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# IMPACT OF ROAD INFRASTRUCTURE ON TOURISM DEVELOPMENT IN KOSOVO

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## ABSTRACT

*Road infrastructure and tourism represent positive implications for mutual relations and constraints. Today, the impacts of road infrastructure on tourism and vice versa are more visible than ever before. Tourism influences road infrastructure through intensive construction and modernization of the road network, increase and modernization of means of transport, increase in the number of passengers and goods, as well as the introduction of new forms of transport organization. The development of road infrastructure in Tourism affects the mastery of long distances, reducing the duration of travel for tourist purposes. The positioning of commercial destinations depends mainly on three basic elements: availability, attraction and organization.*

*Through a developed road network, it is possible to physically own long distances from markets in the origin-destination (OD) relationship, so the destination through a quality road network becomes easier to access, better organized and more attractive, better positioned, and the most famous. The synergistic effect of road infrastructure and tourism is reflected in the fact that joint investments, and coordinated in tourism and road capacities, provide greater financial effects than the effect that can be achieved with separate investments of the same capital in one and the other activity, therefore this phenomenon deserves consideration in the case of investments in road and tourist capacities. One of the limitations of Transport and Tourism is environmental pollution and the low level of road safety which, not only poses major social and economic problems but directly threatens the development of tourism.*

*Due to the lack of roads, or the poor condition of the existing roads and due to the low level of road safety, in some tourist destinations there may be a decrease in traffic for tourist needs. This means that a developed tourism must be preceded by a developed road infrastructure.*

**Keywords:** Tourism development, road infrastructure, Kosovo.

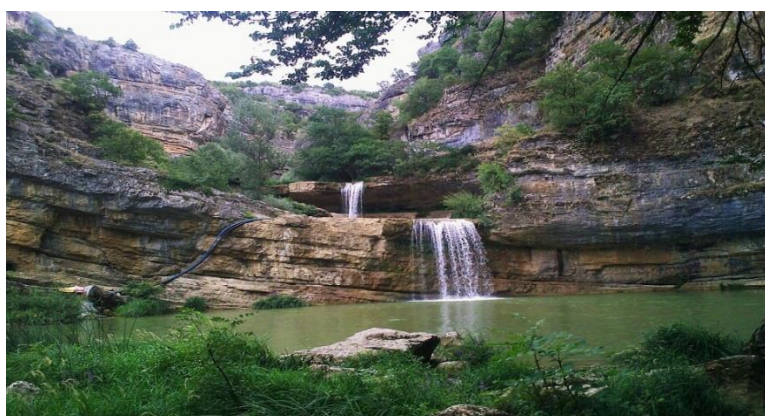
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## 1. INTRODUCTION

The correlation of Transport and Tourism in the modern economy requires detailed research, transport and tourism as interconnected phenomena depend on each other, affect each other, being one of the factors of economic development. The positive and negative effects with which transport affects the development of tourism over time become more pronounced, so it is necessary to harmonize with each other on the basis of sustainable development, while preserving the environment, on which the development of tourism should be based. . For the effect of traffic in tourism in our country, this topic has not been addressed enough so far (in the absence of adequate scientific framework-in the field of traffic) and the effect has not reflected the importance of these two sectors which has left a vacuum in The scientific treatment of this issue, however, has negative effects not only on Infrastructure, but also on tourism, and generally on the economy of our country.



**Figure 1** Attractive places in Kosovo, "Mirusha Waterfall"

## 2. KOSOVO'S ROAD NETWORK IN FUNCTION OF TOURISM DEVELOPMENT

The road network in Kosovo is divided into:

- Highways, highways, and regional, which are under the administration of the Ministry of Infrastructure (MInf).
- Local, including urban and rural roads which are under the administration of municipalities.

Road density does not differ much from some European countries (see Table 1).

