BLOCK DISPATCHING FOR HGVS ON PROBLEMATIC ROAD SECTIONS DURING EXTREME WINTER WEATHER CONDITIONS

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ABSTRACT

Winter maintenance on German arterial roads plays an important role. Especially since introducing an HGV road toll, pressure has risen on the persons in charge of winter maintenance to guarantee secure trafficable roads during that season. For more effective maintenance and to maintain traffic flow in winter, certain means were developed which will help the persons in charge to maintain high standards, including not only the optimisation of winter maintenance in highway surveillance centres, but also traffic-controlling or traffic-limiting means, concerning single or more road user groups.
As HGVs are often decisive for the level of service in winter due to vehicles breaking down or blocking roads, causing long traffic jams and high economic costs, a block dispatching scheme for HGVs on German motorways has been developed, after a Swiss concept. The main focus in this project is to stop HGVs during heavy winter conditions, in front of problematic road sections, like high or low gradients for example, just before skidding problems appear. This procedure allows winter maintenance vehicles a “congestion-free” possibility to enter the motorway via suitable service accesses or junctions and therefore to guarantee a secure continuation of the HGV’s journey.
The whole concept presented here was developed by a working group with members of the highway police, highway surveillance centres and different public institutions. It includes firstly the concept of traffic signing. This should be easy and understandable, so that the problems in winter are not exacerbated. Furthermore, an operation schedule was created to guide the persons in charge when carrying out the project.
Traffic simulations have also been conducted. Their results gave information about the average waiting time in front of an incline and about the time required to leave a waiting area, as well as about the required length of the area. In this way, it could be guaranteed, that congestion events would not reach motorway intersections in conurbations, an important criterion.
The pilot tests are taking place in Winter 2008/2009 and 2009/2010 on two motorway sections in Germany (BAB A8 in Baden-Wuerttemberg and Bavaria). For evaluation, a questionnaire was developed and on-site cameras will record events. The results will then be compared with similar information from full closures of motorways due to winter road conditions, including acceptance of road users, employment of staff, etc.

KEYWORDS

WINTER MAINTENANCE / BLOCK DISPATCHING / HGV / ROAD SURFACE CONDITIONS

1. INTRODUCTION

Due to an increase of traffic and the fact, that mobility today is an important location factor, winter maintenance on German arterial roads plays an important role. Especially since an HGV road toll has been introduced for this type of road, the pressure on the people carrying out winter maintenance has risen. It must be ensured, that a road can be accessed at all times; summer and winter.
As it is often not that easy to carry out winter maintenance due to fast changing weather conditions, the occupation of all employees and/or vehicles etc. (what doesn't leave much room for any other occurring problems), it is important to have a closer look at other measures to support the persons in charge of winter maintenance, so that a high standard level of winter maintenance can be obtained.
For this reason, the Institute of Highway and Railroad Engineering of the Karlsruhe Institute of Technology was assigned in 2007 to conduct the research project "Coping with High Traffic Volumes on Federal Motorways in Winter" by order of the Federal Ministry of Transport, Building and Urban Affairs and represented by the Federal Highway Research Institute (BASt).
Within the framework of this project, new measures have been developed for German motorways to guarantee, at least theoretically, the mobility of all traffic in heavy winter weather at all times. These measures, the so-called "block dispatching for HGVs" will be provided especially in front of problematic road sections, like high or low gradients for example, to avoid skidding problems and accidents with HGVs blocking the whole carriageway for many hours.
For this measure, a "block dispatching scheme" for two sections on German motorways has been developed (BAB A8 in Baden-Wuerttemberg and Bavaria). This includes in particular the theoretical preparation of the measures with the persons in charge of winter maintenance to consider their experience as well as the preparation on site like developing a traffic sign plan and an operation schedule.
The measures were intended to be carried out in winter 2008/2009 as well as in winter 2009/2010. Although they were not fully carried out in winter 2008/2009, the preliminary stage before fully carrying out the measure was already assessed as good and will be in use as an additional instrument to support winter maintenance in the upcoming winter 2009/2010. The basic conditions will be given in this paper.
Figure 1 shows the theoretical operation schedule for the measures in Baden-Wuerttemberg, which is the basis for all implementations.

