BITS
Bicycles and Intelligent Transport Systems

Evaluation report

Conflict analysis by camera
City of Zwolle

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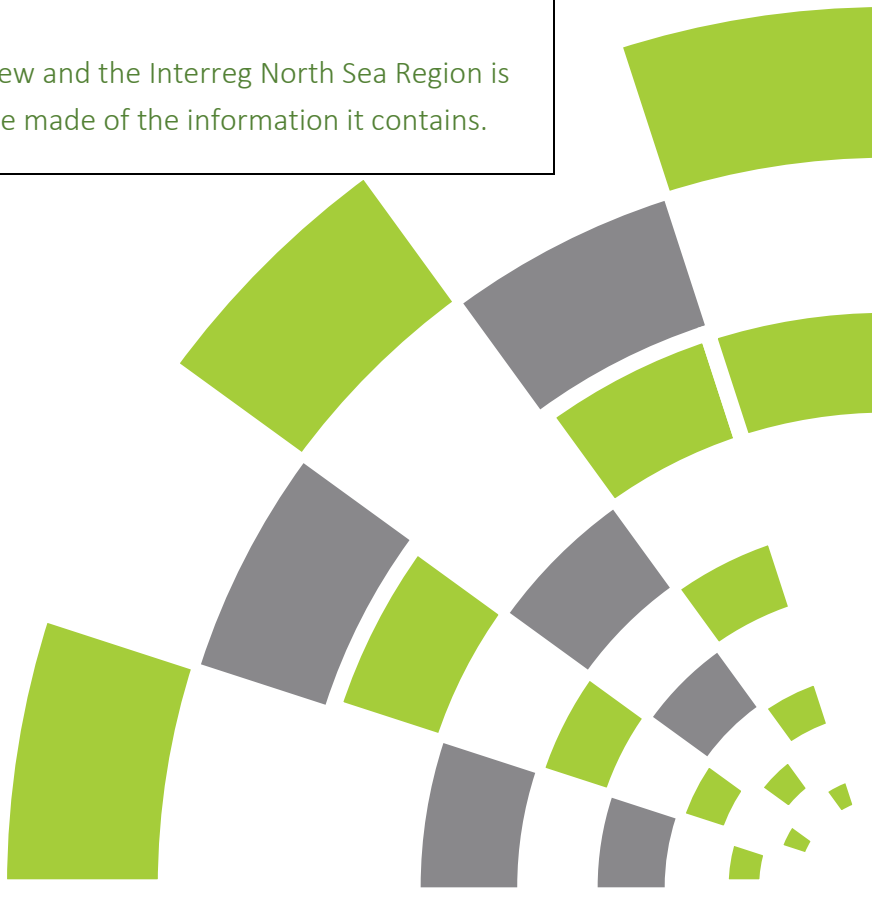

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Short description

The intersection Assendorperstraat - Luttenbergstraat - Bartjensstraat in Zwolle is known as a traffic unsafe intersection. Mobycon, in consultation with the municipality of Zwolle, has therefore decided to investigate this intersection as a pilot project to see whether and to what extent Microtraffic's new conflict analysis technique offers added value compared to existing research methods. Existing research methods are analysing the registered data of actual accidents and testing the intersection design against the Sustainable Safety design characteristics.

Type of ITS

Camera and software for analysis of images

Timeline

In March 2020 recordings were made of the intersection and in July 2020 the results were delivered through a final report. 2023, adjustments will be made to the intersection by the municipality of Zwolle.

Hypothesis

In this pilot, the following research questions were formulated: (i) What emerges from the accident data from VIA, (ii) What emerges from a check against the Sustainable Safety basic characteristics, (iii) What emerges from a conflict analysis with Microtraffic, (iv) What are measures to make the intersection more traffic safe?

It is hypothesized that Microtraffic's conflict analysis will add value to the existing method of identifying problem areas at the intersection. This should lead to recommendations that, if followed, would increase the safety situation. By doing so, we expect it to become even more attractive for people to start cycling. This is expected to increase the number of cycling movements by 5% - 10%.