**Table 1** Road density – comparison with other countries.

	(km/1000 km <sup>2</sup> )	(km/1,000 Persona)
Estonia	1,320	41.2
Hungary	1,733	15.7
Czech Republic	1,646	12.5
Slovenia	1,007	10.2
Croacia	506	6.4
Bosnia and Hercegovina	427	5.6
Serbia	494	4.8
Macedonia IRF	342	4.3
Kosovo	783	4.2
Albania	657	3.5

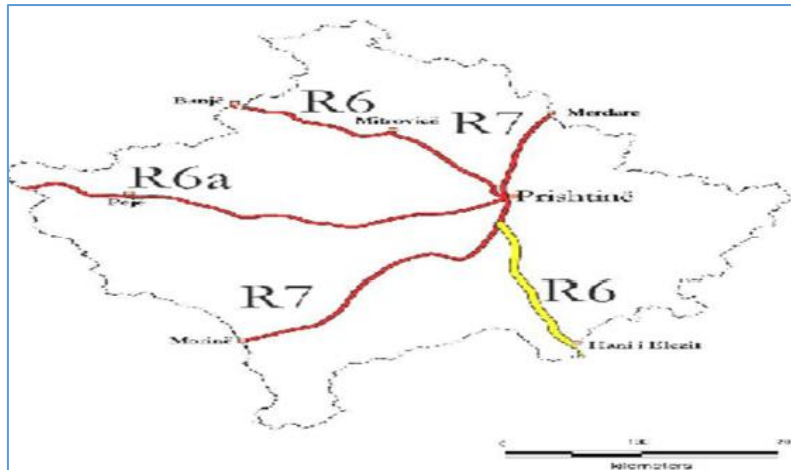


Figure 2 Kosovo highways

## 2.1. Traffic forecasts have traditionally followed Four-Step Model Sequences

The four levels of the classic transport system plan are:

- Travel Generation: determines the frequency of travel origins or destinations in each area according to the purpose of the trip, depending on the Land Use and the demographics of the families, as well as other socio-economic factors.
- Travel Distribution: matches origin with destinations, often using the Gravitational Model function, which is equivalent to an entropy maximization model.
- Modal Choice: calculates the share of travel between each origin and destination that uses a particular mode of transport. This model is in the form of a log.
- Determining itineraries: sets the travels that are performed with special modes of transport between origin and destination, according to certain itineraries. Wardrop's principle of user equilibrium applies to the assignment of road itineraries, in which each user chooses the shortest route (travel time), a choice that is made in the same way by each other user.

Software program Trans Cad uses the gravitational model according to the following mathematical formula as a travel distribution model (Matrix O-D):

$$T_{ij} = k \cdot (G_i \cdot A_j) / C_{ij}^b \quad [ 1 ]$$

Where:

*i & j* - represent the area Origin and Destination

*T<sub>ij</sub>* - passenger traffic flow (road transport) between areas *i* and *j*

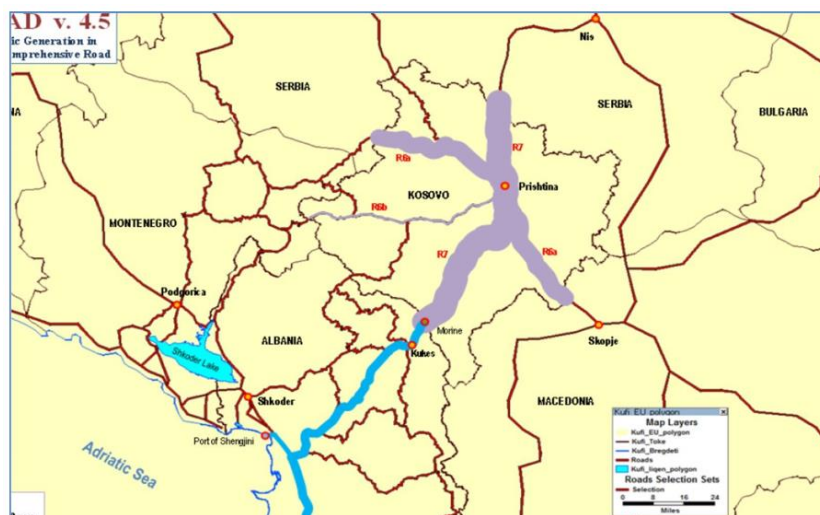
*G<sub>i</sub>* - number of trips generated by area *i*

*A<sub>j</sub>* - the number of trips withdrawn from area *j*

*C<sub>ij</sub>* - obstacles for travel between areas *i* and *j* (a function of travel time between *i* and *j*)

Factors *a*, *b* & *k*, that need to be determined in the modeling process.

Figure 3 below shows the traffic flow which is expected to be generated through the main road network of Kosovo (roads 6 and 7) in a time frame 2012-2021. Modeled with Trans CAD software program.



