

## CREATING A MACROSCOPIC MODEL WITH PTV VISION VISUM, EXAMPLE OF PELAGONIJA REGION

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*Abstract: The development of information and computer technology finds application and becomes an integral part of traffic engineering. Modern traffic engineering can not be imagined without the use of modern software tools that facilitate and verify the work of traffic engineers. In developed European and world countries, traffic forecasts are made with modern software tools without which traffic engineering can not be imagined. The PTV Visum Macroscopic Traffic Model is the world's leading software for traffic analysis, forecasting and data management, transport demand modeling, and forecasting for neighborhoods in urban areas, cities, regions, and even countries. The aim of the paper is to use the PTV VISUM software to forecast the transport demand at the regional level, for example in the Pelagonija region.*

*Keywords: Model, planning, design, software, forecast*

### 1. INTRODUCTION

The region is a territory that has similar or homogeneous characteristics and differs from them in other regions. According to economic and sociological principles, the regions are divided into homogeneous, planned and nodal. Eight planning regions have been adopted in North Macedonia. As part of this paper, the Pelagonija planning region located in the southwestern part of North Macedonia, the largest region by area and settlements, but with a low population density, will be considered. It consists of nine municipalities, and they are traffic zones within the zoning. Figure 1 shows the location of the Pelagonija region.

Based on the input of the Pelagonija region and the set scale, nodes are marked that represent places that show the location of intersections and stops of JGP, then links are drawn that represent the railway and road network, zoning of the region, where each city is a traffic zone, composed of different purposes that are the source and purpose of travel. The connections between the zones are made with connectors, the penultimate step is to create the demand model where based on the entered data obtained from field counting or from another source, they are transcribed on the network, and the last step is the forecast of transport demand for a specific target. year, with the help of this software can be determined what will be the level of noise and harmful emissions from the traffic flow.



Figure 1: Position of the Pelagonija region (Source: <https://mk.wikipedia.org/wiki/>)

## 2. STEPS IN THE APPLICATION OF THE SOFTWARE PACKAGE PTV VISION VISUM FOR EXAMPLE OF PELAGONIJA REGION

### 2.1. User interface, background setting in VISUM software and scale

Figure 2 shows the user interface, already set background in the VISUM software and scaling, ie setting in scale.



Figure2: The user interface background and scaling (Source: Created by the student in the software tool Visum)

### 2.2.Placement of nodes (nodes) and posting links

The node (marked with a black dot) that actually represents each intersection (the part of the network where the links / sections intersect), has the task to define the type of traffic control at the intersection (roundabout, unmarked, signaled, with a sign of priority).

The links (marked with a black line) are sections that represent the connection of two nodes, where the width of the lane, the length of the section, traffic mode (one-way or two-way), speed of movement, etc. should be realistically defined. Figure 4 shows the placed links. Figure 3 shows placed nodes and shows the placed links.

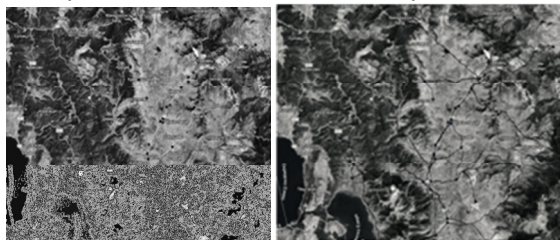


Figure 3: Place nodes and shows the placed links (Source: Created by the student in the software tool Visum)

### 2.3. Zoning

Zoning is the procedure of determining and delineating the zones of the city. Zones are objects that describe a special purpose area of land and their location in the network. The purpose can be in the form of settlements, commercial zones, shopping centers, schools, industrial centers, recreational zones, etc. They are the source and purpose of travel in the transport network. The Pelagonija region is composed of 9 municipalities, which means that we will have 9 traffic zones. Figure 4 shows the zoning of the Pelagonija region.



