Implementation of Incident Management on secondary roads in The Netherlands

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Since July 1st 2004 Incident Management has been implemented as a pilot on the secondary road network in various regions in the Netherlands. The first region was the Westland region (province of Zuid-Holland), followed by the city of Amsterdam, the south-eastern part of the province of Noord-Brabant and the region around Alkmaar (province of Noord-Holland). In each region the road manager (city or province), regional police, fire department, Incident Management Foundation Netherlands and the towing companies agreed on procedures in case of incidents, with the aim to reduce traffic jams resulting from incidents. The pilots are (in the process of being) evaluated, and the results are promising!

Introduction

Daily car drivers have to deal with it: small and big accidents, breakdowns on the road, lost cargo from trucks…. Since many year Incident Management has proven its added value on the Dutch highways, because on those roads clear agreements have been made in order to reduce the negative impacts of such events, such as delays and unsafe situations. Incident Management (IM) includes a range of measures and procedures to be taken by involved parties in order to clear the road in the quickest possible way after an incident has happened. Thus traffic jams will be reduced, both in length and in duration. In addition IM also contributes to traffic safety of those directly involved, since they know of each other who is responsible for what. Thirdly, processes can be speeded up, simply because the co-operation between the various parties involved improves.

The evaluation carried out by the Directorate General of Public Works and Water Management supports this added value of Incident Management [1].

For a number of provinces there was sufficient proof to investigate the potential of Incident Management for the secondary road network and to set up pilots as a first step towards full implementation in their regions. It is expected that IM on the secondary road network will have similar benefits as on the highways, even though this network has different characteristics (e.g. less traffic, more alternative routes). The province of Zuid-Holland was the first to start a pilot with IM on the secondary road network, followed by the city of Amsterdam and the provinces of Noord-Brabant and Noord-Holland. The first two pilots have been completely evaluated, the latter two pilots are still in the process of evaluation, although preliminary results are already available. This paper will present the (preliminary) evaluation results of three regions, i.e. Westland Region, Alkmaar Region and Eindhoven Region. These regions are shown in figure 1. The total length of the secondary road network to which the IM pilot applies amounts to around 200 kilometres, i.e. 120 km for Noord-Brabant, 45 km for Noord-Holland and 40 km for Zuid-Holland (Westland region).

1 The authors want to thank Lieke Berghout and Alwin Bakker for their contributions to the first (Dutch) version of this paper, which was published in Verkeerskunde in August 2005 (more briefly and Westland pilot only).
IM on the secondary road network
For the implementation of IM on the secondary road network first an analysis has to be made of the necessary steps to be taken by the road manager. In the first place there has to be sufficient internal support, and both politicians and civil servants have to have a clear picture of the value added and necessity of IM. Next, for the pilot the specific roads have to be identified on which IM will be implemented first. These roads should have a sufficient level of car traffic and should be of sufficient economic importance to justify the costs of quick towing away of vehicles and getting back to normal as soon as possible. Often these roads have already been identified as important regional roads and in many cases Dynamic Traffic Management is already applied.

Once the roads on which IM will be implemented have been selected, the relevant organisations can be contacted, such as the regional police, fire department, municipalities and towing companies. Together with these parties and those parties already involved in IM on the highways (Directorate General of Public Works and Water Management, central co-ordination point Incidents, central co-ordination point
truck incidents, and the traffic control centre Netherlands) Incident Management on the secondary road network has been elaborated.

Since many of these actors already are involved in IM on the highways, already existing internal and agreed procedures will be adopted where possible. Implementation of different procedures or working methods will only lead to confusion and misunderstandings. As a result, just like IM on the highways, separate arrangements have been made for passenger cars (LPR) and for trucks (LVR). These agreements will be explained later.

Legally speaking the road authority has to authorise the local police working on the roads where IM will be applied to arrange for a tow truck in case of an incident with passenger cars. In the case that the tow truck proves to be superfluous (e.g. a simple accident), the road authority will guarantee the towing company that its costs will be paid by the road authority. In addition a number of already existing agreements with relevant parties have been adopted, and contracts have been signed with towing companies for towing of heavy vehicles in case of incidents where heavy vehicles have been involved. Within the Province of Zuid-Holland procedures have been adapted and a central registration desk has been established. All these procedures are laid down in the ‘Draaiboek Incident Management’ (Manual Incident Management) [2].