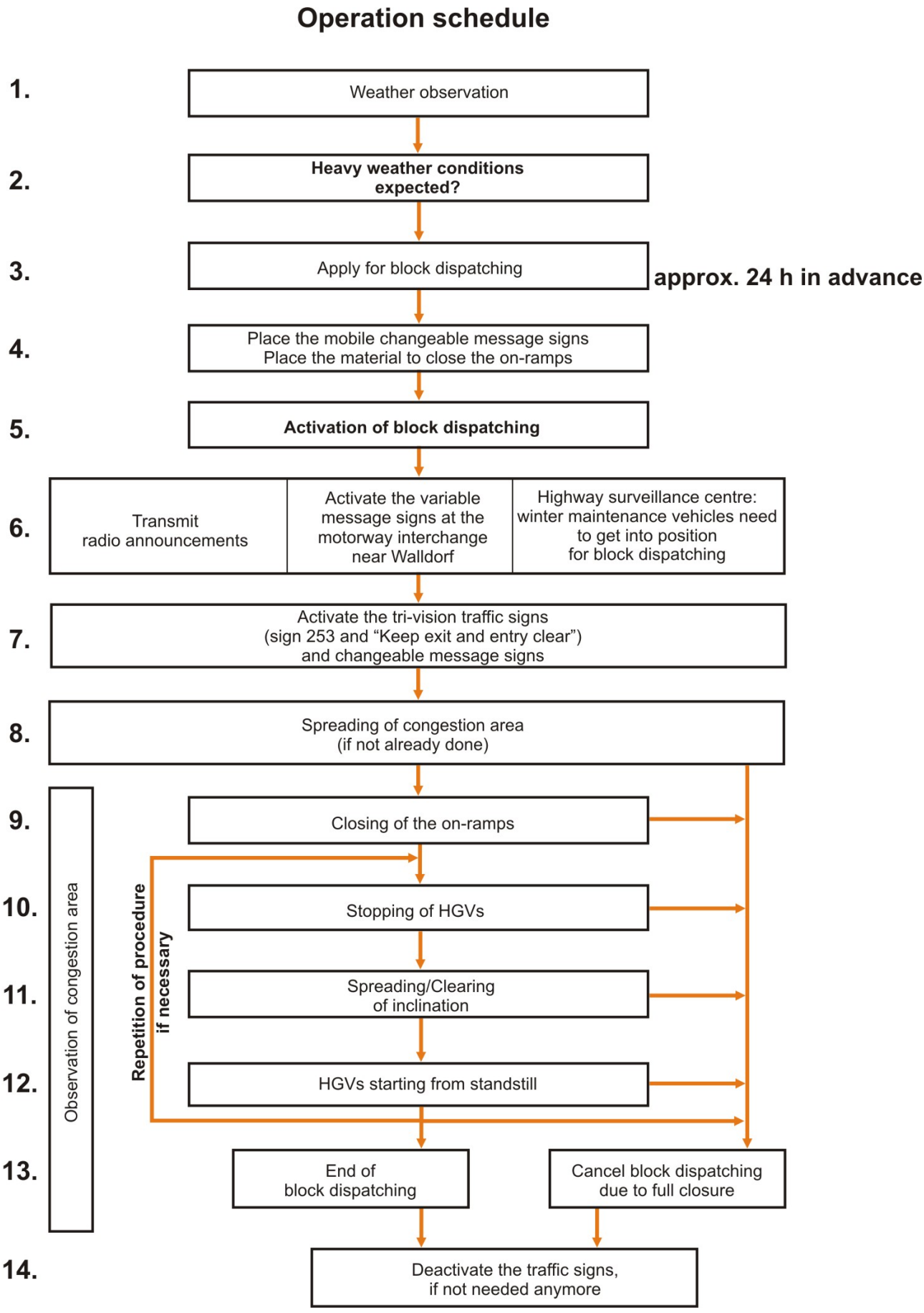

Figure 1 – Theoretical operation schedule for block dispatching for HGVs in Baden-Wuerttemberg

2. GENERAL BASIC CONDITIONS

For the measures, the general idea was to prevent long traffic jams with HGVs blocking the whole carriageway, which occur every year due to slippery pavement surfaces, especially on high gradients on motorways. The blocking of the whole traffic (HGVs and passenger cars) has already been successfully performed for several years to support the persons in charge of winter maintenance, but as the whole traffic will be blocked during that measure, the idea came up to just block the "primary source" of such heavy accidents, namely HGVs. This should help to keep traffic flowing for passenger cars and to better guarantee non-slippery surface conditions for HGVs, which are often on the road with summer tyres or which do not dare to pass high gradients for fear of skidding and stop just before them. Others try to overtake and do not realise the carriageway has a slippery surface and get stuck due to slippage on the fast lane.
Therefore, the following basic conditions were assumed:

- Inclination of ≥ 4 %: The risk of HGVs blocking the road here is extremely high, therefore this basic parameter was defined (at least for the pilot study)
- Stopping of the HGVs on the near side lane: This was chosen to be the best place to stop the HGVs as the traffic signing would not be as complicated as when using the hard shoulder to stop them. It is necessary in such situations to give easy information to the road user to prevent confusion amongst them
- The stopping of the HGVs should not be longer than 5 to 10 minutes. During this time, the winter maintenance vehicle should already be in the start position to go onto the road in front of the stopped HGVs. This will also prevent the forming of ice under the stopped HGVs due to excessive warming of the pavement surface. Also the HGVs are used to distribute the salt/saline solution better and should not be stopped longer
- Detailed road weather information (RWIS) is needed. The measure should not be a reaction to heavy weather conditions, but should be used as an action just before really bad weather is on the way, mainly to prevent dangerous situations, and to better organise the measures at the beginning
- To prevent HGVs from using the fast lane(s), it is necessary to ban them from it. Detailed information about the traffic sign plan will be given in Section 4
- The driving speed should be restricted to less than 80 km/h
- Detailed information for the road user: Press releases about the measures before the winter starts are essential, as well as providing information via radio/TMC during the measures. Flyers for distribution in motorway service areas were created to give information in different languages.

3. SELECTED ROAD STRETCHES

For the pilot study, two stretches of the motorway A8 in Baden-Wuerttemberg and Bavaria have been selected. They meet the demands of Section 2 (high gradient), bear high traffic volumes and are also potentially dangerous in winter times due to heavy ice or snowfall on the road.
A working group with members of the highway police, highway surveillance centres and different public institutions have been formed to discuss the different factors affecting the organisation of the measures. Also, some basic conditions were weighted differently in these two areas. Table 1 shows the differences between these two road stretches and also the differences in carrying out the measures:

Table 1 – Differences in carrying out block dispatching

Motorway A8	Baden-Wuerttemberg	Bavaria
Number of lanes	3 + hard shoulder	2
Block dispatching in direction	East	East and West
Junctions within the congestion area	Should be kept free (with the help of traffic signs)	Should be kept “self-regulated”
Use of traffic signs in preliminary state	In use	Not in use
Use of additional warning signs	Yes	No
Notification of other rescue parties	Yes	No

More detailed information especially about the handling of the traffic signing will be given in Section 4. Figure 2 shows the scheme for traffic signings in Baden-Wuerttemberg.

