

# **Developments on Speed Limit Databases in Flanders: A First Prospective**

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## **ABSTRACT**

In 2006, a first study was conducted to make an inventory of which speed database information was available in Flanders. In this research it was noted that already a certain base is available and is still growing. The Flemish Government will start to make an inventory of all the road signs in 2005 and will be complete in 2008 and participate in EU-funded ROSATTE project. Meanwhile some research projects on protocols, tool-development and legislation are taken for the construction of a speed limit database. In this paper an overview of these initiatives is made.

## **KEYWORDS**

Speed Limit Database, Speed Map, Speed information, Intelligent Speed Adaptation (ISA), Speed Alert, Speed Warning Systems, Speed Management.

## **INTRODUCTION**

Many initiatives are made on European and national level to develop a speed limit database. These databases are needed in a further development of “speed management.” The OECD - ECMT described an integrated speed management necessary to counter the problem of speeding. Speed management (OECD, 2006) can be described as an integrated well defined approach of measures on infrastructure, signs and signing, vehicle technologies, education and training, enforcement and the use of intelligent transport systems (ITS).

Within this approach of speed management, the construction of a speed limit database is a necessary condition to provide speed limit information and the use of new technologies.

The main difficulties in the construction of the database –besides technological details - is how to gain and to store this information and who will be responsible for getting the information, the maintenance and provision of the data.

## **BEST PRACTICES IN EUROPE**

Many research activities funded by the European Union has constructed a framework which is of great use in the development of a speed limit database:

SpeedAlert (2006) researched and developed a framework to harmonise the in-vehicle speed alert concept definition and to investigate the first priority issues to be addressed at the European level, such as the collection, maintenance and certification of speed limit information. In the research of ActMap (2006) mechanisms for online incremental updates of digital map databases in the vehicle was investigated and created. In the MAPS&ADAS (2007) subproject of PREVENT the use of digital maps as primary and/or secondary sensors for Advanced Driver Assisting Systems (ADAS) was investigated.

Besides these European projects, national initiatives were made which were considered as useful for the creation of the Flemish speed limit database. In Sweden (2003) and Finland (2007) the speed limit database is a part of the national road database, which contain different kind of road information. In Denmark (2007) the registration is based on all speed signposts in the county of North Jutland including approximately 22,000 km of roads. A GPS logger with a special designed keyboard has been used for this purpose. This special keyboard made it possible to gain this information in about four weeks. In the Netherlands, a speed limit database has been made available on the Internet which should become 98% accurate in two years time. The information could be filled in online.

We can generally conclude that on European level the major technical guidelines and protocols were developed. Within the national initiatives the focus was more on an operational level, concluding legislations, national protocols, basic tools and field practice.

These approaches are considered as major guidelines and constructs to come to a Flemish speed limit database. In 2005, The Ghent University (De Mol and Vlassenroot, 2006), in order of the Flemish Government, did research on the construction of a Flemish framework for the future construction of a speed limit database. This study was based on the information found within European and national research and approaches. In a second step, an inventory was made of the available speed data in Flanders. Throughout this information some guidelines were constructed.

