

## HIGHWAY VERSUS ENVIRONMENT (CASE STUDY OF BRATISLAVA)

Milan Trizna

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*Department of Physical Geography and Geoecology, Faculty of Natural Sciences,  
Comenius University, Bratislava, Slovakia*

**Abstract:** The contribution deals with an impact of transport line constructions - highways on the environment. On the example of highway sections D61 a D2 in the area of Bratislava, the paper demonstrates some specific cases of possible highway's impact on environment, which is necessary to consider in the process of activity impact assessment on environment, based on the Act No.127/1994 (E.I.A.).

**Key words:** line construction, activity impact assessment, proposals of steps

### 1. INTRODUCTION

Bratislava is from the traffic point of view a significant inland and international knot. Its favourable geographical position in Europe predestines to become one of the junctions of continental traffic systems, which give the city big possibilities of development. Well-developed transport infrastructure of the city is the basic assumption for good international binds, as well as for the life of the city.

It is necessary to consider some social and international matters in the process of assessment. The important one of them is the rise of independent Slovakia since 1.1.1993 with Bratislava as a capital. There have settled many organisations consequently, which where located out of Bratislava till then. A boom of private entrepreneurialism since 1989 was another important social matter. They are not only private businesses, that directly influence traffic (truck transit for long distances, forwarding companies, driving schools) but also firms which utilise means of transport as an enterprising "instrument" (commercial activities, transit of goods etc.)

The result of the influence of those factors is that coefficient of growth in number of vehicles in 1998 reached 1,85 for cars and 1,53 for lorries in Bratislava in comparison with 1992. Forecast for the first decade of the new century tells about 2,21 for cars. Manageability of the traffic increase is not possible without high-quality system of communications in the city. As for already mentioned peculiarities of Bratislava, as well as city's location, a barrier of the Malé Karpaty Mountains and other factors, the basic communication system is built as a radial-circular with the six radials and two circles (internal and middle). It is necessary to say that the sections of highway D2 and D61 are the parts of the middle circle. It means that the sections of highway are useful not only for source, aim and transit traffic, but also for inter-regional internal traffic of the city.

## 2. HIGHWAYS OF THE CITY

Considering the location at the boundaries of the three states, there are two highway lines in Bratislava. It is the highway D61 that starts at the state border between Slovakia and Hungary in the direction of Bratislava - Trnava - Trenčín. From the international point of view, it is necessary to emphasise that the highway D2 is a part of trans-european multimodal corridor No. IV Berlin - Prague - Bratislava - Budapest - Istanbul and the highway D61 is a part of trans-european arterial road north - south and belongs to multimodal corridor No. V Bratislava - Žilina - Košice - Vyšné Nemecké - Ukraine.

By connecting of these two highway lines, it rises homogeneous transit across the city. To the effect of this project there were built two highway bridges across the Danube river (The Prístavný most and The Most Lafranconi). At present, these two bridges are connected with the junction of the D2/D61 highways and four-lane Einsteinova ulica in Petržalka, on the right-bank of the Danube. To complete the highways D2 and D61 in Bratislava, there is a need to build a section D61 - Vienna street - The Prístavný most, continuing of the section The Prístavný most - Mierová ulica by section D61 Mierová ulica - Senecká cesta towards Trnava and Trenčín and a section of the highway D2 Lamačská cesta - Staré Grunty. Now there is 5,038 km of highway D61 running and 19 km of D2 highway is partly running in the city.

In 1997 there was partly built up a section of the highway D2 in Petržalka, which allows connection of our highway network with the transport communication system of neighbour states Austria and Hungary. After total connection as well as after building all highways up in Hungary, the significance of the highway D2 in the area of Bratislava will increase.

## 2.1. Impact of the highway sections D2 and D61 on the traffic in Bratislava

A traffic situation in Bratislava is quite complicated. It is a consequence not only of factors, which are presented in this contribution, but also a consequence of long-term not solving a traffic situation of the city. As a result of this, the city traffic often collapses. It is a situation at the access and exit roads of the city. It is a consequence of fact, that there does not exist a complete transit routes across the city, which would allows lowering of aim traffic and on the other hand gradual increasing of source traffic.

