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THE SPECIFICITY OF ROAD SAFETY: A FEW REFLECTION'S

Road traffic can be interpreted as a phenomenon of great complexity which is not subject to the simple laws, and often you can observe the paradoxes negative of intuition or common health. In this paper contains several special problems showing multi-aspects of road safety issues.

SPECYFIKA BEZPIECZEŃSTWA DROGOWEGO: KILKA REFLEKSJI

Można interpretować ruch drogowy jako fenomen wielkiej złożoności, który nie podlega prostym prawom, a często można obserwować w nim paradoksy przeczące intuicji lub zdrowemu rozsądkowi. Przykładów ilustrujących taką opinię jest wiele. W referacie zamieszczono kilka różnych partykularnych problemów pokazujących wieloaspektowość problematyki bezpieczeństwa ruchu drogowego.

1. INTRODUCTION

The proper functioning of transport systems depends to a large degree on efficient management. It should cause the transport was highly functional, pro-ecologic, economically optimal and, above all, safe.

When writing about managing the safety of road traffic, you need to take into account all the elements of the transport system, with which there is a road traffic; these include primarily: 1. road transport infrastructure; 2. means of transport; 3. human factors (various roles in the system of transport); 4. system environment; 5. three main working processes of the system, i.e. road traffic, cargo operations, traffic control processes.

Road traffic is very difficult object of study. It is a process: 1. spatially and temporarily unstationary, 2. has a nature of self-organization process, 3. carry out in it difficult decision- tasks situations and there are often small safety margins.

On the other hand, there are certain regularity, which may facilitate the analysis and traffic management: 1. demand for traffic has often repetitive character, hence observed cyclicity; 2. traffic on the road network has in the long term trend to stabilize the structure of the motion, as a result, participants in traffic set their preferences of road choice for traffic needs.

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2. THE SPECIFICITY OF ROAD SAFETY RESEARCH

It should be recalled old thesis of M. Salusjarvi which relate the specificity of the tests of road safety, [1]:

1. road safety cannot be treated as a separate matter divorced from social concern in general;
2. all methods and explanations of reason of road accidents are entitled, and each of them can form the basis for argumentation research;
3. researches and actions for the improvement of road safety should be seen and designed in the context of the changing social reception of road safety rank.

Road traffic can be interpreted as a phenomenon of great complexity which is not subject to the simple laws, and often you can observe the paradoxes negative of intuition or common health. Examples that illustrate the opinion are many. For illustration, several special problems showing multi-aspects of road safety issues.

2.1. Braess' paradox

Methodology for limiting transport congestions, particularly bottlenecks requires opposite strategies of than tells intuition; for example, turning off some lanes of traffic. This paradox strategy is effective: shortly the average driving speed quite quickly returns to standards, because some participants of traffic go out choosing urban public transport, and some select detours. Therefore, in cities with a large public transport systems, congestion has not increase even after the closure of many of the lanes, and even entire streets. The effectiveness of this strategy is confirmation of Braess' paradox, who in 1968 has calculated that increasing the throughput of the network of roads not only increase its productivity, but it restricts, [2, 3].

Another interesting problem is associated with systems of forecasting the traffic intensification on roads. Prognostic information about impediments in traffic on a particular chunk road goes to road users, and those responding, looking for detours; the same forecast proves to be false. This recalls the negative feedback in cybernetic set.

2.2. "Butterfly effect"

The Phenomenon observed in dense road traffic is the "butterfly effect" which is described in chaos theory. In traffic this effect is achieved as a result of the shock wave, (shock front), which source can be a single disturbance of traffic, for example a sudden braking or changing lanes. This phenomenon is trying to be used for prediction of congestion on roads, [4]. In the analysis road traffic in urban networks more willingly go back to the fundamental relationship between supply and demand, known in economics. This approach is used to design of electronic systems for charging for entry into the most jammed streets during peak hours, so that the demand is highest.

2.3. Shared space concept

The concept of shared space concept borrowed inter alia by Hans Monderman to enforce safe behaviour of road users. It appears that, for example, the complete removal of conventional means of regulating and controlling traffic in the city (road signs, traffic lights) and replace them with one simple principle "give way from right side", results in an increase in road safety. Seemingly irrational strategy has yielded good results. Explanation is simple: drivers and pedestrians began (because they had to) careful. And simple

conclusion on the issue of modeling and testing of such complex phenomena as road traffic: sometimes the simplest solutions are most effective, [5], [6].

Future road risk management methodology must increasingly take into account all known aspects of road traffic, namely: physical, psycho-social and economic. May also discard strategy seemingly paradox.

