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POSSIBLE APPROACH TO STUDYING TRAFFIC IN STATES OF EMERGENCY

SUMMARY

In view of the fact that there are different approaches to studying traffic in states of emergency, this article discusses one of the possible approaches to research of global standpoints in the analysis and assessment of the factors of exposure, menace, level of risk and danger of traffic systems in states of emergency.

1. INTRODUCTION

Considering its composition, extent, dynamics, inter-disciplinary nature, the specificity of individual sub-systems and their organisation, a traffic system is of special interest to the economy and the general efficient functioning of the state.

As the basic integrational factor, a traffic system must ensure the activation of all the human and material potentials, both in "normal" and "exceptional" circumstances. Exceptional circumstances, states of emergency, in this article imply all forms of natural catastrophes, such as earthquakes, floods, fires, landslides etc., as well as military activities. Everything else is considered normal.

All experience to date on the role and function of traffic in states of emergency, as well as problems that appear in such circumstances, give rise to the need for continuity of research with the aim of finding solutions for the effective functioning of traffic systems in all the circumstances, including the exceptional ones.

Previous experience about the exceptional and also decisive role of traffic during earthquakes in Skopje, Northern Italy, most recently in the Soča valley in Slovenia, and elsewhere in the world, floods in Zagreb, Slavonia, Northern and Western Europe and elsewhere, the most recent landslides in southern Italy, as well as other natural catastrophes throughout the world, confirm its exceptional importance.

Similarly, the traffic system played an irreplaceable role in the evacuation and care of the population, evacuation of material goods, ensuring the operation of the economy, etc., in both world wars, as well as during the most recent wars in Slovenia, Croatia, Bosnia & Herzegovina, and especially during the bombardment of Sarajevo, as well as in other local wars and conflicts.

2. APPROACH TO THE RESEARCH

The traffic system must ensure speedy, precise, safe, flexible, reliable and completely effective functioning of all its subsystems, also outside the conditions of states of emergency, so that it can continue meeting the demands of optimal functioning, in the shortest possible time and spatial diapasons, even under conditions of total uncertainty.

Ensuring the optimal functioning of traffic in states of emergency demonstrates all its complexity, pronounced variability, in which the question is always raised whether there the unavoidable reduction might not result in an incomplete or even entirely mistaken understanding of the studied phenomenon of states of emergency.

The complexity of research and occasional nature of the phenomenon of states of emergency often accustoms researchers to a simplification of numerical changes, or only to the specific case of states of emergency, which gives proper results for the specific phenomenon only.

Studying the problems of traffic in states of emergency, according to all experience up to date, has to be performed by specially adapted methodology. Therefore, one of the possible approaches for seeking global solution is through systemic analysis and assessment of the factors of exposure, menacing, threat and danger to traffic systems in states of emergency.

2.1. Exposure of a traffic system in states of emergency

A schematic presentation of the exposure of a traffic system in states of emergency is presented in Figure 1. The exposure (1) of the traffic system in states of emergency can be presented in the form:

$$I = SI \cup OS$$

and the real exposure (RI) in the form:

$$RI = SI \cap OS$$

where:

SI – systemic exposure of a traffic system
OS – existing state of the traffic system.

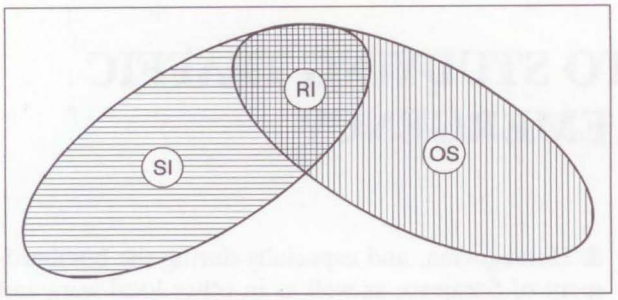

Figure 1 - Exposure of a traffic system in states of emergency

The systemic exposure of the traffic system is here:

$$SI = f(IP, MTI, IPP, TS, ZU, DPS, NR, EM, TR, ...)$$

And the existing state of the traffic system:

$$OS = f(OPP, OŽP, OVP, OLP, UT, UU, OPS, US, ...)$$

where:

IP – exposed area,
MTI – material and technical exposure,
IPP – inter-disciplinary/branch conditions of traffic,
TS – transport means and equipment,
ZU – users' demands for traffic services,
DPS – socio-political system,
NR – natural resources,
EM – economic power,
TR – technical and technological development,
OPP – organisation of road traffic,
OŽP – organisation of railway traffic,
OVP – organisation of water traffic,
OLP – organisation of air traffic,
UR – how well the territory is regulated from the point of view of traffic
UU – qualification of participants in traffic
OPS – Show well equipped with the necessary equipment and resources,
US – Unification and standardisation, etc.

2.2. Threat to the traffic system in states of emergency

A schematic presentation of the threat to traffic systems in states of emergency is presented in Figure 2. The threat (Ž) to the traffic system due to the possibilities of states of emergency can be shown in the form:

$$Ž = MIR \cup R$$

and the real threat (RŽ) in the form:

$$RŽ = MIR \cap R$$

where:

MIR – the possibility of states of emergency in a traffic system,
R – resources of states of emergency.

