

Vacancy graduation assignment: Traffic safety risk indicators per road type

INTRODUCTION

Traffic safety is an important theme in road network (re)design. Several guidelines exist to qualitatively assess the effects of measures in the road network on traffic safety, but often a quantitative assessment is desired too. Rijkswaterstaat¹ has developed traffic safety risk indicators for the primary road network (mainly highways) to quantitatively express effects on traffic safety (Figure 1). These risk indicators express the number of traffic accidents with injuries or death (effect/consequence) per distance driven (exposure) on highways. The indicators are for example used to estimate what the effect is of adding an extra lane to the highway in terms of x less or more expected accidents with injuries.

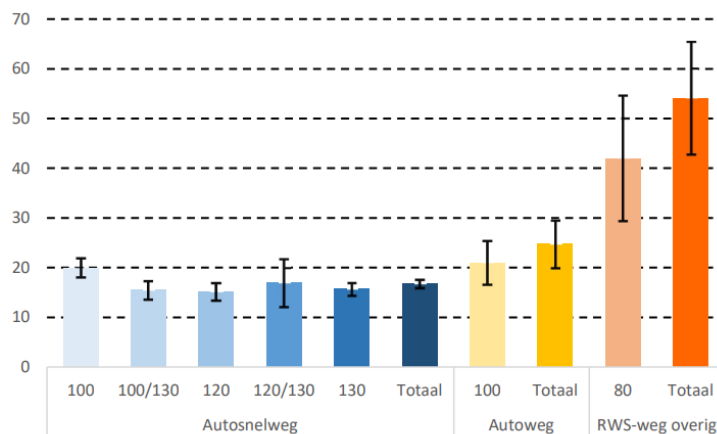


Figure 1. Risk indicators of accidents with injuries by road type and speed limit. Period: 2018-2020. Data source: INWEVA, BRON. Adopted from Rijkswaterstaat².

¹ Rijkswaterstaat is the Department of Waterways and Public Works of the Netherlands, which is responsible for maintaining the national (primary) road network.

² Rijkswaterstaat (2022) Veilig over Rijkswegen 2020: monitoringsrapport verkeersveiligheid van rijkswegen, Deel A: Landelijk beeld. Available [online](#).

PROBLEM DESCRIPTION

For other road types than those depicted in Figure 1, up-to-date traffic safety risk indicators are not available. This is a problem, because such indicators could be of real value in quantitatively assessing effects on traffic safety when there are for example considerations to change the road regime to a lower maximum speed. This is a hot topic in the Netherlands, where more and more discussions and plans arise to change regimes from 50 km/h to 30 km/h. The common notion is that this will lead to less (severe) accidents. Risk indicators for these two road types make it possible to quantify the degree of this expected effect and as such support the decision-making.

Goudappel has made initial efforts to develop traffic safety risk indicators per road type by combining traffic accidents statistics (see Figure 2) with the distance travelled by road type³ derived from Goudappel's data-driven, nation-wide mobility model *OmniTRANS Spectrum* (see Figure 3). Yet, several **challenges** arose that require more exploration and critical evaluation to come towards trustworthy traffic safety risk indicators per road type, like:

- How to deal with different vehicle types? Especially, in the cases of accidents involving different vehicle types (e.g. motor vehicles and cyclists).
- What are the effects of in- or excluding cross-roads (intersections) in the indicator?
- How to account for the incompleteness and inaccuracy of the accident statistics?

³ In Dutch this is called the 'verkeersprestatatie' (literal meaning: traffic performance). It is expressed in vehicle kilometres per hour and is obtained from multiplying vehicle intensity with the length of the road links for which the intensity applies.



Figure 2. Impression of the geo-referenced traffic accident data from the STAR-database (<https://www.star-verkeersongevallen.nl/en-GB/>) for a part of Deventer. Source: VIA Statistiek Ongevallen.

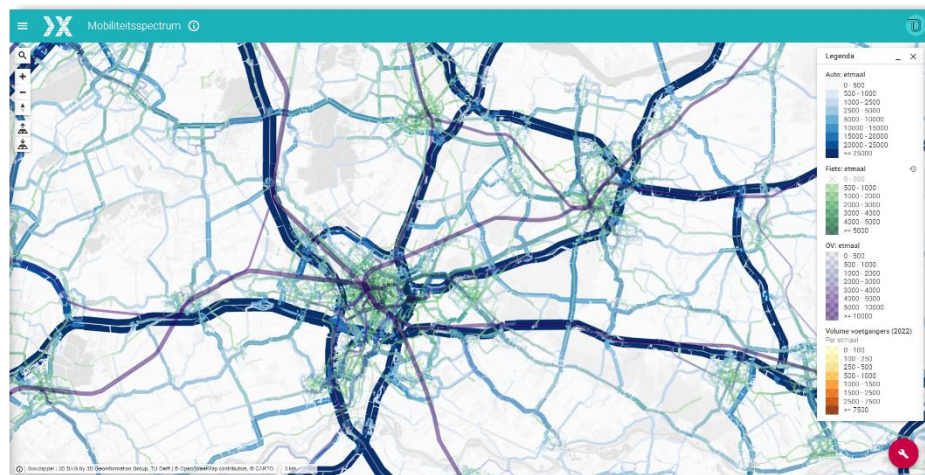


Figure 3. Impression of the Mobiliteitsspectrum that contains amongst others intensities of motor vehicles and cyclists for the whole of the Netherlands (Utrecht and surroundings are shown). Source: Dat.mobiliy and Goudappel.

Are you:

- a student with a background in (traffic or civil) engineering, mathematics or computer science?
- triggered by these challenges?
- strong in conceptual thinking?
- skilled in working with (geo)data?
- enthusiastic about contributing to traffic safety through research?

Then you might be the right person to tackle these challenges with us!

RESULT / OBJECTIVE

The objective of this research is to develop *traffic safety risk indicators per road type* in the Netherlands based on geo-coupling of national *traffic accidents* statistics and the *distance travelled* derived from *OmniTRANS Spectrum*.

ASSIGNMENT

You will start with a **literature review** on traffic safety risk indicators that similarly express the number of accidents per distance driven.

Second, inspired by what you may find in the literature, you will develop a number of **alternative definitions** of the traffic safety risk indicators. These definitions will, for example, differ in how they combine car traffic and bicycle traffic in the indicator. Also you will explore making different risk indicators for cyclists and motor vehicles, separately.

Third, you will actually **determine the values** of the traffic safety risks indicators per road type, according to the alternative definitions. This involves working with geo-specific, nationwide data on accidents and vehicle intensities, which will need to be combined and aggregated to different levels. Here you can build upon the scripts and expertise that are available from Goudappel's initial efforts in this topic.

Finally, you will **critically evaluate the outcomes** of the traffic safety risk indicators per road type. Can we explain the differences we find between road types? How do these differences match with our experiences in practice and in research? To what

degree are the number for highways in line with those that have been developed by Rijkswaterstaat in the past? Last, but certainly not least, we want to you to reflect on the question: to what degree are the results affected by inaccuracies in the accident data, with particular attention for the known under-registration of (one-sided) accidents with only cyclists involved. The ultimate outcome of this evaluation is a recommendation which set(s) of traffic safety risk indicators is/are most suitable for the intended use(s).

INFORMATION

When interested in this graduation internship assignment please contact: Joep Schyns (jschyns@goudappel.nl) or Martijn Ruijgers (mruijgers@goudappel.nl). More information on Goudappel and Dat.mobility can be found via www.goudappel.nl and www.dat.nl.