## **SITUATION IN FLANDERS**

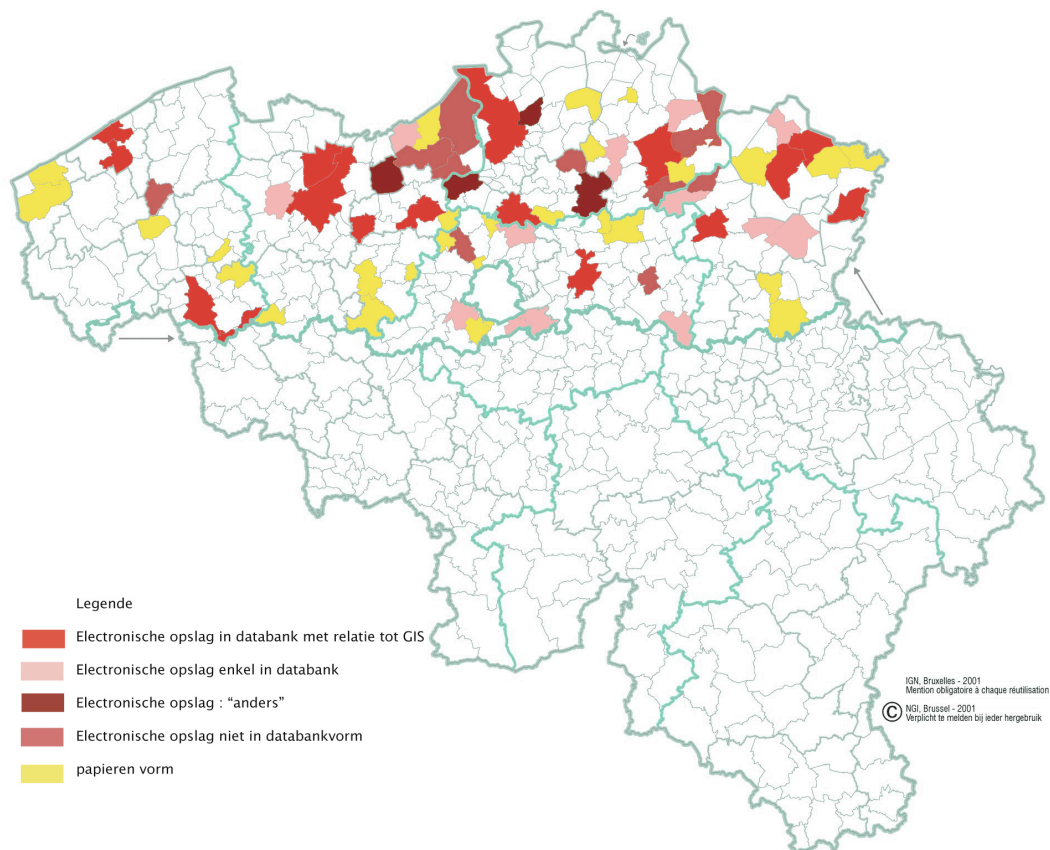
### **Availability of data**

The first speed limit database that was directly operational for the use of speed warning devices was constructed in 2002 for the ISA-trial in Ghent (Vlassenroot et al., 2006). This data was gained by observations and driving with a vehicle, equipped with a GPS application to put in location- based information. After the construction of this rough database a GIS based program was used where updates of data could be filled in on an easier way, and field work was not necessary.

At the same time The Flemish Government constructed a speed limit database only for the main roads that was used for the DEVINE project. An integrated platform for different applications was used in this project, including speed warning on highways.

In 2005 and after, more municipalities were using GIS, the question arise if besides the City of Ghent, other towns would have speed limit information. Within this research local authorities were interrogated if they could have speed limit data.

Of the 191 municipalities that respond, 72 said that they had speed limit data in one form or another. 44 municipalities would have the data digitally. Compared with the total of roads in Flanders, this would indicate that 31% of all municipal roads are in a digital form.



**Figure 1. Municipalities that have speed limit information in Flanders**

In the figure above, the municipalities that have speed limit information are given. In other words a certain base is present in Flanders to start the creation of a speed map. 39% of these data contain the exact position of the speed sign and in 64% the data was available for the whole stretch of road. This position was mostly based on the house numbers and not on GPS. Only 15% would have the exact coordinates of the speed signs.

Also, the Flemish government started in 2004/2005 to make an inventory of all the traffic signs along the highways and regional roads under its jurisdiction. It concerns 6500 km of regional roads, plus an additional 6500 km of local roads that intersect with regional roads. By mid 2009, this inventory will be completed for all districts in Flanders.

This would indicate that a lot of speed limit data would be available in a period of two years. It is assumed that some local data would not reach the proper usable standard or that many data is still not available. Therefore some guidelines and focal points to manage the speed limit data and to come to a uniform approach in the collection and maintenance of the data are constructed.