In the Table 1, there are numbers of vehicles during 24 hours at the selected sites in the city, always in both directions. Presented numbers are from 1995, when a preparation of construction of the sections of highway began.

Table 1 Intensity of traffic at the selected sites in Bratislava (1995)

Profile	Direction	Number of vehicles /24 hours
Highway D61	to Bratislava	9415
	from Bratislava	9480
Road I/63	to Bratislava	6460
	form Bratislava	6460
Harbour bridge	to Petržalka	27971
	form Petržalka	23683
Bajkalská street	to Vajnorská street	19262
	to Harbour bridge	21913
Highway D2	to Bratislava	6083
	from Bratislava	5193
Brnianska street	to center	16239
	from center	16128
Mlynská valey	to bridge Lafranconi	11403
	to Patrónka	11954

From the numbers in Table 1, it is possible to assume a situation in traffic intensity at the city communications. Presented numbers assure us about complicated traffic situation at the access roads to the city. The construction of the highway sections D61 and D2 should be a solution.

Table 2 presents volume of traffic coming on the built up highway sections.

Numbers presented in Table 2 tell about significant share of highway sections D61 and D2 on traffic volume. To show more, for example on Rožňavská ulica traffic will reduce about 40%, on Trnavská ulica about 34%, on Bajkalská ulica about 12% and on Prievozská ulica about 7 %.

Except aim, source and transit traffic, the highway sections are also used for city traffic. Table 3 presents volume numbers of internal traffic on the highway sections.

Table 2 Share of traffic volume in proposed highway sections D61 and D2

Road section	Percentage of traffic volume	
	D61	D2
Rožňavská street	- 40	-
Trnavská street	- 34	-
Bajkalská street	- 12	-
Prievozsá street	- 7	-
Alexyho street	-	- 48
Polianky	-	- 39
Patrónka	-	- 37

Table 3 Share in internal traffic on proposed highway sections D61 and D2

Road section	Share in internal traffic on highway sections	
	D61	D2
Ivánska road - Galvaniho street	8	-
Galvaniho street - Gagarinova street	18	-
Gagarinova street - Harbour bridge	37	-
Alexyho street - Harmincova street	-	29
Harmincova street - Polianky	-	34
Polianky - Patrónka	-	34

The numbers in Table 3 document a big significance of highway sections for internal traffic, especially in the case of the D2 highway at Lamačská cesta - Staré grunty.

### 3. HIGHWAY IMPACT ON ENVIRONMENT

Construction and operation of line infrastructure influence environment differently. It is possible to divide them according to many criterions. For example, other impacts can be seen during construction and others during full operation. Highway impacts are different in a case of environment and socio-economical environment etc. Also, spatial spreading of impact, its intensity and time of working is changeable.

It is not possible to evaluate all impacts of highway sections D2 and D61 on the area of the city in this contribution. Environmental studies that consider impact of the highways D61 and D2 on environment were published (Trizna, 1997, 1998). Only some of specific examples of highway impact on environment are presented in the contribution.

### **3.1. Specific impact of Highway D61 Bratislava, Mierová ulica - Senecká cesta on environment**

The most impacted section of highway D61 is the south edge. The highway goes on a fly-over over Strojnícka ulica and Mlynské luhy in the area between Gagarinova ulica and Vrakunská cesta. Despite the fact, that the highway is in a corridor, which was selected for it (20 years ago), demolition of buildings on mentioned streets is necessary. Totally two 3-floor, fourteen 2-floor houses with extensions and about 35 other, especially wooden buildings will be demolished. Fig. 1 shows demolition in space. In the process of consideration of impact on environment, in the case of this section many drawbacks of this process have showed. Not very well elaborated environmental study at the second level was the first one. There were not sufficiently elaborated many impacts, which prevail in the area. For example, direct impacts caused by transport line under construction. More consistently had to be verified some data on noise, vibration data missed. Consideration of highway impact on environment should be done complexly. Also positive impact of highway section on environment at these sites, where is lowering of traffic intensity (Table 2), was not sufficiently emphasised. Because of these negative impacts prevailed in close neighbourhood of the highway, which is with regard to highway built in new traffic corridor understandable.

