

THE UTILIZATION OF THE TRANSPORT MODELS FOR ASSESSMENT OF THE TRANSPORTATION ROADS FOR VEHICLES, WHICH CARRY DANGEROUS ARTICLES ACCORDING TO ADR

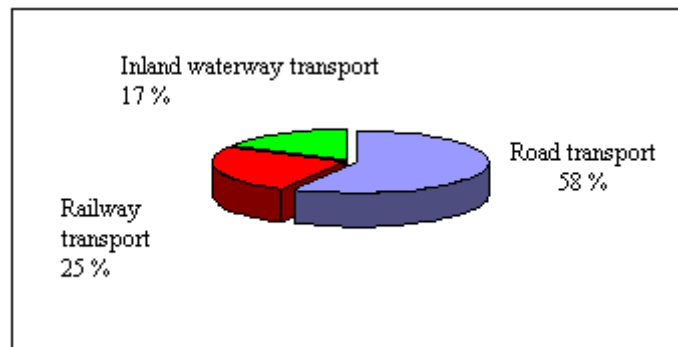
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Summary: The article deals with the dangerous articles road transportation dilemma, especially with the assessment of critical places on roads in the Czech Republic. The assessment of critical places is the key problem for quality increasing and safety increasing during this kind of transportation, which is unavoidable for incoming development of this specific transportation. The proposal of recommended transport routes based on risk analysis of an accident occurrence is made on the end of the paper.

Key words: Agreement ADR, dangerous article, road transport

1. INTRODUCTION

The total volume of transport of dangerous goods is about 110 000 millions of tons per year in the European Union as it follows from the analysis of contemporary stage abroad. 58 % of dangerous good are transported by road transport, 25 % by railway transport and 17 % by inland waterway transport.



Source: [1]

Fig.1 - Transportation volume division during dangerous goods transportation in EU countries

The main deciding factor for choosing of the right sort of transport is a price. Thanks to this reason the traffic volume of dangerous articles decrease on railway and increase on road transport in the EU. It is necessary to paid extraordinary attention to risks of dangerous articles road transportation.

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2. GENERAL PRESUMPTIONS FOR ESTABLISHING OF CRITICAL PLACES OF DANGEROUS ARTICLES TRANSPORTATION ON CZECH ROADS

It is necessary to examine accident's volume of cargo vehicles which carry dangerous articles. The examination is based on traffic accident's records in a given time period. It is necessary to have information about a place of a traffic accident, time of the accident origin, reasons of origin and about participants of the traffic accident.

2.1 Place of the traffic accident origin

A place of the traffic accident origin is the most important stand-point for assessment of critical places on the transport infrastructure. It is important to have information about the road, where accident has happened, for assessment. This information should be detailed for high-exact of partial results. That information includes road category, kilometre of road, but also the direction in which the accident has happened.

2.2 Time of the traffic accident origin

Another stand-point for the assessment of the critical places is time, which is important for assessment of the traffic accident's reason. Every day period has its specificity which influences on risks of the traffic accidents. It is possible to mentioned changes in traffic intensity during the day (the week), variable sight-rate in different day period, but also in different seasons. Its roll plays also weather conditions and technical conditions of roads. The places with frequent occurrence of traffic congestions influence places of traffic accidents origin and process of quest.

2.3 Reason of the traffic accident origin

It is necessary to know reasons of the traffic accident for critical sections problem solving. The reasons should be driver's failure, another reasons (dangerous articles, defects on the road, and so one). It enables to make the survey about the traffic accidents classification and utilizes reasons for probability calculation of generation of the traffic accidents.

2.4 Participants of the traffic accidents

A category and a technical condition of all vehicles, which participate on the accident, eventually information about another participate persons (pedestrians), are inherent information for the risks elimination during this special transportation.

The mentioned dates (place, time, origin reasons and participants of traffic accident) have to be analyzed. The analysis says which of the accident will be counted in and which not and why.

3. CRITERION FOR DANGEROUS ARTICLES TRANSPORTATION EXCLUSION FROM A GIVEN SECTION

The Law about Traffic on the Roads no 361/2000 Sb. in valid wording knows the traffic restrictions (it means traffic signs “Prohibition of Entry“, and “Prohibition of Entry for Vehicles with dangerous Load, which can cause water pollution“). The missing maps of the Czech roads and highway network are big embarrassment.

Each section of the transport network is necessary to explore from view of dangerous articles transportation accessibility.

Factors which influence accessibility are:

- a) Road category
- b) Traffic intensity in relations to section capacity
- c) Engineering characteristic of roads
- d) Accident frequency on a given section
- e) Other characteristic of section (rural area/urban area, number of inhabitants who living in proximity, schools, health care institutions, and so one).

4. PROPOSAL OF REDUCTION OF ROAD AND HIGHWAY SECTIONS FOR DANGEROUS ARTICLES TRANSPORTATION – WITH THE CRITICAL PLACES AND TRAFFIC RESTRICTIONS USING

Having cognisance about location of traffic restrictions (prohibition signs relevant for dangerous articles transportation) is important for reduction of road and highway sections in the Czech Republic.

The author made the map with transportation routes (fig. 2). The map is based on reliability couched in the self probability enumeration of traffic accident nascency in the road transport. The map originates from the elimination of the riskiest section.