Figure4: Zoning of the Pelagonija region (Source: Created by the student in the software tool Visum)

### 2.4. Enter attribute data

One of the most important procedures for zones is to enter attribute data. Setting the attributes of the network elements is a procedure in which all activities and trips are defined for each zone separately. Figure 5 shows the entered attributes.

For the Pelagonija region, 12 attributes are defined: Citizens, Industry (jobs in industry), Education (jobs in education), Recreation (jobs in the field of recreation), Shopping (jobs in the shopping sphere), Administration (jobs in public administration), Catering (jobs in catering), Agriculture (all jobs in agriculture), All jobs, From the zone, In the zone, Employees.

SZONE:NO	CODE	NAME	TYPENO	ODZONA	RMADMINISTR	RMINDUSTRI	RMOBRAZOVA	REKREACIJA	SOPING	UGOSTITEL'S	ZITELI	SITERABOTN	VOZONA	VRABOTENI	RMZEMIODELSTVO
1	0	0	131	10763	1010	238	250	1085	75129	1973	0	33400	7482		
2	0	0	138	10032	1039	145	352	1053	92329	2259	0	29251	959		
3	0	0	39	2276	60	20	30	48	5621	109	0	3000	1530		
4	0	0	35	150	41	1730	500	68	9501	232	0	1532	50		
5	0	0	50	1000	117	50	30	61	8330	252	0	935	257		
6	0	0	92	2607	157	40	20	133	16352	580	0	4705	3200		
7	0	0	13	160	32	15	10	18	6253	193	0	1929	82		
8	0	0	29	3200	39	10	20	9	3169	96	0	908	51		
9	0	0	48	500	83	50	21	21	14098	333	0	3200	6150		
100	0	0	0	0	0	0	0	0	0	0	0	0	0		
101	0	0	0	0	0	0	0	0	0	0	0	0	0		
102	0	0	0	0	0	0	0	0	0	0	0	0	0		
103	0	0	0	0	0	0	0	0	0	0	0	0	0		
104	0	0	0	0	0	0	0	0	0	0	0	0	0		
105	0	0	0	0	0	0	0	0	0	0	0	0	0		

Figure 5: The entered attributes (Source: Created by the student in the software tool Visum)

### 2.5. Installation of connectors

The connectors have the function of connecting the traffic network with the zones. Their number is not limited, and is set in relation to which parts of the zone are most congested with traffic. Figure 6 shows the installed internal and external connectors.

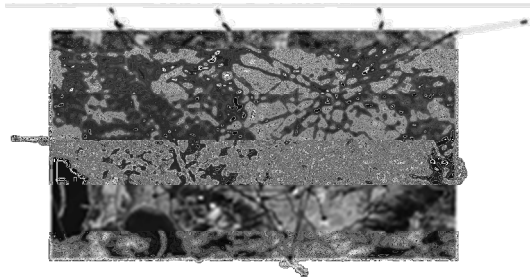


Figure 6: The connectors (Source: Created by the student in the software tool Visum)

## 2.6. Steps for creating the travel demand model

In this step we first go by setting up the transport systems, entering the purposes of the zones, freight transit and individual traffic, the period of analysis, creating matrices and entering data in them, calling and selecting the four-stage model.

## 2.7. Calculation procedures

Calculation procedures are the most important part of the model. Here we do the generation of the trip, the distribution and the rewriting of the trip. Distribution and generation were created and trip selection was performed, distribution and generation were entered, factors were entered, attributes were called, Skim matrix, matrix parameters were set, distribution factors were set, and private transport was assigned.

## 2.8. Calculation of modal's values

The next step is when the software needs to calculate the sizes and include all the activities such as generation, distribution and rewriting. Figure 7 shows the procedure for calculating and shows the modal's values.

