ANALYSIS OF THE IMPACT OF SOCIO-ECONOMIC DEVELOPMENT ON ROAD SAFETY BASED ON THE EXAMPLE OF BALTIC SEA REGION COUNTRIES

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1. INTRODUCTION

Baltic Sea Region (BSR) is a specific region of Europe, bringing together countries with different levels of socio-economic development. The main common point is territorial access to the Baltic Sea and the importance of maritime transport in the transportation of goods. The region consists of 9 countries, including Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden, Denmark and Russia (more specifically, Kaliningrad and Leningrad Oblast), of which all, except Russia, are members of the European Union. BSR is an extremely important European region. With the most competitive economies of the world (Scandinavian countries, Germany, Finland), the region (excluding Russia) generates 30% of European GDP.

The specificity of BSR is, however, very diverse. The countries differ in almost every way, economic, political, social or cultural. For many years Eastern Europe countries (EEC) versus Western Europe and Scandinavian countries (WEC) have been shared by a large economic and social distance. These differences, although diminishing in result of political transformations, are not without impact on other areas of life. Although Europe is the continent with the lowest level of danger regarding fatal road crashes (WHO, 2015), when analysing road safety data of the BSR countries we can observe the impact that the socio-economic situation has on road safety. Against the backdrop of other countries, highly developed WEC countries can be clearly distinguished having the lowest road fatality rates (table 1). Sweden, in result of implementing Vision Zero (Johansson, 2009; Pihlak et al., 2004; BITRE, 2016), achieved one of the world lowest road fatality rates. On the other hand, Russia can be distinguished with more than twice higher road fatality rate than in other EEC and with the same indicator 5-8 times higher than in WEC countries.

Base on the data collected for BSR countries, attempts were made to analyze and assess the impact of the level of socio-economic development on road safety in the road network of analyzed countries. The results are discussed in the paper.
Table 1: Characteristics of Baltic Sea Region countries, 2014.

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>GDP per capita</th>
<th>Motorisation rate</th>
<th>Life expectancy index</th>
<th>Road fatality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>82,0</td>
<td>36,7</td>
<td>602</td>
<td>0,938</td>
<td>41,2</td>
</tr>
<tr>
<td>Poland</td>
<td>38,0</td>
<td>20,8</td>
<td>610</td>
<td>0,870</td>
<td>84,2</td>
</tr>
<tr>
<td>Lithuania</td>
<td>3,0</td>
<td>16,9</td>
<td>665</td>
<td>0,817</td>
<td>87,8</td>
</tr>
<tr>
<td>Latvia</td>
<td>2,0</td>
<td>13,2</td>
<td>361</td>
<td>0,817</td>
<td>105,0</td>
</tr>
<tr>
<td>Estonia</td>
<td>1,3</td>
<td>17,6</td>
<td>558</td>
<td>0,860</td>
<td>58,2</td>
</tr>
<tr>
<td>Finland</td>
<td>5,4</td>
<td>29,2</td>
<td>707</td>
<td>0,934</td>
<td>41,1</td>
</tr>
<tr>
<td>Sweden</td>
<td>9,5</td>
<td>34,2</td>
<td>599</td>
<td>0,955</td>
<td>22,2</td>
</tr>
<tr>
<td>Denmark</td>
<td>5,6</td>
<td>31,9</td>
<td>483</td>
<td>0,923</td>
<td>32,9</td>
</tr>
<tr>
<td>Russia*</td>
<td>143,5</td>
<td>14,6</td>
<td>349</td>
<td>0,753</td>
<td>187,9</td>
</tr>
</tbody>
</table>

* data collected for the country

2. AIM AND METHOD

When reviewing research reports, many comparison studies can be found on changes in road safety level across continents, countries or regions (WHO, 2015; BITRE, 2016; Hermans et al., 2009; Akaateba, 2012). A variety of approaches is being used: from simple comparisons to identification of a set of key factors influencing road safety at the strategic country level (Akaateba, 2012; BITRE, 2014; Jamroz, 2012; Jamroz et al., 2013). Aim of the paper is to compare changes in road safety level across countries with different level of socio-economic development, and, to identify and analyse key factors affecting road safety at the strategic country level based on the example of BSR countries. The study is ongoing and will be finalized by September 2017.

For the analysis, data sets were used covering the data on road fatalities and a set of parameters characterising the level of economic, social, infrastructural development in the analysed nine BSR countries. The data covered the years of 1990-2014.