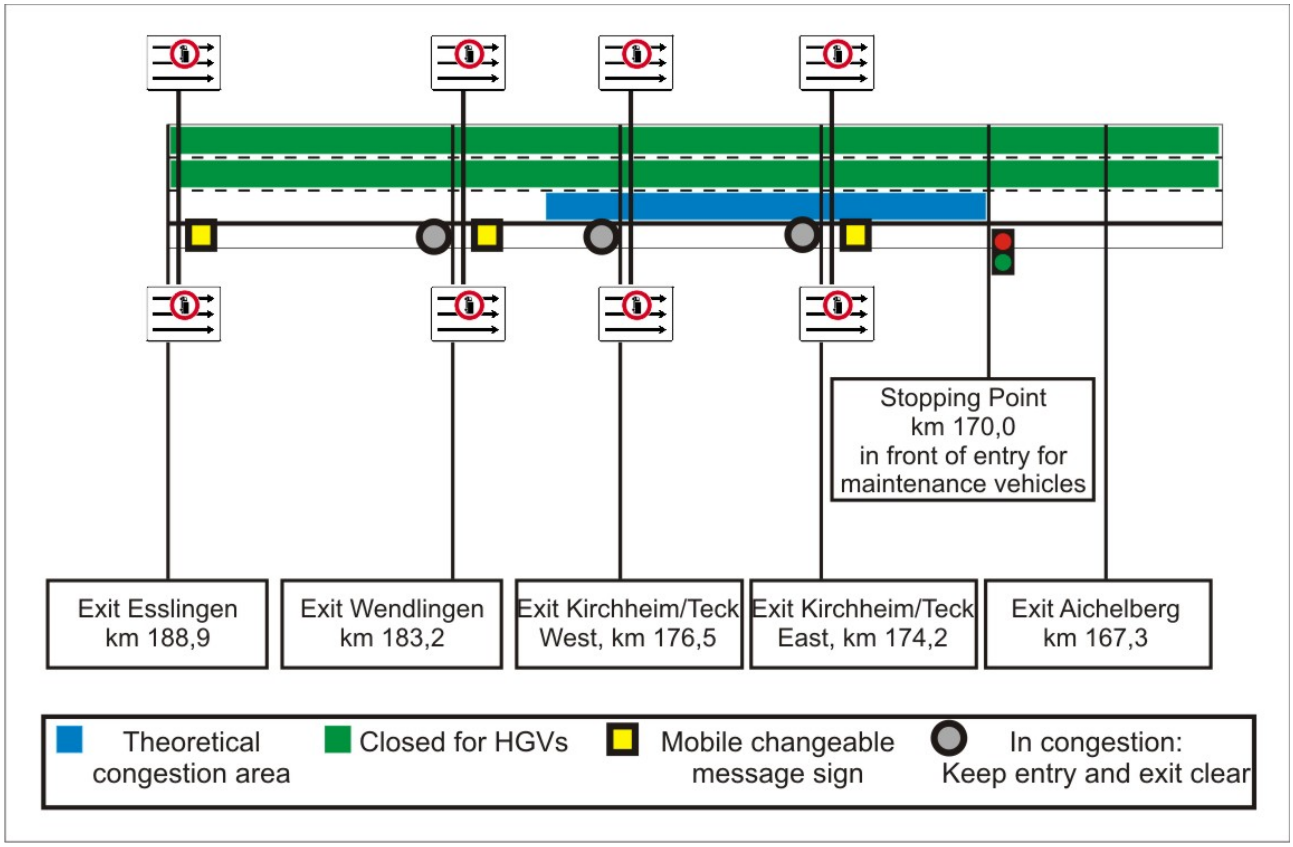

Figure 2 – Scheme for traffic signing in Baden-Wuerttemberg

4. TRAFFIC SIGN PLAN

A basic requirement of the traffic sign scheme was to keep it easy to understand. As in difficult situations, like heavy snow on motorways, it is important to give easy understandable and not too much information about what is happening. Therefore it was decided to use the following traffic signs to support the measure:

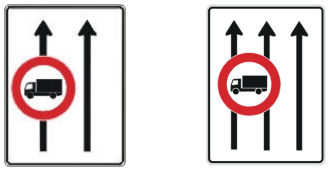

Figure 3 - Road Sign 253 of the German road traffic regulations on a lane indicating board

To prevent HGVs on the fast lanes in the congestion area during block dispatching, Tri-vision traffic signs are used that can be operated via text messages from a mobile phone to guarantee a fast reaction. Another advantage of those traffic signs is that they can also be used in case of accidents or road works, not only in winter times.

Figure 4 – Mobile changeable message sign

Mobile changeable message signs with different possibilities of programmed displays are used to indicate that block dispatching for HGVs is in progress. In Bavaria one is placed in each direction a few kilometres in front of the stopping point (two in total). In Baden-Wuerttemberg one is placed after each motorway entry within the congestion area in front of the stopping point (three in total).

Attention should be paid to the operation of those signs. Problems occurred in Bavaria with the mobile phone operations. If there is heavy snow and the snow load is already too high, the mobile sign will not be able to unfold again. Therefore stationary changeable message signs are being considered to save time and employees. In Baden-Wuerttemberg the mobile changeable message signs are operated by remote-control. This means, someone has to pass all signs to activate them. In this case, the problem of a too high snow-load exists no longer, but someone amongst the employees has to be in charge of activating them.

Figure 5 – Traffic sign "In congestion: Keep entry and exit clear"

This traffic sign is only used in Baden-Wuerttemberg. It should indicate in the congestion area that exits and entries should be kept clear in case an accident happens and rescue teams have to enter the motorway.

To prevent road users from entering the motorway, the entries will also be closed at the beginning of the on-ramp.

5. PUBLIC RELATIONS

In both areas information for the road users was very important. Flyers in different languages were created and placed in motorway service areas. They explain the measures and how to behave when they are in progress. Figure 6 shows an example of one of the flyers. They also were created within the working group.
Press releases were published in October, just before the winter started. Also TMC-messages and radio announcements were created in case the measures were about to take place.
For the forthcoming year (winter 2009/2010) it is planned to include reports in transportation-related journals to reach the persons affected by the measure even better, i.e. mainly HGV drivers.