## **APPROACHES AND FOCAL POINTS IN THE CONSTRUCTION OF A DATABASE**

If we want to come to a speed limit database, the existing data could be used, but a certain framework should be made to convince the municipalities to gain and to deliver the speed data. Certain legal issues and support can help to convince the local governments to cooperate in the construction of the speed limit database. Based on the best practices in Europe, other countries and the information throughout the questionnaire have lead to the development of a realistic approach for Flanders.

### **1. Creation of co-operation**

A specific statutory regulation, like in Finland, is needed to construct legal agreements between the different administrations (local and Flemish) and private sector specialised in gaining speed limit data. This legislation should stipulate the statue of the database, financial agreements (e.g. maintenance costs, possible fees for the municipalities), forms and procedures of the data collection and updating, copyright and application issues (who can use the database and in which conditions) and the rights and duties of the involved partners.

### **2. Starting up the database**

#### **2.1 Who will deliver the data?**

Some municipalities and the Flemish government could deliver the first necessary digital speed limit data. This data can be in different digital forms, so the main coordinator (in this case the Flemish government) has to convert this data in the same framework. Still many municipalities would not have the necessary data. They must be convinced to give the data and be provided by some necessary tools to collect the data.

Different approaches can be considered in a first phase to collect these data:

- If municipalities will have the data in digital form, they will hand it over in their format.
- If they have a good described “paper” form of data, they would give this information and the local co-ordinator will put this in the general database.
- A web interface (like in the Netherlands) can be built where the local government would fill in the necessary data.

These three options would make it possible to collect speed information on a very short term. It is possible that the necessary quality demands of the data would not be provided.

The legal framework should make it possible that every municipality has to provide the data, where small towns can not provide the data, because of the absents of certain technologies, the Flemish government should be responsible to collect the data.

If the data is absent, municipalities have to be provided by the necessary tools to collect the data on the field. A certain GPS-unit should be given to the local governments that is easy to use (e.g. like the keyboard used in Denmark, PDA).

## **2.2 Tool development**

This data should be stored in a database. Within the different European researches some requirements are described for the storage and quality issues of the data. These guidelines should be used as base. To gain the speed limit information (on a long based approach) a certain (web-based) interface has to be provided to all the involved actors who provide the data.

## **3. Information quality**

As in a first phase, some data will not require the necessary quality issues; certain requirements have to be formulated for the different uses of the data. Starting with the end-user needs, the development of requirements shall focus on system related quality aspects experienced by the end-user. It shall give input to the different building blocks of the system architecture and information chain to identify their potential for supplying the service.

Within the Speed Alert (2006) project these quality requirements are described:

<i>Quality Characteristics</i>	<i>Description</i>	<i>Example of error/failure influencing the quality</i>
Availability	Degree to which geographic data are available at a certain point and at a defined time	<ul style="list-style-type: none"> <li>▶ Technical availability, system operational</li> <li>▶ Coverage of service</li> </ul>
Completeness	Degree of adherence of all geographic data (features, their attributes and relationships) to the conceptual model	<ul style="list-style-type: none"> <li>▶ Lack of certain speed limit categories in the service</li> <li>▶ Incomplete data sets, lack of certain attributes (e.g. time period, lane dependence...)</li> </ul>
Consistency	Degree to which geographic data (data structure, their features, attributes and relationships) correspond with the information model	<ul style="list-style-type: none"> <li>▶ Data are collected and stored according to the data specification/model</li> </ul>
Correctness	Degree to which geographic data correspond to the reality, assuming that the data is up-to-date	<ul style="list-style-type: none"> <li>▶ Data errors (from capturing or processing)</li> <li>▶ Errors in deducing correct speed limit depending on situation (weather) etc.</li> </ul>
Up-to-dateness	Degree to which geographic data correspond to reality as its changes over time	<ul style="list-style-type: none"> <li>▶ Errors from delay in updating of on-board data-base</li> <li>▶ Time delay between VMS signal or speed limits at road works etc. and service display,</li> </ul>
Accuracy	Accuracy of continuous and non-continuous data <ul style="list-style-type: none"> <li>▶ Metric accuracy</li> </ul> degree of deviation between measured and real value semantic accuracy: <ul style="list-style-type: none"> <li>▶ Degree of discretisation of the object information</li> </ul>	Metric accuracy: <ul style="list-style-type: none"> <li>▶ Positioning of the vehicle (in road direction, across road direction/lanes)</li> </ul> Semantic accuracy: <ul style="list-style-type: none"> <li>▶ ‘Road Works ahead’ or ‘VMS’ vs. precise information on speed limitation value and position;</li> </ul>