3. RESULTS

Observing the trends in the economic and social development of the BSR countries (examples in Figure 1), it can be observed that there is a clear stratification in the analysed area. The observed differences between the analysed indices allow to divide the countries into three distinctly different groups:

- **WEC countries** (Sweden, Denmark, Germany and Finland), achieving the highest gross domestic product per capita in the region, as well as having a high levels of education (EDI) and low levels of corruption (CPI), with slowing trend of motorization (MR).
- **EEC countries** (so-called Eastern Bloc countries and, at the same time, new EU countries): Poland, Lithuania, Latvia and Estonia, which far off from highly developed WEC countries, with GDPPC 1,5 to 2,8 times lower. In these countries there is a dynamic increase in the level of economic development, education (EDI), life expectancy (LEI), and dynamic growth of motorization (MR).
- **Russia**, which stand out from the rest of BSR countries, reaching the lowest level of education, the lowest economic and social development, and having the highest level of corruption (CPI) and one of the highest levels of alcohol consumption per capita (ACPC).
Socio-economic development of a country has an undoubted impact on road safety level. Most frequently with the economic growth the level of consciousness increases and the perception of the road safety problem changes. Developing countries learn from developed countries and allocate more resources to improve road safety, implement new solutions and regulations, and thereby reduce mortality in road transport.

Over the years, in all BSR countries, demographic road fatality rates (RFR) are decreasing (Figure 2). Over the analysed period 1990-2014, in all BSR countries, the rates have decreased by two to four times (in Latvia and Estonia, due to the lack of data, we are referring to 1995), only in Russia was a mere 20% decrease in the death rate relative to 1990. It is worth to notice the dynamics of the decline - for example in 1990 the difference between Lithuania and Sweden was 180 fatalities per million inhabitants, in 2014 this difference decreased 3-fold. By analogy, the distance between Poland and Sweden in 1990-2014 has decreased almost twice.

The distinguished three groups of BSR countries clearly differ from each other when looking at the trends in demographic rate of RFR (Figure 2). In WEC countries the decrease is progressing systematically, while, in EEC countries it is dynamic but irregular. We can see a clear impact on the level of road safety regarding their accession to the European Community (2004), who imposed quite strict requirements for improving road safety. In Russia, in turn, we can observe only a slow decline since 2003. Since then, the road fatality rate has decreased by 25%, while in the analogous period in Poland it was 40%, in Lithuania almost 60%.
The analysis conducted within the study has also included studying the relationships between individual socio-economic development indicators and the RFR. Figure 3 illustrates, for example, the impact of the level of economic development measured by GDPPC and the level of health protection system measured by the LEI index on the level of road fatality rate RFR.

The results shown in Figure 3 show that economic and organizational development and social development have a significant impact on reducing road fatalities. Once again the stratification of 3 groups of BSR countries can be observed, both in relation to the analysed socio-economic indicators and the indicators of road safety. The ranges of individual indicators can be clearly indicated, i.e. in WEC countries GDPPC increased in the analysed period from 20 to 35 thousand ID per capita, while RFR varied at the same time from almost 150 to less than 25 fatalities per million inhabitants. In EEC countries in the same period GDPPC varied between 6 and slightly over 20 thousand ID per capita and RFR has been changing in the range of 320 to 60 fatalities per million inhabitants. In Russia GDPPC did not exceed 15 thousand ID per capita, but RFR remains high at more than 180 fatalities per million inhabitants.

Comparison of RFR changes according to the analysed GDPPC, LEI, HDI, EDI, MR or CPI indicators indicates that different groups of countries in 1990 started from completely different levels of socio-economic development, which also translated into the level of road safety. Nevertheless, the gap between the highly developed WEC countries and the EEC (new EU) countries in the analysed years is
clearly decreasing, which results from a much stronger dynamics of changes in the new EU Member States and a gradual catch up of highly developed WEC countries. Russia is not exactly fit in the trends – here the socio-economic development progress much less dynamically and less regularly than in other groups of BSR countries.

4. CONCLUSIONS

Based on the conducted analysis of road safety and the analysis of relationships between road safety indicators and selected indicators of socio-economic development in BSR countries, many conclusions can be drawn. At the forefront is the broad diversity of these countries and the formation of three groups of countries in BSR, depending on the socio-economic development and the dynamics of changes over the last 25 years. On the basis of the analysis, we can clearly observe the relationship between the indicators of socio-economic and the level of road safety. The results will be used to develop predictive models of the number of fatalities and to analyse the conditions for implementation of Vision Zero in particular groups of countries.

REFERENCES