Data sources

Data	Source	Available
Traffic safety at a junction.	*VIAstat (accident registration system), conflict analysis, risk analysis*	*Yes*
Number of people who will cycle sooner or more when road safety is improved.	*Survey*	*Yes*

Analysis

Report of the pilot

Methodology

The methodology of the evaluation is based on a comparison of 3 sources of information:

1. accident statistics,
2. a check on the intersection design against the Sustainable Safety design characteristics and
3. an analysis of the images obtained by the Miovision camera system and Microtraffic analysis.

The accident statistics were obtained using the VIA portal and analysed.

The Sustainable Safety design characteristics of the intersection were analysed based on CROW-publication 315A

De images of Miovision were analysed using the conflict analysis technology of Microtraffic.

The outcome of this methodology is an answer to the research questions and a 'lessons learned' on the use of Miovision and similar systems in objectifying safety situations at intersections.

Results

Accident analysis does not give a clear picture of the location and cause of accidents. Based on the analysis of accident registration data, we can conclude that the intersection Assendorperstraat - Luttenbergstraat belongs to a high-risk intersection.

- Based on the Cross-score, we see that this intersection ranks number 3 of the top 10 most unsafe intersections in Zwolle.
- From the accident data, we can see that there are relatively many flanking accidents but we do not know where they occur on the intersection.
- Speed does not seem to explain the accidents at this intersection.

Testing the intersection against the Sustainable Safety basic characteristics does not explain the accidents. The intersection largely meets the Sustainable Safety basic characteristics for a right of way intersection. Only the pedestrian crossing facilities across Assendorperstraat and the priority lanes on Luttenbergstraat do not fully comply with the basic characteristics. The pedestrian crossing facilities across Assendorperstraat have no relation to the flanking accidents identified in the accident analysis. The lane crossings on Luttenbergstraat could possibly have a relationship with the observed flank accidents.

Microtraffic conflict analysis gives a clear picture of near conflicts and clarifies the accident analysis and the check of the Sustainable Safety basic characteristics. The two major near-conflicts areas on the intersection Microtraffic identified, are partially consistent with the accident analysis. The two minor near-conflicts areas found by Microtraffic corresponded to the points where the intersection does not fully meet the Sustainable Safety basic characteristics.

Microtraffic analysis provides great added value compared to accident analysis and checking basic characteristics. Whereas the accident data analysis and the check of the Sustainable Safety basic characteristics only give an indication of the problem and the possible cause, the Microtraffic analysis indicates exactly where the problem is. With that information, targeted measures can be taken while otherwise guessing whether measures actually reduce the likelihood of accidents.

Impact

Impact of the technology

The technology used has a clear potential to generate data based on which recommendations can be done to improve the safety at dangerous crossings.

Based on the Microtraffic analysis and the CROW guidelines, the following measures were recommended:

- Applying small measures that give an improvement for the largest two conflict movements: These measures involve lineation and markings and are therefore simple and inexpensive to implement.
- Evaluating the new situation using Microtraffic analysis: The adjusted situation can be analysed again with Microtraffic after a period of habituation. From this, the effect of the measures on the largest conflict movements can be determined. Also, it can be determined to what extent the two minor conflict movements are still in play with the adjusted design.
- It was further recommended that, if necessary, more drastic measures be taken that give an improvement for the minor conflict movements associated with the Sustainable Safety basic characteristics. If the minor conflict movements are still found to exist upon evaluation, then the

more drastic measures linked to the Sustainable Safety basic features can be taken. Since civil engineering measures will then be taken anyway, perhaps the other measures can also be implemented in accordance with the CROW guidelines.

- A reconstruction of the intersection is planned for 2023: the intersection will be much smaller. Maximum speed will be reduced from 50 to 30 km/hr, however, these adaptations are not a direct consequence of the pilot and go beyond the more limited proposals that resulted from the pilot. However the speed reduction was also recommended in the Mobicon analysis report, based on Microtraffic's analysis.

  Impact on cycling

An exercise was made to hypothesize the potential increase of cyclists due to increased safety on the intersection. Using the BITS survey data of the respondents of the city of Zwolle, we can make some statements concerning the potential impact of increased safety if the safety situation would improve due to recommendations resulting from the pilot.

We assume that the interventions made at the intersection will significantly increase safety, since the speed of vehicles will be reduced (Isaksson-Hellman & Töreki, 2019, Raihan, Alluri, Wu & Gan, 2019) and since markings will be made more visible.