In July 2004 first trials with IM started. The first six months focused on learning and getting used to the new working procedures. In order to learn from these early experiences as much as possible, regular meetings have been held to discuss day-to-day problems. The experiences with IM on the highways proved to be very useful during these meetings. As a result of these meetings additional procedures have been agreed, and some information flows, especially relevant for the administrative and financial handling of the incidents, have been adapted. These meetings proved to be a good basis for regular IM meetings also after the initial start-up phase. After these first six months the pilot project officially started on January 1st 2005.

Evaluation

In order to see whether the high expectations at the start of the project will be met, the Province of Zuid-Holland has asked Mobycon to carry out the evaluation of the IM pilot in the Westland region during the period January – March 2005 [3]. The objectives of the evaluation were twofold:

- To research and analyse the IM process with the aim to propose improvements to the procedures if necessary (process evaluation)
- To identify the costs and the benefits of implementing IM on the secondary road network (impact evaluation)

![Figure 2: Evaluation methodology](image-url)
For the collection of the necessary data the following methods have been applied:

- Distribution of evaluation forms among the various actors involved, such as the provinces, the police and the towing companies
- Various kinds of registered data with relevant information, among which the data of the traffic centres (national, regional), the CMI/CMV organisation and the provinces.
- Interviews with those persons directly involved in the incident handling.
- Telephone enquiries with the police or towing company employees ‘on the street’ for missing information.
- A workshop with all parties active in the Incident Management process.

**Process evaluation**

During the evaluation period a total of 121 incidents have occurred of which 72 accidents, 24 breakdowns and 25 other/unknown incidents (brick on road, oil, ‘really’ unknown). In 36 out of these 121 incidents the incident room of the regional police Haag-landen decided to start up the IM procedure.

Since the handling of incidents with passenger cars requires a different approach than the handling of incidents with trucks, for both types of incidents different procedures have been agreed. The main difference is the fact that in the case of incidents with only passenger cars the police will immediately contact the Central Registration Desk Incidents (CMI), whereas in the case of incidents in which one or more heavy vehicles are involved the Central Registration Desk Trucks (CMV) will be contacted only after the police first has visited the site of the incident in order to make the right judgement. Of the 36 IM procedures started during the evaluation phase, 33 of them were CMI procedures (passenger cars) and 3 were CMV procedures (trucks).

For each incident the average incident duration has been calculated. This is the time that elapses from the first registration (incident happened) to the last registration (incident ended) by the police. The evaluation showed that the actual duration could be longer due to the fact that sometimes the road manager needs to clean or repair the road, while the police no longer will wait for this, since it has to go to another incident.

The average duration of passenger car incidents was 48 minutes. When a truck was involved, the average incident duration increased to 1 hour and 13 minutes. When the IM procedure was carried out only partially the average incident duration increased to 51 minutes for incidents with passenger cars only. Remarkably, when the IM procedure was not started, the average duration of the incident was 27 minutes. Apparently the police is very well capable to judge whether the IM procedure should be started or not.

**Time intervals**

For 33 completed CMI procedures (passenger cars) the average time intervals have been calculated and compared with the time intervals of IM on the highways. The differences are only marginal. In general one can say that all time intervals fall within the acceptable margins. Especially the towing companies are performing well, being on the spot of the incident within 10 minutes after being called. This is just 50% of the time required for being on the spot on the highways.

In the following figure the CMI procedure in Zuid-Holland is shown schematically, including the critical path. All intervals together make a complete CMI procedure, but since some intervals are running in parallel, the total duration of a full procedure is
less than the sum of all intervals. The CMI procedures in Noord-Brabant and Noord- Holland are almost identical and vary only on minor aspects.

Figure 3: Schematic presentation of CMI procedure with critical path

Figure 3 shows the time gain that can be realised through the implementation of IM. In the ex-ante situation (before IM was implemented) the provincial road manager and the towing company were notified one after the other, which could take more than 30 minutes. In the CMI procedure the Province and the towing company are mobilized only minutes after the police incident room has been informed. If this procedure is followed properly, the time savings could be close to 30 minutes, as could be witnessed both in the Westland region and in Noord-Brabant.