**Figure 3** Traffic generated (additional) flow analyzed with Trans CAD Software Program, Worked by the author

### 2.1.1. International Bus and Car Traffic Generated in Kosovo

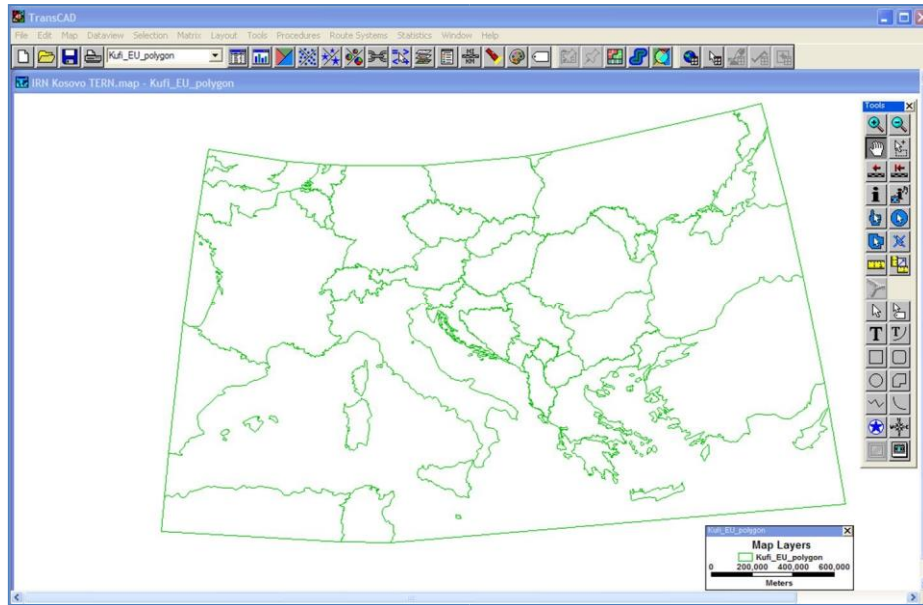
As a result of the integration of the Kosovo Road Network into the Pan-European network, the Kosovo SEETO Road Primary Network (R6a, R6b and R7 Road) will generate additional traffic presented in the following tables:

**Table 2** International traffic generated (additional) of cars, analyzed with the software Trans Trans CAD, Worked by the author

N r.	Predicting annual, international and transit traffic, the additional number of cars on the main roads R-7, R6a, and R6b		
1	Road with traffic	The annual number of vehicles	AADT
2	Road R-7	2,346,012.00	6,427
3	Road R6b	13,023	36
4	Road6a +R6b	213,527	585
5	Road R-7 + R6a	4,799,065.00	13,148
6	Road R-7 + R6a + R6b	395,711	1,084
7	Total international + transit	7,767,338	21,280

### 2.2. Modeling and Simulation of Tourist Flows

Tourist activity has less feasibility compared to other forms of economy, which means that the activity of operational research and sectoral analysis in the design of tourist activities remains low. However, the tourism industry is increasingly being integrated and scientifically researched, through modeling and simulation safe analysis and design are done. It is natural that these analyzes will be more accurate if they are related to certain (narrow) areas, and to accurate data. By applying quantitative methods for forecasting tourist flows from one place to another, opportunities are provided for the use of simulation methods. The application of quantitative methods for decision-making and planning in the tourism industry highlights the problem of collecting, processing and exchanging information, and generally the problem of quantifying individual parameters.



**Figure 4** Modeling and simulation of tourist flows, application of Trans CAD software program

For the development of international tourism, the calculation of the number of tourists coming from one country to another should be done, the mathematical formulation (for the evaluation of the number of tourists coming from the country of the country j), is:

$$N_{ij} = K \frac{A_j P_i^{\alpha_i} G_{ij} \beta_1 L_{ij} \gamma_i T_n^{\epsilon_j}}{D_{ij}^{\delta_j}} \quad [ 2 ]$$

$N_{ij}$  - number of tourists who come from country to country j

$P_i$  - population in the country i

$G_i$  - per capita income in the country i

$L_{ij}$  - assessment of the connection of the country i and j, for example the language of speech, tradition, etc.

$A_j$  - appreciation of the country's popularity j

$T_n$  - time parameter

$D_j$  - the distance between the place i and j

$\alpha_i, \beta_i, \gamma_i, j, \delta_j$  - elasticity coefficients of the respective parameters

$K$  - proportionality factor

This mathematical formulation offers the possibility for analyzing the importance of certain parameters, for example  $D_{ij}$ , the distance between place  $i$  and place  $j$  can be "reduced" with good transport organization. In the formula are taken all the important factors for predicting tourist flows.