15.1% of the respondents of the city of Zwolle indicated that they found cycling (very) dangerous. For 16.9% of the respondents the absence of safe routes (including dangerous crossings) was a barrier that prevented them from biking or biking more, while for 17.9% of the respondents the availability of safe roads make them cycle more. 9.6% of the respondents is not at all satisfied or somewhat dissatisfied with the safety on intersections in Zwolle.

When taking a look at the people who would like to cycle a lot more to go shopping or to see family or friends[1], we see that for 1.9% of them no safe route is to a large extent a barrier to cycle (more). Additionally, for another 16.7%% this is to some extent a barrier, which means that for 18.6% of the respondents with a high willingness to cycle, lack of a safe route prevents them from cycling (more). In the table below, comparisons with the willingness to cycle more to commute (38%) or as a leisure activity (38%) in itself can be found. For more than 38% of the people willing to cycle a lot more, a lack of safety is to a large extent a barrier to cycle, regardless the motive.

	Motive	Lack of safety is a barrier to a large extent	Lack of safety is a barrier to some extent
I would like to cycle a lot more for …	Shopping, see family or friends etc.	16.7%	1.9%
	Commute	20%	18%
	Leisure	20%	18%

If we assume that all people willing to cycle more, also would transform their willingness into action, we can make the following assumptions. When we take the people with a **high willingness to cycle** (more) or who would like to cycle more (for any of the forementioned motives) into consideration and analyse to

what degree safe cycling routes are a barrier to a large or some extent, we can expect 2.7% more cyclists if safety would be increased.
It may be noted that this percentage is substantial lower than in the province of Antwerp where a comparable pilot has been done to improve safety in cycling. This is the result of the fact that safety is a barrier there to a much greater extent.

An immediate increase of 2.7% cyclists should not be expected. This numbers are hypothetical, since these people indicate their willingness to cycle; they will not always transform this into action on the bicycle immediately. However, it gives some indications on the impact of increased safety. Moreover, this pilot had the intention to increase safety on one intersection in Zwolle and did not increase safety in the entire city. Still, we can hypothetically conclude that improved safety in the wider area in the long term can eventually lead to an increase in cyclists.

Experiences project managers/ Lessons learned

Several observations on the use of Miovison technology and its potential were made by the project leaders:

- It was the first time that the technology was used in Zwolle. The project managers indicated that it really helped them with objectifying risks and identifying the problematic aspects of the intersection. Based on this experience the technology is nowadays more often used when analysing dangerous traffic points.
- The technology requires a lot of expertise that is not always present within the city administration. Raw data are meaningless without that expertise. That problem was solved by combining the technical expertise delivered by a company specialized in conflict analyses (Microtraffic) with more holistic expertise on issues of mobility and traffic (Mobycon) to get a fuller understanding of the intersection at hand and they it influences the behaviour of its users.
- The use of this technology should not always be the result of incidents or problematic incident statistics on a specific spot, it can be implemented preventively for example in case of citizens' complaints
- It would be interesting to do a follow-up measurement using the same technology to detect change in users' behaviour after the refurbishment at the intersection (planned 2023) compared to the baseline measurement (completed 2 years ago).
- The conflict analysis is based on assumptions regarding near accidents that have a foundation in scientific literature and are based on the concept of kinetic energy: the risk of a specific conflict is the result of speed and time and allows for an assessment of conflicts in terms of magnitude of risk. No risks however can be calculated for bike-bike conflicts (in contrast with a similar pilot in Antwerp)

Conclusion

It may be concluded that Microtraffic analysis that objectifies traffic conflict analyses, has great added value compared to accident data analysis and checking basic characteristics. Whereas the accident analysis and the checking of the Sustainable Safety basic characteristics only gives an indication of the problem and the possible cause, the Microtraffic analysis indicates exactly where the problem is. With that information, targeted measures can be taken while otherwise guessing whether measures actually will reduce the likelihood of accidents.

With respect to the general goals of the BITS-project, the uptake in cycling, however, would be rather limited (compared to the province of Antwerp in which a similar pilot has been done to increase safety) as safety of crossings is considered much higher by the citizens of Zwolle than by the citizens of Antwerp and is considered a barrier to cycling to a much lesser extent.