**Table 1. Required speed limit qualities as noted in the SpeedAlert project (SpeedAlert 2005)**

As the databank will develop, more of these quality characteristics can be achieved.

#### **4. Data output**

The usability of the data depends on how the data will be provided and how it can be used. ITS suppliers (private sectors) will need high quality data, related to GIS maps. Municipalities could use the data for the development of a local speed management. Besides road administration, other public administrations could have benefits of these data (e.g. courts, police,...).

This study and the researches conducted in all over Europe has given an impulse to go further in the construction of a speed limit database. In the next section some Future steps would be described.

## **FUTURE STEPS IN FLANDERS**

In this section, the first initiatives are described that will start in 2008. In the full paper more technical information will be given.

### **1. Flemish Road Sign Database**

Besides the above-mentioned 13000 km of roads that will be inventoried by mid 2009, the Flemish Government also plans to make an inventory of the traffic signs along the remaining 55000 km of municipal roads. The Flemish Government will take the lead in carrying out the zero measurement on all municipal roads. The purpose is to have the database by 2010. It will then be essential that all road authorities co-operate to keep the established database up to date.

### **2. ROSATTE project**

The ROSATTE project intends to develop enabling infrastructure and supporting tools to ensure European access to, as well as continuous update of safety-related road attributes (essentially speed limit and traffic signs). This infrastructure will facilitate both administrative internal functions and supply of data to third parties e.g. for safety relevant services, especially in –vehicle map based applications.

The Flemish Ministry participates in this ROSATTE project. The project will start on January 1st 2008 and lasts 2.5 years. One of the test-sites in the ROSATTE project will be located in Flanders.

### **3. IBBT Next Generation ITS project**

The IBBT (Institute on Broadband Technology) launched a call, under supervision of ITS Belgium, for a project to create a test-bed on future ITS developments in Flanders, called “Next Generation ITS.” The NextGenITS project is use case driven; the project will focus on five promising ITS services: e-call, traffic information, intelligent speed adaptation, road charging and cooperative vehicle systems. Each of these services have considerable potential in both a social and commercial context. The different services will be based on European standards to ensure interoperability between different market players and across geographical borders. One of the sub-projects is to provide an accurate speed database and map and to develop strategies for best communication from server to vehicle. More specifically, the objectives are:

- to develop a speed database for Flanders in correlation with the given procedures and standards out of other national and international (EU) studies
- to develop the necessary tools, procedures and legal frameworks to create, maintain and update the speed limit database
- to create procedures and tools for updating the speed limit database

- to develop, test and demonstrate the communication and data transmission to the vehicle
- to test and to demonstrate the use of the speed database within an ISA application.

Partners involved in this subproject are Ghent University, IBBT, TeleAtlas and The Flemish Government. The Approval of this project will be given at mid December and the objective is to start in 2008.

## **PRIMARILY CONCLUSION**

With the research on the construction of a Flemish framework for the future development of a speed limit database it is noted that some data is available within the municipalities and on higher level. Although, it is still a small part of all the data, a certain climate is set to come to full working database. The initiatives on Flemish level on collecting the data of the speed signs, the participation in ROSATTE-project, the future research initiatives on protocols, tool-development and implementation are a good start. Also co-ordination between these projects is necessary to come to a full integration of the different platforms and application. On policy level, the issue of the speed limit database is getting more debatable which result in an integrated working group between the government, different stakeholders and the private industry concerning these issues. These first indications must be seen as a first step into the use of ITS applications on Flemish roads.



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