In order to be complete, the schematic presentation of the CMV procedure is shown in figure 4, although with respect to the CMV procedure (trucks) the number of incidents was not sufficient to provide reliable data on the time intervals.

Figure 4: Schematic presentation of CMV procedure with critical path

Time interval targets secondary roads required
Since the pilot IM in the Westland region is the first of its kind on the secondary road network, no specific target levels have been set for the time intervals of IM on the secondary road network. Therefore the only reference for the time intervals is the time intervals on the highways [4]. Although it was outside the scope of the evaluation study to define the time interval targets for IM on secondary roads, three reasons can be identified in favour of different time interval levels for IM on the secondary road network compared to IM on highways:

- Due to the differences in characteristics and type of secondary roads and highways, the driving time to the incident spot in general will be shorter for secondary roads than for highways, thus enabling the relevant parties to arrive at the incident spot more quickly.

- In the case of serious incidents on secondary roads traffic can get jammed to such an extent that police, road managers and tow trucks will have difficulties to reach the incident location (no emergency lanes). Thus IM on the secondary
road network will show a number of extremely long intervals which will influence the average figures.

- If the police will be able to arrive at the spot more quickly, this will also imply that the total CMV procedure will be shorter, since the travel time of the police is part of the critical path of the CMV procedure.

### Conclusions process evaluation

With respect to the IM process it can be concluded that overall the IM procedure worked well, but that some improvements could be realised:

- Every IM notification should get a unique registration number, which will allow the various organisations to trace the IM notifications more easily, and which will result in time savings in the administrative process. In addition the registration of the IM notifications should be recorded more consistently. This has already been realised.

- In many cases the incident room of the police makes the decision to start up (or not) the IM procedure. In some cases the IM procedure is only started at a later stage, resulting in unnecessary or longer traffic jams. Given the positive cost/benefit ratio (see below) the question should be raised whether the police should not start up the IM procedure more often. In case of doubt it is recommended to start up the IM procedures.

- Especially in the beginning of the pilots the IM procedures are not always clear. At the incident room of the police, where most IM procedures are started, this has consequences for the success of the IM implementation. Therefore it is considered essential to provide instructions on the IM procedures to the incident room (which roads, who to contact).

- It is important that all relevant parties have the same up-to-date unambiguous maps (on paper or GIS-based) in which the roads where IM is implemented are well marked. This will avoid misunderstandings, confusion and problems with cost claims.

- In some cases it occurred that the incident room of the police did not inform the Province, due to not knowing or not being aware of the IM procedures. Most likely these mistakes are due to start-up problems.

- The recorded time intervals to a large extent fall within the margins of the IM time intervals for highways. However, in the case of CMV procedures the police, after arriving at the incident spot, could have reacted more quickly. Another option would be to adapt the procedure in such a way that the police incident room could already start up the CMV procedure, without the police going to have a look on the spot. However, in that case the CMV procedure on secondary roads would differ from the one on highways, which is not desirable.

- It could be considered to set specific target levels for time intervals for the secondary roads, since these roads have different characteristics.

### Impact assessment

Not only the process has been evaluated, but also the impacts of Incident Management have been assessed. The assessment has been carried out as a socio-economic cost/benefit-analysis for the duration of the pilot IM in the Westland region.

#### Limited costs

The costs that have been made in relation to the pilot IM in the Westland region consist of the following components:

- **Training**
  - Police, province and towing companies have invested (‘opportunity costs’, training institute) in training their employees ‘at street level’ to get accustomed
to the procedures. On an annual basis these costs are around € 3,260,- for the province and € 760,- for the police.