Source: Author

Fig.2 - The suggestion of transportation routes – the author self elaboration

The transport modelling software tools enables to compile the distant matrixes on generalized cost base. The costs can be set by the formula (4.1). The minimum cost road can be searched from the matrixes.

$$GC_{ij} = \alpha D_{ij} + \beta T_{ij} + \gamma C_1^{ij} + \delta C_2^{ij}, \quad [\text{money}] \quad (4.1)$$

where: GC_{ij} are generalized costs [money]

D_{ij} is the distance between places (zones) i and j [km]

T_{ij} is the journey time between places (zones) i and j [min]

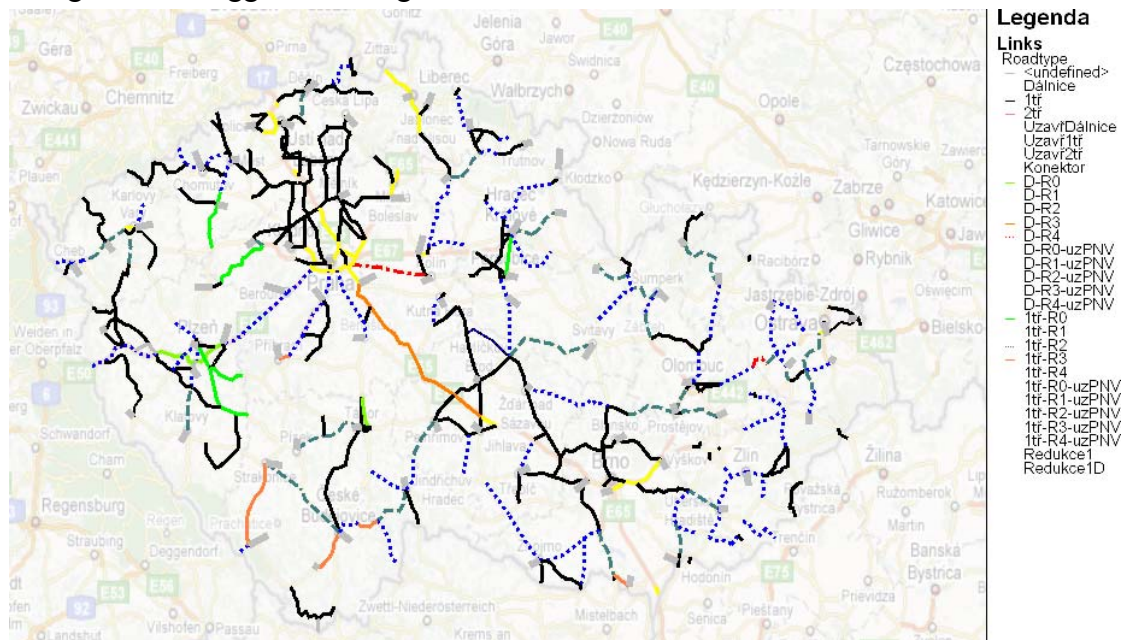
C_1^{ij} are additional costs (risks costs) between places (zones) i and j [money]

C_2^{ij} are additional costs gained from previous assignments (previous iterations of calculations of assignment of the traffic flow to a given net's section) between places (zones) i and j [money]

$\alpha, \beta, \gamma, \delta$ are weighting and transfer coefficients for transmitting of parameters on similar base (money) and for implementing of weighting factors in the calculation. These coefficients are set up ad hoc case to case in the process of model verification [money/km; money/time; - ; -]

The generalized costs can be couched in minutes, but those gained times doesn't correspond with real time of transportation. Nevertheless they included the risks factor. It constitutes a mathematic mean for calculation of the shortest road with regard to risks on the sections.

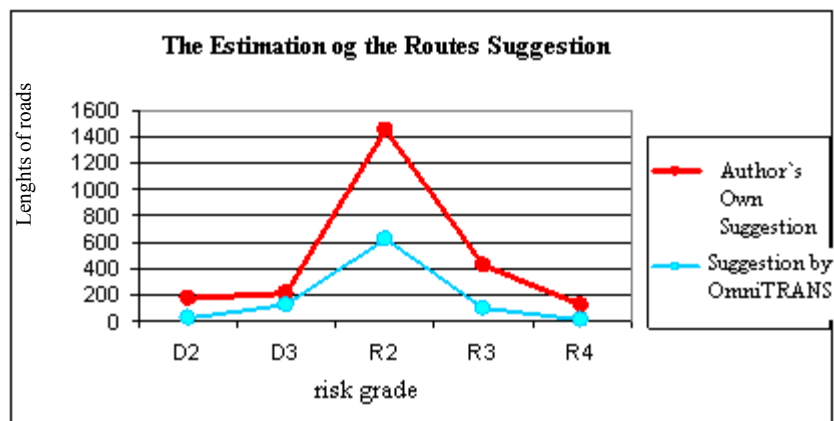
The OmniTRANS software compiles the next map with transportation routes. The author used SQL inquiries there to create this map (fig. 2). As we can see, rotes are more reduce against the suggestion in fig.3.



Source: Author

Fig. 3 - The reduced net by using OmniTRANS

The author's map includes 2 396 km of transport routes with risks 2 – 4. The OmniTRANS compiled map with only 892 km of transport routes with risks 2 – 4. The biggest number of routes with risks 2 was left in both examples (see fig. 4).



Source: Author

Fig.4 - The estimation of the routes suggestion

5. CONCLUSION

The most problematic sections from dangerous articles transportation view were chosen on the critic section analysis of roads in the Czech Republic base. The established sections were recognized in two proposals of transportation lines. The first proposal has been created by analytic methods; the second one has been created with modelling software support. Thanks to this fact has been proved usability of those equipments for this kind of problem, because the demandingness of transportation has been checked during the risks assessment.

6. ACKNOWLEDGEMENTS

The paper has been processed in the framework of the ministerial project (MD CR): No. CG742-015-030 "Management of transport of dangerous articles by european and national norm in relation to system of crisis operation in the Czech Republic".

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