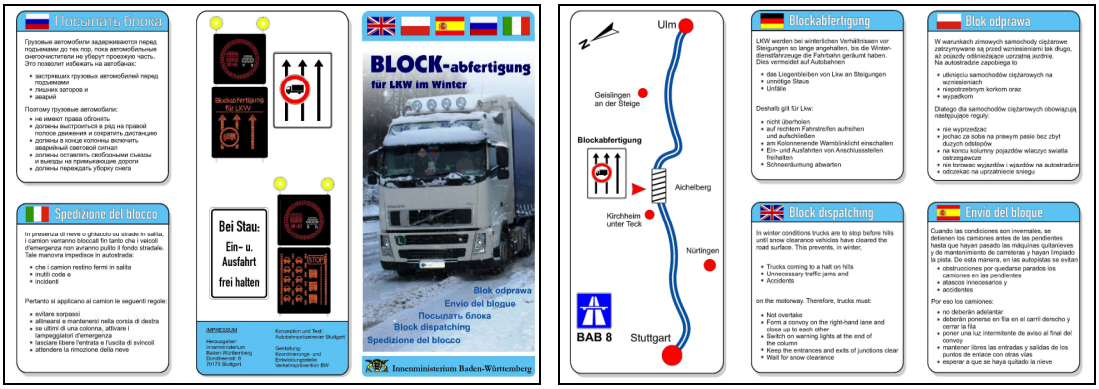

Figure 6 – Example of flyer for road user information

6. EXPERIENCE

In winter 2008/2009 there were some winter days with heavy snowfall, when the block dispatching scheme could have been carried out. Due to differences in the operation schedule, both areas approached the measure with different preparations and points of view.
The main difference was probably the scope of action, which is explained in the following.

In Baden-Wuerttemberg, the measures were considered as soon as the weather forecast predicted heavy snowfalls during the next days. In this case, the mobile changeable message signs were brought into position. The advantage of this approach is, that when the really heavy snowfall begins, the signs are already in the right place and ready for use. Also the equipment for closing the on-ramps in the congestion area was brought into position to lose as little time as possible when block dispatching is about to start. The HGVs are stopped by the highway police (at least during the pilot study).
In the preliminary state, the tri-vision traffic signs were already used to direct the HGVs into the right lane and to be better prepared for the measures. Experiences were positive regarding the behaviour of the HGV drivers. Also due to the radio announcements and the knowledge of heavy snow, they kept in lane.
To ease the situation on site, variable message signs on the A5 at the motorway interchange Walldorf inform HGV drivers about the situation on the A8 in Baden-Wuerttemberg and recommend them to use alternate routes, if they’re not as affected by snowfall as the original route.
Members of the auxiliary police were trained by the highway police to support them when the measures start, or if other unexpected situations like accidents occur. This helps the

highway police to cope better with the measures, as there will be enough staff available to handle possible additional, maybe unexpected, work.
The highway police and the highway surveillance centre are working together very closely. Only when both sides agree to carry out block dispatching, the measure will be performed.

In Bavaria, the past winter brought some changes in procedures. The highway surveillance centre and highway police collaborated here as well. As in Bavaria, snowfalls usually turn out to be much heavier than in other regions of Germany, all staff has to concentrate on carrying out winter maintenance. Therefore it was difficult at all times to place the changeable message signs. Also the question arose as to how to stop the HGVs. The method that members of the highway police stop the HGVs was found to be too dangerous. This brought up the idea to use stationary traffic lights.
There were some situations when block dispatching could have been used. However the problems mentioned above always led to the decision not to implement the measures as the inhibition threshold was too high to overcome.

7. CONCLUSION

It is not possible to say that the measures can be carried out always within the same framework. Due to the fact that basic conditions (like inclination, number of lanes, climatic area, traffic volume and percentage of HGVs, etc.) are changing, the measures have to be adjusted to every new situation. Even the experience of staff plays a big role: The definition of heavy snow or extreme winter weather conditions varies a lot in different regions.
In both areas, the measures were found to be effective and that it should be possible to prevent difficult situations like HGVs blocking the whole carriageway causing long congestion. However the past winter showed that there were still questions that should be considered during the next winter.
The measures will find a permanent place in the list of measures for supporting the highway surveillance centres and will be implemented in the forthcoming winter.

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