- **Towing costs**
  For every CMI and CMV notification the so-called co-ordination costs\(^2\) are being charged (€ 17,- per notification for CMI and € 132,- to € 330,- for CMV) to the Province of Zuid-Holland, to which the Westland region belongs. In addition each CMI or CMV notification leads to the so-called execution costs, the costs charged by the towing company to the insurance company (in case of actual towing away) or to the road authority (in case of an unnecessary trip). These costs are between € 70,- and € 150,- for CMI operations. For actual CMV operations the costs are much higher, up to € 1100,- per operation, whereas for unnecessary CMV operations the costs are around € 180,-. In those cases where the insurance companies don’t pay for the towing costs, the road authority will try to recover the costs from vehicle owner. Based on the 3-months pilot period in the Westland region the actual costs for the province of Zuid-Holland for unnecessary trips amounted to € 3,261,-.

- **Extra man power police**
  Although IM requires that the police go to the incident spot more frequently, this does not result in an additional need for manpower, and as a consequence there are no extra costs related to IM. The extra time needed for the full procedure in case of an IM notification is only marginal.

- **Extra man power Province of Zuid-Holland**
  IM has led to a more frequent deployment of road managers at the incident location. In addition the Province of Zuid-Holland has to pay a fixed sum to an external party for each incident notification that is handled by this organisation. The total costs for the Province for the duration of the pilot (3 months) was € 2,033,-.

In table 2 the total socio-economic costs of IM on the secondary road network in the Westland region are shown in the left-hand column. These costs for the three months pilot have been calculated to be nearly € 7,000, which is around € 200,- per incident.

**High socio-economic benefits**
The final goal for the implementation of IM on the secondary road network is of course to realise benefits for society. These benefits are mainly travel time savings and reliable travel times. In addition some other benefits can be realised, such as improving comfort, a reduction of detours, reduction of fatal and seriously injured and reduction of noise pollution. During the evaluation only the first two aspects (travel time savings and reliable travel times) could be quantified. Apart from the benefits mentioned before, the improved co-operation between police and road managers has resulted in recovering the costs of damage to road side equipment (sign posts, etc.) from the car owner that caused the damage. This latter benefit has not been included in the cost/benefit analysis.

- **Travel time savings**
  For the calculation of the travel timesavings the estimates have been used from the evaluation forms, which were completed by the authorities (police, province, towing company) that were called to the incident. These estimates varied between 20 – 30 minutes when IM was applied. In two other regions in the

\(^2\) Co-ordination costs are those costs made by the CMI organisation (which is part of the insurance companies) for organising, managing and reporting the incidents. In the case of CMV these costs are even higher due to a higher complexity and the issue of possible costs recovery from the Dutch or foreign owners. This file is available for the road manager.
Netherlands (Noord-Holland and Noord-Brabant) preliminary figures also indicate possible time savings of 20-30 minutes per incident. For the calculations the lower figure of 20 minutes has been used. The calculations (see box 1) shows that the total travel timesavings of 33 CMI notifications resulted in a socio-economic benefit of nearly € 80,000. For the 3 CMV notifications the socio-economic benefits amounted to € 13,000. In both cases these benefits were realised either because of shorter traffic jams, or because of a timely re-routing of the cars and trucks.

**Box 1: Calculation travel time savings**

For the purpose of the evaluation a simple model has been taken, in which vehicles arrive at fixed intervals and total waiting time/delay increases square with the total duration of the incident. In the following figure this is shown schematically.

The average duration of an incident was 68 minutes before implementing IM and 48 minutes after implementing IM. This does not mean that all vehicles have 20 minutes travel time saving:

- All vehicles that arrive in the first 48 minutes will save 20 minutes each. In the figure this is shown by the area B1.
- The vehicles that arrive at the accident location between the 48th and 68th minute will experience on average a time saving of 10 minutes, varying between 0 to 20 minutes. In the figure this is shown by the area B2.

On an average working day 1.032 vehicles pass an average road section in the Westland region\(^3\). This is comprised of 878 passenger cars and 154 freight vehicles. The Directorate General of Public Works and Water Management – AVV has made a calculation in 2001 which shows that the direct costs per vehicle hour are € 42,- for a freight vehicle and € 8,- for a passenger car. Taking into account inflation, these values can be used for calculating the economic value of the travel time savings of implementing IM on the secondary road network in the Westland region. Assuming a 20 minute time saving per incident, each time IM is applied will save € 4.421,-, it is € 2.119,- travel time savings for freight vehicles and € 2.301,- for passenger cars.