Simulation methods through software programs enable a model to be theoretically verified, this affects large time and material savings. Methods of simulating tourist flows offer the possibility of creating a secure statistic with multiple repetitions, which in real conditions are quite complex and expensive.

For the programming of tourist flows, the simulation methods are very efficient because they contain elements with theoretical consideration and real experiment, through the simulations the impact of changes of some parameters on the sustainability of the model can be predicted. The analysis of tourist movements in the origin-destination (OD) relationship is

without question considered as a very important determinant for the design of tourist development plans.

### 3. ROUTE 6 AND 7 IN FUCTION OF TOURISM DEVELOPMENT IN KOSOVO AND SURROUNDING COUNTRIES

Neighboring country Albania has a coastline of about 440 km and its position on the Balkan Peninsula is very suitable for the development of the tourism industry. Kosovo (especially the mountainous one) will also have a tourism development, as the Sharr Mountains (the ski center in Brezovica) and the Albanian Alps are very attractive for vacationers, which means they are offered to vacationers (tourists). Opportunity to enjoy the natural beauties of Kosovo in winter and Albania in summer, "Summer-Winter".



**Figure 5** The natural beauty of the Albanian coast

As it is known, the tourism industry is one of the pillars of economic development in many countries of the world. This industry is especially important for developing countries and with problems of unemployment, poverty, exports, etc., such as Kosovo and Albania, where thanks to natural resources can be considered among the priority sectors for economic development. Our destiny is that, geographically, we are in the Mediterranean basin, which due to the climate and other factors is the largest tourism market in the world and an annual magnet for hundreds of millions of foreign tourists from the richest countries in the world (Europe). North America, Japan, etc.).



**Figure 6** The natural beauty of the Kosovo Mountains

In this aspect, all Mediterranean countries have the priority of this important activity, being at the same time in constant competition with each other, through the continuous increase of accommodation capacities, quality of services, infrastructure, public safety, etc.

The construction of road 6 and road 7 in Kosovo will undoubtedly increase the number of tourist flows in both Kosovo and Albania as the time distance becomes much more favorable for the visits of local and foreign tourists, this will affect the growth of budget revenues and the overall economic development of Kosovo

#### 4. TRANSPORTATION TOURIST FLOWS IN EUROPE

Europe has always been the strongest market with its diverse offerings, from the roots of Mediterranean civilization to technical "wonders" such as the Eiffel Tower or the La Sagrada Familia in Barcelona. In recent years, the popularity of travel to Europe has declined, while the number of trips to Macro-regions has increased. For example, the Middle East has achieved an average annual growth of 10.5%, while Europe only 2.8%.

However, Europe remains the world's leading tourist destination with a 50% share in world tourism. The European Union has an important role in the development of tourism, which with various funds and programs is helping member states in the development of projects and thus is positively influencing the strengthening of influential multipliers in tourism, where special importance is attached to increasing employment and the development of underdeveloped regions. Strong tourist traffic in the European Union (38% of world international traffic) affects the fact that tourism remains one of the leading sectors of the economy. In addition to qualitative impacts, European Union policy supports the overall increase in the quality of tourism products, and high ecological standards. Such a policy is seen as beneficial in terms of increasing the competitiveness of member states.

**Table 3** Dimensions of the total passenger market in Europe

Passengers kilometers (million)	Estimates based on global average			Estimates based on groupings of states		
	Total Public Transport	Total Buses	Long distance buses	Total Public Transport	Total Buses	Long distance buses
EU15	812,600	416,900	207,381	812,600	416,900	224,809
EU12	178,000	105,600	55,602	178,000	105,600	59,524
Total EU	990,600	522,500	262,983	990,600	522,500	284,333
Other states	761,651	481,440	277,529	589,116	362,795	223,079
Total	1,752,251	1,003,940	540,512	1,579,716	885,295	507,412

