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Simon Koblar, MSc[1]
E-mail: simonk@uirs.si
Luka Mladenovič, PhD[1]
E-mail: lukam@uirs.si

[1] Urban Planning Institute of the Republic of Slovenia

# ROLE OF TRAFFIC SAFETY IN REGIONAL SUMP

**Key Words**
SUMP
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Assessment
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**Abstract**

Traffic safety is an important part of traffic planning. It is a complex field that is traditionally dealt with by traffic safety experts. In recent years there has been several calls for change of paradigm, which would put more focus on a wider look at the safety challenges and securing generally better conditions for pedestrians and cyclists. As such it should be considered in the process of SUMP preparation to specify a baseline situation and to identify potential problematic areas that needs to be addressed in future. The paper presents assessment of traffic safety in Slovenian Koroška region as a part of a regional SUMP development process. Within the analysis we were using actual, non-aggregated data of traffic accidents including location. Within the paper we are presenting a proposal for a statistical data processing approach that is relevant from the point of view of a SUMP status analysis and target setting. The objective was to evaluate the variables related to traffic safety that can be influenced by a SUMP. The approach is showing an interesting insight into conditions of traffic safety on a regional scale, but also potential for further research if collected data would be merged with additional data, such as actual passenger data for different transport modes.

## 1. INTRODUCTION

Road traffic is causing negative externalities on society. Research shows, that in partly urban/rural routes traffic accidents contributed largest share of external costs, [1]. Traffic safety increased dramatically in last decades, thanks to improvements in

vehicles safety, road design, traffic safety campaigns and other measures to reduce accidents. Accidents rate per vehicle/km has been significantly reduced, however increase in kilometers traveled is slowing down the progress in reducing total number of road accidents.

Traditional traffic safety paradigm is targeting reduction of special risk factors for traffic accidents. These programs usually impose significant costs but provide only limited additional benefits. Therefore Littman proposes a new paradigm [2–4] which addresses the safety issues much wider, by supporting integrated planning, bringing significant co-benefits other than traffic safety: congestion reduction, infrastructure cost savings, lower emissions and energy consumption and better basic accessibility.

One of the emerging areas in transport planning are Sustainable urban mobility plans (SUMP-s) which are expanding the focus from local to regional level. Traffic safety is one of the objectives within the SUMP preparation. However general guidelines don't provide enough details about relevant traffic safety indicators [5, 6]. In order to evaluate progress, we first need a solid baseline measure.

Relevant statistics on a regional level are often lacking. Results from a regional analysis should be compared with data on national and international level. General statistics are often not sufficient, because they lack precise location. The most accurate measure of exposure would be if we would measure accidents by distance travelled. Unfortunately, travel data is not readily available.

The objective of this paper is to assess traffic safety for Koroška region, as a part of regional SUMP preparation. Koroška lies in the northern part of Slovenia. It is mostly rural with 70,755 inhabitants in year 2020 and three larger urban centres: Slovenj Gradec, Dravograd and Ravne na Koroškem. We analyzed traffic accidents data and displayed key statistics relevant for traffic safety assessment. Besides general analysis, we focused more closely on Štrekna bike path, as an example of a well-designed bike path.

## 2. METHODOLOGY

Database with traffic accidents data was retrieved from Ministry of the Interior website [7]. It includes all accidents where police were called to examine the accident. In practice, this means that minor accidents are not included, but those are not as relevant for our analysis. Data is split into yearly reports and consists of two tables, one with traffic accidents and the other with persons involved in these accidents, with unique identifier connecting two tables with one-to-many relationship. Raw data for period 2005–2019 was imported to Microsoft Access where we joined, filtered and statistically analyzed data. Spatial analysis was performed in QGIS 3.16.

Location of accidents is included in two fields – one with administrative unit and other with coordinates, that are retrieved from position on a state road, or from the closest house address on municipal roads. We first filtered data based on administrative units from Koroška region (Dravograd, Radlje ob Dravi, Ravne na koroškem and Slovenj Gradec). Out of 9,410 traffic accidents 715 had wrong coordinates or

coordinates were missing. Those were included in statistical analysis but were not displayed on a map.

## 3. RESULTS

In Koroška region 9,410 traffic accidents with 17,801 persons involved occurred in the period 2005–2019. This numbers have been rapidly declining till 2009 and then fluctuated a bit, but in average stayed below 2009 level – see figure 1.