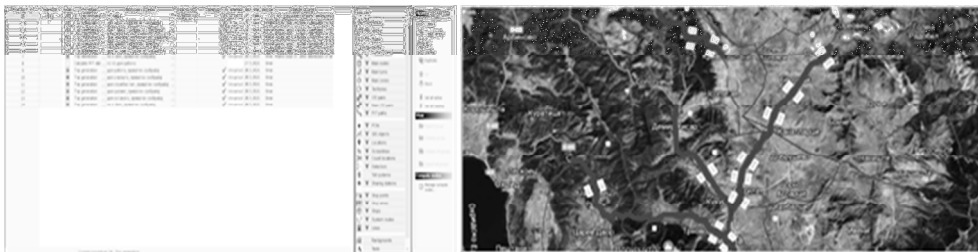


Figure 7: The procedure for calculating and shows the modal sizes (Source: Created by the student in the software tool Visum)

## 2.9. Transport demand forecast

The transport demand forecast is made in order to see how the transport demand will increase or decrease over a certain period of time. The projected values for the traffic load of a certain city are a challenging task for each individual, and especially for the traffic engineer. The fastest and simplest procedure for forecasting a single traffic flow is provided by the PTV VISUM software. Graphic display of PTV VISUM software for transport demand for 10 years with modal sizes displayed, in order to determine on which section the volume of trips is. Figure 8 shows the forecast values for 10 years.

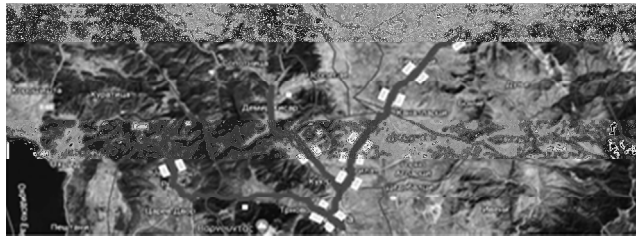


Figure 8: The forecast values for 10 years

### 3. RESULTS OF THE TRANSPORT DEMAND FORECAST FOR EXAMPLE

The transport demand for the Pelagonija region will increase in the next 10 years as the Pelagonija region becomes an increasingly competitive and desirable destination for living and tourism, with a perspective for young people, a clean environment and a European future. As a result of the increased demand, the capacity of the existing infrastructure should be increased, construction of a new one, reconstruction and improvement of the conditions for realization of the traffic.

### 4. ENVIRONMENTAL IMPACT MODEL

With the help of this software it is possible to determine how the flow of vehicles affects the environment. The noise level of a given section, the level of nitrogen oxides, sulfur dioxide, carbon monoxide, hydrocarbons can be determined. Increased traffic frequency in addition to reducing the quality of life, negative consequences for human health, the biggest problem globally is air pollution. Environmental pollution today is one of the most difficult and complex problems in today's world. Figure 9 Calculated sizes for induced emissions.

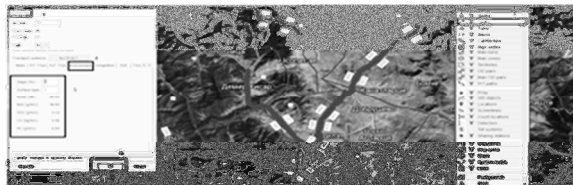


Figure 9: Calculated sizes for induced emissions (Source: Created by the student in the software tool Visum)

### 5. CONCLUSION

The software tool PTV Vision VISUM enables planning and can be used for real forecasting of transport demand. At the beginning, we set a base and scale, we draw nodes, because we work for a region, our node is a city, we draw links that represent our traffic network. Each city represents a separate zone for us, we also create external zones towards other surrounding cities that border the area covered. We set up connectors that show us where we have the highest number of trips. Model creation is done by setting up transport systems, defining purposes, activities, type of traffic to be analyzed, creating matrices, connecting them, defining peak hour and type of model. We create generations and distributions for all purposes, and skim matrix, and perform rewriting of private trips. With that, the values are calculated, and the forecast for the coming years is made based on them.

## REFERENCES

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