There is "protective zone of highway" in a city very narrow - only 4 m in building low (Construction Act). As a consequence of this, in this area there are buildings very close to the highway, which stay there after building a over-fly up. They are not considered to be object buildings "touched according to the low", they do not have right to compensation. Situation is complicated by fact that many of these buildings are buildings built after 1990. Just for interest, a over-fly is together with the highway and anti-noise walls in these sites high about 12 m and wide 26,5 m. Except other impacts, for example some buildings in close neighbourhood are significantly shadowed, which also was not sufficiently evaluated.

It resulted in forming of citizen association as a consequence of these subjective and objective unpleasant circumstances, which work against construction of the highway in this area. Effect of this was slowing down in before project and project preparation, which of course negatively influenced the whole realisation of this highway section.

### **3.2. Specific impact of the highway D2 Bratislava, Lamačská cesta - Staré grunty on environment**

The direction of highway D2 Bratislava, in section Lamačská cesta - Staré grunty, was studied in many variants. In 1990 The Dopravoprojekt a.s. (planning institution specialised on transport) elaborated "Comparative highway study" to finish till then proposed line variants of the highway D2 at section Harmincova ulica - Most Lafranconi with connections to other communication network. There were elaborated at the same technical level and complexly elaborated and compared 9 variants of solution in mentioned study. After consideration of all 27 organs, organisations and citizen's

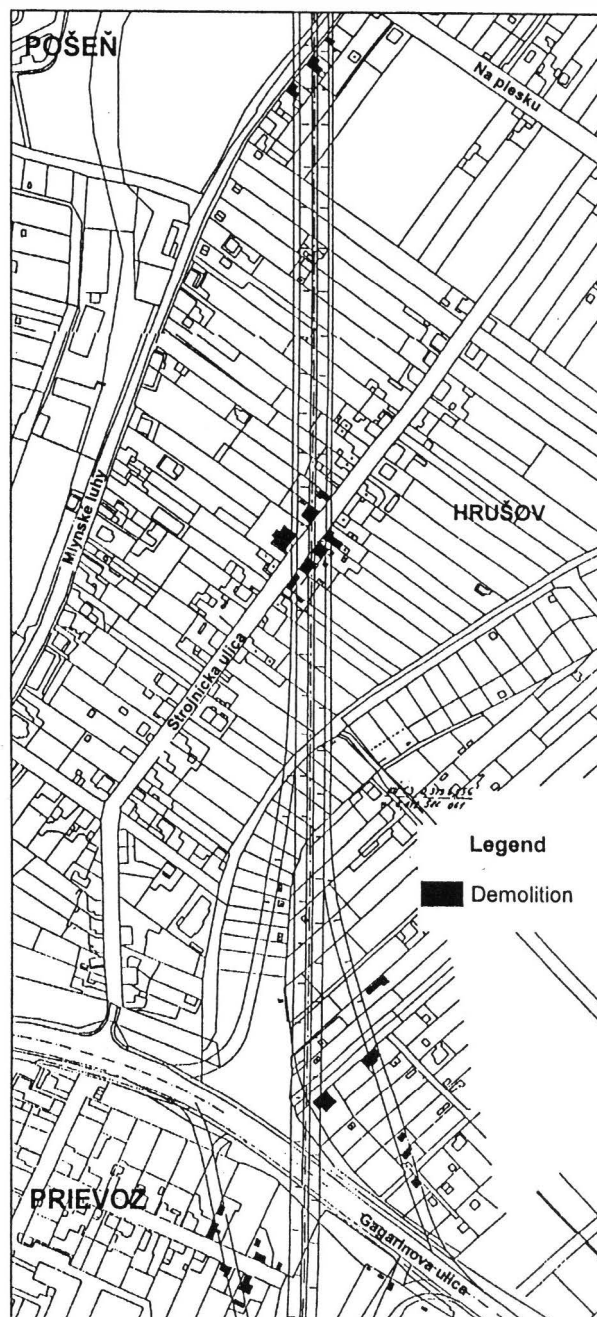


Fig. 1 Demolition of buildings and other impacted objects by constructing of the highway D61 Bratislava, Mierová ulica - Senecká cesta

associations, three of them had been chosen. Their impact on environment are complexly elaborated in paper Trizna, 1998. Attention is paid only to some specific facts in the contribution.