To get a better representation of progress in Koroška region, we calculated average no. of persons by severity of accidents in periods 2005–2009 and 2015–2019 and calculated index for Koroška and Slovenia.

*Table 1. Decline in persons involved in traffic accidents by type of injury for period 2015–2019 compared to 2005–2009 for Koroška and Slovenia*

| no injury | minor injury | severe injury | death | all | period | area |
|---|---|---|---|---|---|---|
| 1.011,8 | 457,2 | 36,6 | 7,4 | 1.513,0 | 2005-2009 | Koroška |
| 678,2 | 242,6 | 33,0 | 4,6 | 958,4 | 2015-2019 | |
| 33% | 47% | 10% | 38% | 37% | decline | |
| 38.626,0 | 13.020,0 | 1.169,8 | 239,6 | 53.208,8 | 2005-2009 | Slovenia |
| 24.812,8 | 7.253,4 | 861,0 | 108,8 | 33.137,6 | 2015-2019 | |
| 36% | 44% | 26% | 55% | 38% | decline | |

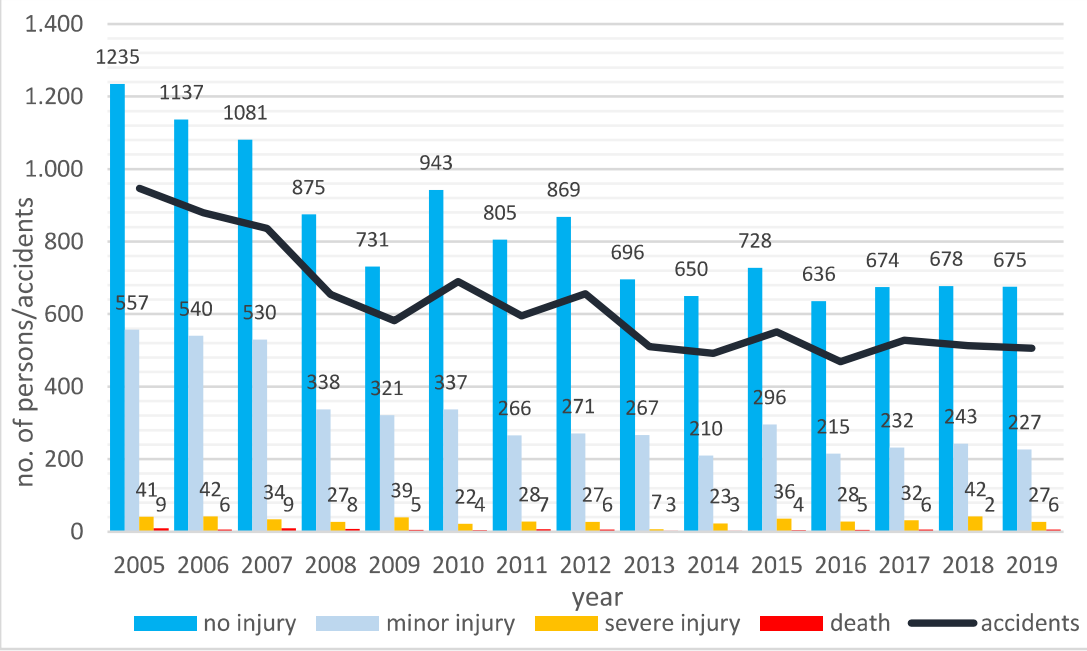


*Figure 1. Persons involved in traffic accidents in Koroška region by severity of consequences*

Traffic accidents can also be analyzed by travel modes. We wanted to analyze if vulnerable road users are disproportionally involved in traffic accidents. Table 1 shows number and percentage of total traffic accidents for pedestrians, cyclists and moped users by severity of injury in Koroška region in period 2005–2019.

*Table 2. Involvement of vulnerable road users in traffic accidents in Koroška for period 2005–2019*

| | minor injury | | severe injury | | death | |
|---|---|---|---|---|---|---|
| | No. | % of total | No. | % of total | No. | % of total |
| pedestrian | 251 | 5% | 64 | 14% | 10 | 12% |
| cyclist | 295 | 6% | 63 | 14% | 3 | 4% |
| moped | 141 | 3% | 24 | 5% | 3 | 4% |

In Koroška region Štrekna bike path is very popular long distance separated bicycle path. We wanted to test the hypothesis, if a good infrastructure for cyclists means less traffic accidents, especially those ending with severe injury or death. For stakeholders and general public, traffic accidents around Štrekna bike path were displayed on an interactive map [8]. Data shows, that there are no spots with high concentration of accidents. Also, there were no fatal accidents.