**Reliable travel times**

Apart from putting a value to travel time, in this research also reliability of travel time has been valued (see box 2). The degree of reliability of freight transport is the degree in which the transported goods are delivered within the agree time window. In this study the value of reliability is € 0,18 per percent change of the

\(^3\) On the basis of 2003 counts, adapted to 2005.
share that has been delivered too late [5]. The total benefits of increased reliability amounted to € 20,000.

Box 2: Calculating the value of reliability

During the 3 months of the pilot a total of 210,000 trips with freight vehicles has been made. Before the implementation of IM 1.75% of the trips was too late due to incidents. After the implementation of IM only 1.23% of the trips arrived too late. This is an improvement of 0.52%.

Applying the formula for valuing the reliability of freight traffic results in the following calculation:
0.52% x € 0.18 per percent improvement of reliability x 210,000 = € 19,656,-.

Therefore the total socio-economic benefits are estimated to be more than € 110,000 for the three months of the pilot (see also table 2).

Conclusions impact assessment

Table 2 shows a summary overview of the total socio-economic costs and benefits of Incident Management in the Westland Region for the 3 months duration of the pilot.

<table>
<thead>
<tr>
<th>Costs for 3 months (euro’s)</th>
<th>Benefits for 3 months (euro’s)</th>
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</thead>
<tbody>
<tr>
<td>Training police, province</td>
<td>1,005</td>
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<tr>
<td>Time savings CMI</td>
<td>79,574</td>
</tr>
<tr>
<td>Costs unnecessary trips (CMI and CMV)</td>
<td>3,261</td>
</tr>
<tr>
<td>Time savings CMV</td>
<td>13,262</td>
</tr>
<tr>
<td>Recovering costs CMV</td>
<td>420</td>
</tr>
<tr>
<td>Higher reliability freight transport (CMI/CMV)</td>
<td>19,656</td>
</tr>
<tr>
<td>Extra manpower police</td>
<td>0</td>
</tr>
<tr>
<td>Reduction of detours</td>
<td>pm</td>
</tr>
<tr>
<td>Extra manpower province</td>
<td>2,033</td>
</tr>
<tr>
<td>Improved comfort</td>
<td>pm</td>
</tr>
<tr>
<td>Costs incident room police</td>
<td>36</td>
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<tr>
<td>Improved traffic safety</td>
<td>pm</td>
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<tr>
<td>Costs registration desk province</td>
<td>90</td>
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<tr>
<td>Reduction air pollution</td>
<td>pm</td>
</tr>
<tr>
<td>Reduction of noise</td>
<td>pm</td>
</tr>
<tr>
<td>Total</td>
<td>6,845</td>
</tr>
<tr>
<td>Total</td>
<td>112,492</td>
</tr>
</tbody>
</table>

Table 2: Overview of costs and benefits

On the basis of 33 CMI and 3 CMV notifications it can be concluded that the benefits of IM are much higher than the costs. Through a sensitivity analysis it was calculated that even with a reduction of 50% of the time savings and/or much lower traffic intensities and/or a reduction of the number of incidents the benefit/cost ratio would still show a very positive result.

Closing remark

Implementation of IM on the secondary road network in the Westland region has functioned very well. Given the very positive benefit/cost ratio it should be considered whether the incident room of the police should not decide more often in favour of starting up the IM procedure. In this way much time can be saved in those cases where the incident room initially makes the (wrong) decision not to start up the IM procedure, when later it proves to be necessary to call for a towing vehicle.

In addition it should be considered to adapt the CMV procedure for trucks in such a way that the towing company is activated at the same time as the police, in a similar way as is being applied in the CMI procedure. Currently in the CMV procedure first the police have to go physically to the incident location to judge the situation and to decide whether or not a tow truck is required. By notifying the towing company at an earlier stage, much time can be saved. However, since this would result in a different
procedure compared to the national CMV procedure, preferably this needs to be coordinated.

During the pilot period (January – March 2005) a total of 36 IM notifications have been registered. The total costs amounted to nearly € 7,000, while the socio-economic benefits amounted to over € 110,000. Thus it can be concluded that the pilot IM on the secondary road network in the Westland region has been very successful.

**Literature**