During consideration of impact of highway at the section of highway D2 to ZOO is the most interesting from the point of significance. The ZOO was established in 1960 and despite some projects, which considered with its moving, stays on the slopes of The Sitina. Situation of the ZOO has been gradually getting worse, because of a 4-lane communication in Mlynská dolina, which had substituted original communication with insufficient capacity. Another strong impact was constructing of sewage, which hits an area of the ZOO. Almost 2/3 of exposition must have been liquidated in several days. Area of the ZOO is not sufficiently protected against already existing traffic impact of communication in Mlynská dolina. This fact is documented in fig. 2.

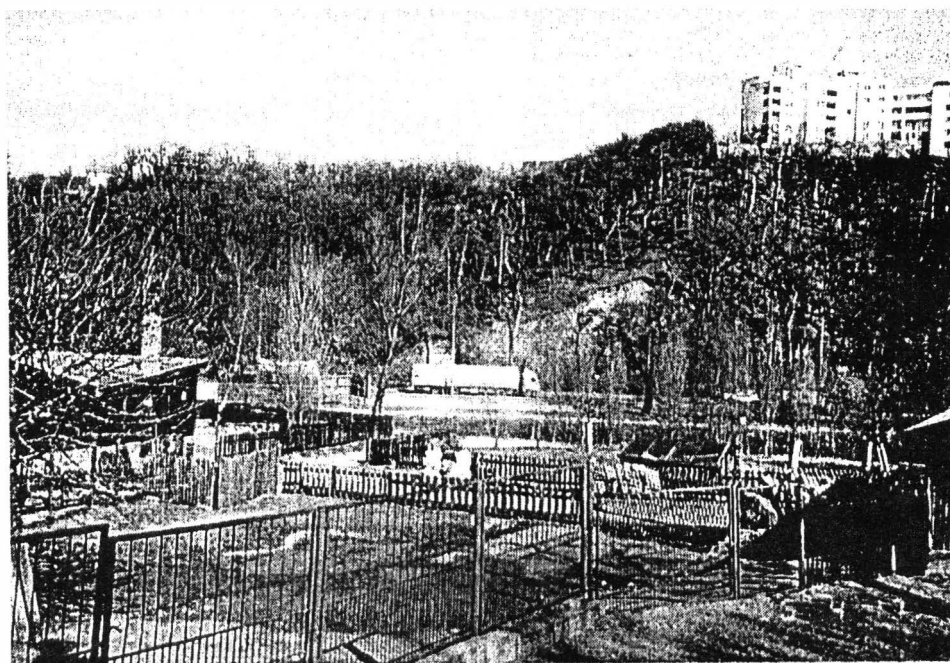


Fig. 2 View from the ZOO on communication in Mlynská dolina

The fig. 2 shows that the ZOO is detached from a communication by a narrow grass lane and only one barrier is thin vegetation, either on the banks of the Vydrice or it had been planted. There is not any barrier (at camel place) at some places. According to the mentioned facts, measurement of noise level there had been done in the area of the ZOO. Results are presented in graph in the fig. 3.

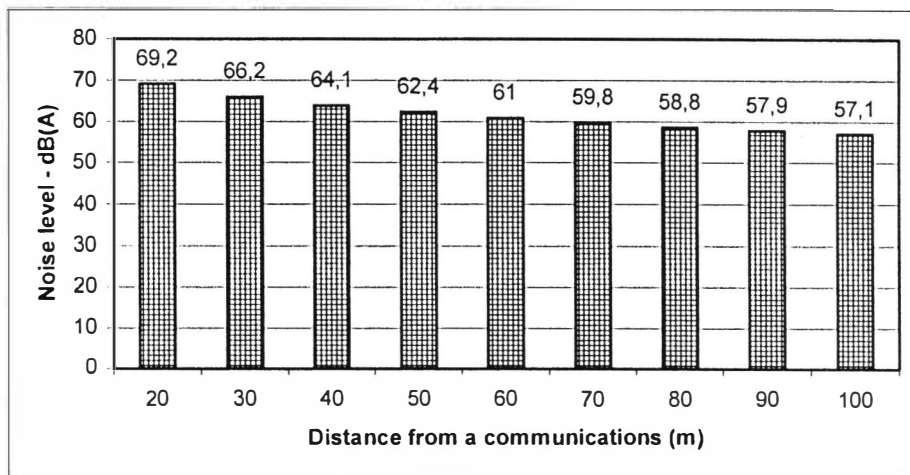


Fig. 3 Noise level in the area of the ZOO depending on a distance from a communication

Presented numbers are equivalent noise levels, momentum noise level when heavy lorry is coming is 82-85 dB.