Spatial component is one of the most important aspects with analyzing traffic accidents. For a better representation of space-time relation, an animation with weekly aggregated data was prepared [9]. Animation shows weekly aggregates of accidents by severity, with underlaying heatmap, that shows concentration of accidents that ended with death or severe injury.

## 4. DISCUSSION

From analyzed data for Koroška, we can see that total number of accidents and number of persons involved in them is declining. The decline has been rapid in the years 2005–2009. After that, the progress in traffic safety has been slow. If we compare averages for periods 2005–2009 and 2015–2019 (table 1), we can see that the biggest improvement has been in accidents with minor injury, which decreased by 47 %. What is worrying, is the fact, that there has been only a 10 % decline in number of persons with severe injuries. Compared to national average, Koroška has had a larger decline only in number of persons with minor injury. We can conclude that progress in traffic safety in Koroška has been slower than the national average. Unfortunately, we can't compare exposure per person kilometer travelled since we lack travel information. Comparisons are only possible for fatalities per 100.000 population. Slovenia with 5,2 and Koroška with 5,9 average fatalities per 100.000 inhabitants in period 2015–2019 are safer compared to world average, and in fact also from European average [10].

We can argue that existing traffic safety programs exhausted it's potential. Now measures implemented in SUMP can help to improve traffic safety. According to Litman [2], mobility management strategies have large benefits also on traffic safety.

*Table 3. Mobility management strategies and their safety benefits (Source [2])*

| Strategies | Safety benefits |
|---|---|
| Traffic calming and speed control | Large benefits |
| Active transport improvements | Benefits if programs increase walking & cycling safety |
| Public transit improvements | Large benefits |
| Transport pricing reforms | Large benefits |
| Mobility management marketing | Moderate benefits |
| Smart growth development policies | Large benefits |

All mobility management strategies from table 3 will be included in SUMP action plan. One of the goals of SUMP is to increase walking and cycling. The increase will have to be supported by infrastructure improvements in walking and cycling network. From the example of Štrekna bike path, we can see that a good infrastructure can provide safe conditions for cyclists. There will also be improvements in road infrastructure with a new expressway. New road infrastructure is controversial in terms of sustainable mobility, however this will open an opportunity for traffic calming on existing state roads, where majority of severe accidents happened – see heatmap [9].

## 5. CONCLUSION

Koroška region in Slovenia was selected as one of the pilot regions to develop a regional level SUMP. Regional level of planning is beneficial terms of integration of spatial and traffic planning. Public transport and regional cycling network can't be planned by single municipality. With the new infrastructural improvements and upgrades of road (new fast road to connect the region to existing motorway network) and cycling network (extension of separated bike connection Štrekna to city of Velenje) major changes in accessibility, but also traffic safety is expected.

The development of regional SUMP opened several challenges already in the initial phases, such as status analysis. Even though traffic safety data is one of the more systematically collected, the analysis on the regional level as well as the interpretation of the collected data offered a different insight into this topic. The main objective of regional analysis of traffic accidents was to establish a baseline and to recognize specific problematic areas where traffic safety can be improved by measures included in SUMP.

If today most traffic accidents are concentrated on the regional road, we can expect this to change once the new road connection is in place. With better road a reduction of accidents is expected on the main road, as well on the regional road because of less traffic. The second group of accidents is taking place in urban areas. Considering the wider approach to improvements of traffic safety, which is supported by a number of actions in regional but also local SUMPs, such as traffic calming and improvements of cycling and pedestrian networks, additional improvements in number of accidents and their severity could be expected.

Unfortunately, comparisons of traffic safety in different regions is only possible by a more general indicator of fatalities per 100.000 inhabitants. Additional data would be needed to measure exposure by distance travelled, which would give us more precise measurement.

The collected data presented in this paper will serve as the baseline data and will be used in target settings. The presented method will support the monitoring and evaluation of the SUMP and will be repeated to observe the changes of the transport system in the region in future.

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