3. POLICIES FOR ROAD TRAFFIC SAFETY

Technical progress and changes in lifestyle, including travel, cause inter alia changes in human mobility model. This was the cause of the increase in motorization and an increase in the average number of kilometers driven per year. One of the many different effects of the intensification of traffic was the increase in the number of road accidents. A response to those phenomena were, inter alia, planning of the various road safety strategy. In Europe from a long time the best achievement in this regard are in the Netherlands, Sweden and the United Kingdom. In the following figure are shown next approaches and strategies for road safety, used from the 1950s of the 20th century in the Netherlands. Similar strategies are applied in Sweden and the UK, [7]. Interesting comment, which explains a historical sequence and context of the road safety strategy in these three countries, gives Meng Lu in his work: „The need for such successive sets of measures can be partly explained from the economic law of diminishing marginal returns, which implies decreasing marginal effects of additional investments in a certain measure for improving road traffic safety beyond a certain level of implementation. (...) Another explaining factor is technological development it-self, which creates an evolution of requirements for traffic safety measures and of possible solutions”, [8]. Let us added that the European Union established the basis for its road safety policy in the year 2001, [9].

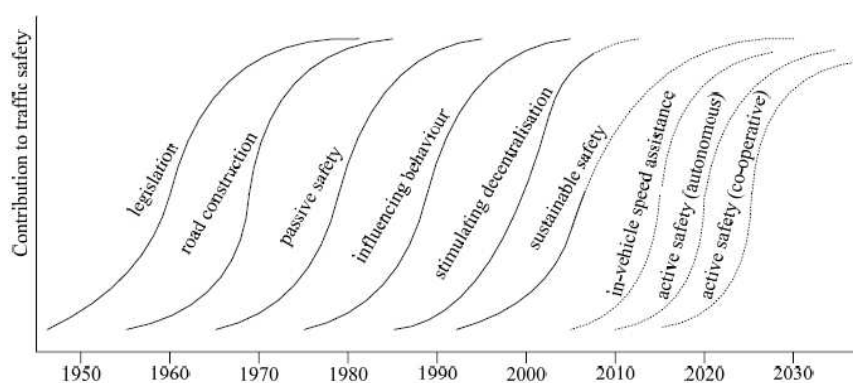


Fig. 1. Conceptual view on traffic safety policy development in The Netherlands, [10]

4. TAXONOMIES OF ROAD TRANSPORT SAFETY PROBLEMS

Road transport safety – is a multidimensional problem, hence all science researches have to take into consideration its basic taxonomies; we announce them after monograph, [11], [12].

Road transport safety taxonomy according to Haddon matrix:

- human [transport user];
- mean of transport, transport infrastructure;
- “around-accident” process phases: pre-crash, crash, post-crash.

Road transport safety taxonomy according to “vision zero” conception:

- inadequate transport system construction and human tendency to errors [reliability human factor, ergonomics];
- dangerous behaviors of transport user [risk psychology, cognitive engineering];
- problems of wrong post-crash medical care [inadequate trauma care].

Taxonomy of safety aspects. Road safety taxonomy according to aspects safety problems:

- magnitude – indicate by population size covered by transport risk;
- externality – indicated by level of “forcing” risk phenomenon by one to another users of transport;
- complexity of transport system;
- spatial distribution of dangerous transport events;
- dynamics;
- “perceived urgency” of transport events;
- “responsibility” of approach to problems solving.

Taxonomy of basic transport risk factors; here you can cite one of definition: risk factor “a factor which affects the probability of a crash or collision occurring or influences the severity of the consequences which arise as a result of the event”, (WHO, 2006).

To specify notions which characterize road risk can be used risk factors criteria. The most often marked out are two risks categories and related them factors:

1. primary risk; 2. secondary risk.

The first relates road accident and the second accident consequences. Basic risk is related with following factors, [14]: 1. - exposure; 2. behavioral factors; 3. road environment; 4. vehicle factors. On second risk have influence, [14]: 1. vulnerability of certain modes of transport; 2. vehicle factors; 3. use of safety devices; 4. road environment; 5. post-crash medical care.

Taxonomy of essential data of road safety management:

1. data of risk exposition;
2. data of special risk factors exposition;
3. data of traffic participants behavior who respect safety requirements, e.g. crossing, speed, alcohol, etc.
4. data of severity of traffic participant damages;
5. data of potentially effective safety measures.

In literature there are many lists and summaries of risk factors in road traffic, for example, [15].

5. CONCLUSION

A good measure of the effectiveness of risk management in transport are external costs of transport. This system, which generates higher costs, has a greater potential of their reduction. Road transport generates the greatest costs and, therefore, it is the system through the effective risk management can be obtained relatively larger reductions to all identified risks. Hence the thesis: road transport as a system of relatively high risk

reduction potential. Perhaps paradoxical is that it is this type of transport - in contrast to the other – there was not so far a coherent methodology for risk management. This is one of the reasons for which this paper written.

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