From the point of noise impact the ZOO area is considered from two points

- ♦ from the point of noise impact on animals,
- ♦ from the point of noise impact on ZOO visitors (high part of children).

An obligatory rules for acceptable noise level estimation for permanent animal stay, which consider comparison of physical noise parameters and its harmfulness are absenting. Probably the most used is so-called Lehman scheme. According to it, noise above 30 dB is dangerous to nerve system, causes stress etc. Respecting already mentioned facts, the whole lane till distance 100m is hit by noise above 30 dB. It means, that noise hits nerve system of animals.

In the case of noise on ZOO visitors we can refer to a public notice No.14/77. For "recreation places of city importance" it is permitted the highest acceptable noise level 45 dB. According to this, we can say, that the whole watched lane till the distance 100m is hit by noise exceeds allowed number.

Impact of present communication in relation to the highway is evaluated from two points of view. In the first case, the important fact is that till now the gate to the ZOO, and a highway direction will be the same with the present state. The second aspect is a fact, that thankfully to impact of highway section on the ZOO, there is an obligation to build necessary protection constructions and make all steps to prevent or eliminate negative impacts. In spite of the fact, that it was obligatory for all previous constructions, because of absence a law No.127/94 it will probably happen now. We have to hope that "our environment maturity exam" also "respect to law" will finish successfully.



## 4. CONCLUSION

Solution to the traffic situation in Bratislava can not omit a completion of transport lines across the city, it means highway sections D2 and D61 and close communications. Constructing of highway in densely urbanised area of the city brings many problems. Its identification, estimation of significance level, as well as proposals to eliminate, it seems to be a part of a process, prescribed by the Act No. 127/1994 about activity impact assessment on environment. Thankfully to the legislature, it is possible to propose an optimal process of realisation of touched highway sections in the city.

In the contribution, we presented only several specific impacts, which highway sections cause in the city's area.

### Acknowledgements

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## Resume

### Diaľnica versus životné prostredie (príkladová štúdia z územia Bratislavy)

Bratislava je z dopravného hľadiska významným vnútroštátnym a medzinárodným uzlom. Kvalitná dopravná infraštruktúra mesta je základným predpokladom pre vytvorenie dobrých medzinárodných väzieb, ako aj pre život vlastného mesta.

Dopravnú situáciu v Bratislave označujeme ako pomerne zložitú. Je to nielen dôsledok objektívnych faktorov ale aj dôsledok dlhodobého neriešenia dopravnej situácie v meste. Je to dôsledok toho, že neexistuje ucelený priesťah mestom, ktorý by okrem tranzitnej dopravy zároveň umožňoval postupné odbúravanie cieľovej dopravy a naopak priberanie zdrojovej dopravy. A práve túto úlohu by v systéme komunikácií v Bratislave mali plniť úseky diaľnic D2 a D61.

Výstavba a prevádzka líniovej stavby sa vyznačuje rozmanitými vplyvmi na životné prostredie. Je možné ich rozdeliť podľa viacerých kritérií. Napr. iné vplyvy pozorujeme v procese výstavby diela a iné počas jeho prevádzky, inak vplyva dielo na prírodné prostredie, inak na socioekonomické prostredie atď. Taktiež sa mení priestorové rozloženie vplyvov, ich intenzita alebo dĺžka pôsobenia.

Zhodnotiť všetky vplyvy úsekov diaľnic D2 a D61 na území mesta nie je možné v predložennom príspevku. Environmentálne štúdie, ktoré posudzujú vplyv diaľnic D61 a D2 na životné prostredie boli publikované (Trizna, 1997; 1998). V predložennom príspevku preto uvádzame len niektoré, pomerne špecifické príklady vplyvov diaľnice na životné prostredie.