long distance transit traffic from the I/11 road to the new road D3 Žilina - KNM and an increase in the maximum permitted speed. Furthermore, there will be an increase in the safety of long distance transit traffic on the D3 highway and traffic on the I/11 road, an improvement in the accessibility of the region and a reduction of the negative impact on the environment and built-up areas (noise). From an operational and technical point of view, the impact of the project will save the administrator's operating costs on the long distance transit road (highway D3).

Recommendations for further project preparation:

- Updating the affected local plans of cities and villages according to the final proposal (modification of the route following the requirements of the migration study, inconsistency between the D3 category considered in plans and design),
- Ensure the implementation of an archaeological survey as part of the next stages of project documentation processing.