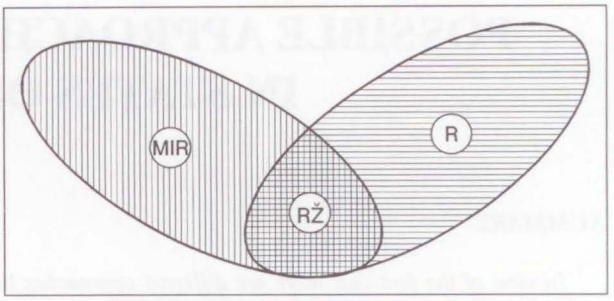

Figure 2 - Threat to a traffic system in states of emergency

The possibility of states of emergency in a traffic system is thus:

$$MIR = f\ (DPU, VPA, TA, NP, EM, ...)$$

And the real threat to a traffic system from states of emergency is:

$$RŽ = f(TP, MPo, MPI, PN, ORG, OPR, ...)$$

where:

DPU– social-political arrangement,
VPA– military-political aspirations,
TA – territorial aspirations,
NOP– natural conditions,
EM – economic power,
TP – fatigue of area,
MPo– possibility of flooding,
MPI – possibility of landslides,
PN – fire risk,
ORG – level of organisation,
OPR– level of equipment, etc.

2.3. Level of risk in the traffic system in the states of emergency

The level of risk of traffic system in states of emergency is shown schematically in Fig. 3. The endangerment (O) can be shown in the form:

$$O = RŽ \cap RI$$

which in the following cases of the level of risk in the traffic system in the states of emergency has the value:

- for the case when RI = RŽ it follows that O = 0,
- for the case when RI> and RŽ< it follows that it is O>,
- for the case when RI< and RŽ>, it follows that it is O<

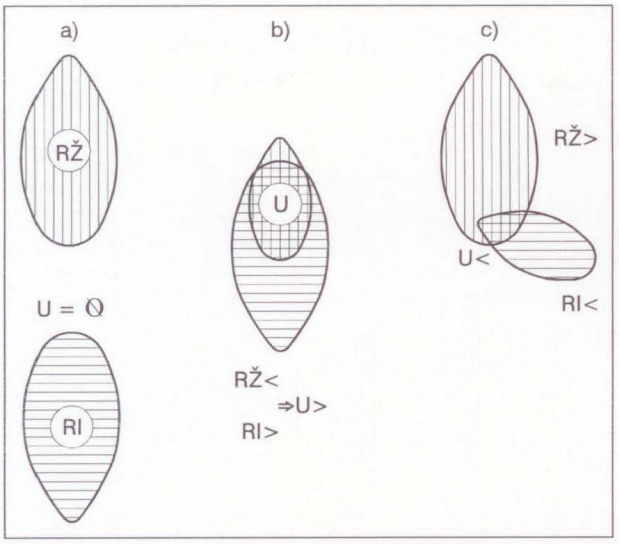

Figure 3 - Level of risk of traffic system in states of emergency

2.4 Danger of the traffic system in states of emergency

The danger in a traffic system in states of emergency is shown schematically in Fig 4. The danger in this can be shown in the form:

$$N = O^c = O \setminus O \cap S$$

where:

S – state of danger

c – current state of danger

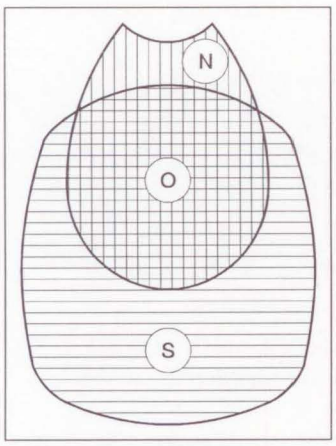

Figure 4 - Danger of traffic system from exceptional circumstances

3. CONCLUSION

The possible approach to the study of traffic in the considered states of emergency is mainly directed at a global systemic analysis of a traffic system, with the aim of supplementing primarily its existing state so that it would function more effectively in all the circumstances, including exceptional ones, without special and complicated transitions from ordinary to states of emergency.

SAŽETAK

MOGUĆ PRISTUP ISPITIVANJU PROMETA U IZVANREDNIM OKOLNOSTIMA

Obzirom na činjenicu da postoje različiti pristupi i studije za rješavanje prometnih problema u zemljama, državama sa gorućim (velikim) prometnim problemima, ovaj članak govori o jednom od načina rješavanja prometnih problema, te predlaže takav pristup rješenju koji podrazumijeva cjelokupno sagledavanje sadašnjeg stanja, uz detaljnu analizu svih bitnih i relevantnih čimbenika, istovremeno uzimajući u obzir moguće negativne posljedice i rizike koji su prisutni, odnosno koji bi se tek mogli pojaviti kod takvih zemalja sa istaknutim prometnim problemima.

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