**Table 4** Performance according to the mode of passenger transport (at 1,000 million passengers-km)

Year	Vehicles	Motorcycles	Buses	Railways	Tram & Metro	Air	Marine	Total
1995	3 930	122	499	351	71	346	44	5 363
1996	3 996	123	504	349	72	366	44	5 454
1997	4 080	126	504	351	73	390	44	5 567
1998	4 185	129	512	351	74	409	43	5 702
1999	4 300	132	514	359	76	425	43	5 849
2000	4 372	109	517	371	78	457	42	5 946
2001	4 477	113	519	373	79	453	42	6 055
2002	4 571	114	518	366	80	445	42	6 134
2003	4 613	117	519	362	80	463	41	6 196
2004	4 683	120	522	368	83	493	41	6 309
2005	4 630	123	523	377	83	527	40	6 304
2006	4 693	123	519	391	85	549	40	6 400
2007	4 762	119	533	396	87	572	41	6 510

Year	Vehicles	Motorcycles	Buses	Railways	Tram & Metro	Air	Marine	Total
2008	4 789	123	535	411	90	561	41	6 551
2009	4 866	122	515	403	90	522	40	6 558
2010	4 832	120	509	404	92	522	38	6 518
2011	4 822	123	512	407	93	575	37	6 569
1995 2011	22.7%	1.1%	2.5%	16.2%	30.8%	66.2%	-17.7%	22.5%
Per year	1.3%	0.1%	0.2%	0.9%	1.7%	3.2%	-1.2%	1.3%
2000 2011	10.3%	12.8%	-1.0%	9.8%	19.2%	25.8%	-12.3%	10.5%
Per year	0.9%	1.1%	-0.1%	0.9%	1.6%	2.1%	-1.2%	0.9%
2010 2011	-0.2%	2.9%	0.5%	0.7%	1.3%	10.1%	-4.0%	0.8%

**Table 5** Travel motives for some EU countries

Travel motives	Spain	Sweden (regular)	Sweden (occasional)	UK (regular)	UK (occasional)
Visits of friends	23%	47%	15%	22%	3%
Holidays	28%	15%	12%	25%	35%
Work / Business	18%	4%	3%	3%	0%
Education / schooling	14%	5%	1%	2%	0%
Others	17%	29%	70%	48%	63%
Total	100%	100%	100%	100%	100%

**Table 6** Travel goals for some EU countries.

Mode. Purpose	Business	Private	Holidays	Outbound / Return	Total
Car driver	11,170	82,137	57,631	89,448	240,385
Car passenger	3,095	58,781	50,787	24,897	137,560
Train	376	3,167	596	2,224	6,362
Bus	529	12,112	5,932	18,536	37,109
Air	65	20	398	0	483
Total	15,234	156,217	115,344	135,105	421,900

Traffic in Europe meets the needs of more than 700 million people. Europe's political geography divides the continent into more than 50 independent state territories. This fragmentation, and the increase in the movement of people by the industrial revolution, led to a high level of cooperation between European countries in order to develop and maintain road networks, the result of which was the development of tourism.

## 5. CONCLUSION

The movement of people is a permanent need because all the activities and needs of the people as well as the need for rest cannot be satisfied in one place alone. With the increase of the level of social development, the need for movement is more frequent and more diverse, but also the greater mobility. Thanks to traffic, increasing speed, reducing costs, increasing the comfort of travel, etc., today the mobility of people is becoming more pronounced and each time with a wide range of reach.

Road infrastructure is a basic condition for the development of tourism in Kosovo. However, road infrastructure in itself does not mean that it is always an adequate disposal of the tourist destination, because it depends on the access and the organization of transport.

From the modeling and simulation of the road network of Kosovo with the software program Trans CAD, especially the main road directions of



Kosovo (roads 6 and 7), analyzed for a period of time 2012-2021, it turns out that: across the territory of Kosovo there will be an expected passenger traffic, international and transit, of about 778,923 buses per year and about 7,767,338 cars per year, necessary for their transport.

The Average Annual Daily Traffic (AADT) is 2,134 buses / day or about 4,268 equivalent cars (pcu), and 21,280 cars per day. Roads R6a, R6b and R7 are expected to have AADT traffic for cars of about 14,095, 982 and 19,937 cars / day, respectively, and for buses of 3,877, 121 and 4044 pcu / day, respectively (equivalent pcu-Autovetura / day).

This result, obtained through measurements (modeling and simulation with the Trans CAD software program), shows the possibility that Kosovo has not only in providing services for transit passage through its territory, but as the shortest route in many relations in the Balkans presents opportunities. Real for the development of transport, trade, and tourism.

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