Harmonising European ITS Services

Traffic Management Services
HGV OVERTAKING BAN

Deployment Guideline

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The Deployment Guidelines have been developed in EasyWay, EIP and EIP+
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Trans-European Transport Network (TEN-T)

Support

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Preface (2016)

After the EasyWay project ended in 2012, the Deployment Guidelines have been updated by the EIP / EIP+ projects. They focussed on updating Best Practice and did neither have the capacity nor the intention for a full revision of the text, since especially the Member State adoption of the guidelines' requirements form a huge asset of European harmonisation. In the light of recent European Delegated Regulations, the EU EIP platform will now consider a full revision of the format and the content of the whole set of Deployment Guidelines.

Preamble (2012)

EasyWay is a cooperation of road authorities and road operators from 27 European countries that have teamed up to unlock the benefits of cooperation and harmonisation in the deployment of Intelligent Transport Systems (ITS) on Europe's major road network. ITS as a technology is a known contributor to sustainable mobility in terms of improved safety, efficiency and reduced environmental impact. Nevertheless, fragmented deployment on a national level will fail to deliver seamless European services and will not contribute to a coherent European Transport network. The European Member States have consequently launched the EasyWay project together with the European Commission as a platform to harmonise their ITS deployments.

This document has been drafted by EasyWay as part of the set of documents containing the 2012 version of the EasyWay Deployment Guidelines (DG 2012). These guidelines have been developed by EasyWay experts and practitioners. They have undergone a thorough review by international domain experts in an intense peer review exercise and they have been validated by the participating Member State Partners of EasyWay in an extensive formal Member State consultation process, which finally led to their adoption as basis for all deployment activities in future EasyWay phases.

EasyWay as a project is not a standardisation body, nor does it have any power to legally constrain the Member State in their national deployment activities. It is therefore crucial to understand that these documents are neither technical standards, nor are they specifications as they would be required for such cases, e.g. as currently developed by the European Commission as their part of the implementation of the ITS Directive 2010/40/EU. But since a certain level of strictness in compliance is required to achieve the intended goal of the EasyWay Deployment Guidelines – harmonisation and interoperability in Europe – the guideline documents are written in a way that clearly defines criteria that deployments have to fulfil in order to claim overall compliance with the guideline.

Although not legally binding in any sense, compliance may be required for the eligibility of deployments in future ITS road projects co-funded by the European Commission. Deviation from compliance requirements may nevertheless be unavoidable in some cases and well justified. It is therefore expected that compliance statements may contain an explanation that justifies deviation in such cases. This is known as the "comply or explain" principle.

Although not standards themselves, the EasyWay DG2012 Deployment Guidelines in some cases do mention – and sometimes require – the use of such standards. This is the case in particular regarding the use of the CEN/TS 16157 series of technical specifications for data exchange ("DATEX II"). Although standardised data exchange interfaces are a powerful tool towards harmonised services in Europe, it must be understood that real world deployments have to fit into existing – and sometimes extensive – infrastructures and investment in these infrastructures must be protected. It is therefore important to note that the use of DATEX II mentioned below as a MUST is referred to implementation of "new" data exchange systems and not the utilisation of the existing ones, unless these latter affect harmonisation of deployments or interoperability of services.

Service at a glance

SERVICE DEFINITION

An HGV Overtaking ban service means **to channel the heavy goods vehicles onto a single lane (slow lane).**

The heavy goods vehicles overtaking ban implementation is one of the traffic management measure allowing traffic managers and road operators to propose solution for a better fluidity of their network during peak periods. This traffic control measure constitutes one of the priority services to improve the cohabitation of heavy goods vehicles and private cars on networks with high levels of traffic.

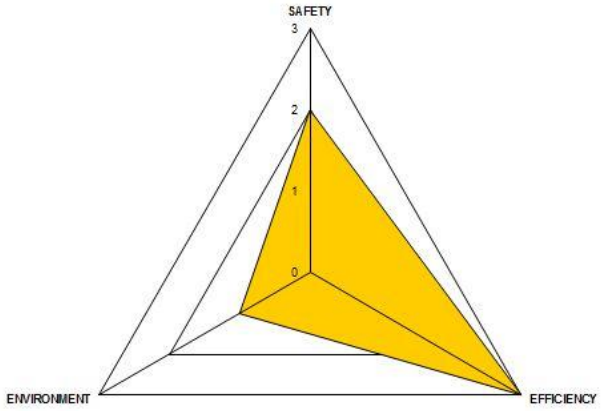
SERVICE OBJECTIVES

Objectives:

- Monitor and manage the HGV traffic flow onto the motorway network
- Improve journey times for light vehicles and safety by reducing vehicle queues caused by slow lorries overtaking
- Ensure a better acceptance of heavy goods vehicles by the other road users.

The service allows traffic managers and road operators to **support better fluidity on the network during peak periods.**

SERVICE BENEFIT RADAR



EUROPEAN DIMENSION

There are numerous aspects of HGV overtaking ban that differ from one installation to another across EasyWay regions. These include the location and frequency of VMS, type and number of detectors, control strategies, etc.

Harmonisation relating to HGV overtaking bans are focused on end user aspects (drivers) and operators:

- Pre-signing on the motorway access and service or rest areas exit
- VMS frequency along motorway sections
- Use of icons recommended by the Vienna Convention

Coherence with other dissemination tools, in particular with on board devices is ensured thanks to the use of DATEX II which guarantees:

- a solid dimension in terms of service standardisation and harmonisation,
- information exchange among traffic managers
- a wide dissemination thanks to the facilities for providing standardised DATEX II publications towards service providers

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List of abbreviations

CO	Carbon monoxide
CO2	Carbon dioxide
HGV	Heavy Good Vehicles
ICT	Information and Communications Infrastructure
ITS	Intelligent Transport Systems
LoS	Level of Service
NOx	Oxides of nitrogen
OE	Operating Environment
RDS TMC	Radio Data System Traffic Message Chanel
TERN	Trans European Road Network
VMS	Variable Message Sign
FR<#>	Functional requirement <number>
OR<#>	Organisational requirement <number>
TR<#>	Technical requirement <number>
CL&FR<#>	Look and feel requirement <number>
LoSR<#>	Level of service requirement<number>

1 Introduction

1.1 The concept of the EasyWay Deployment Guidelines

1.1.1 Preliminary note

This document is one of a set of documents for the EasyWay project, a project for Europe-wide ITS deployment on main TERN corridors undertaken by national road authorities and operators with associated partners including the automotive industry, telecom operators and public transport stakeholders. It sets clear targets, identifies the set of necessary European ITS services to deploy (Traveller Information, Traffic Management and Freight and Logistic Services) and is an efficient platform that allows the European mobility stakeholders to achieve a coordinated and combined deployment of these Pan-European services.

EasyWay started in 2007 and has since established a huge body of knowledge and a consensus for the harmonised deployment of these ITS services. This knowledge has been captured in documents providing guidance on service deployment - the EasyWay Deployment Guidelines.

The first iteration of the Deployment Guidelines mainly captured best practice. This strongly supported service deployment within EasyWay by:

- making EasyWay partners in deployment aware of experiences made in other European deployment programmes.
- helping to avoid making errors others had already made
- reducing risk and facilitating efficient deployment by highlighting important and critical issues to consider

Meanwhile, this best practice has already successfully contributed to ITS deployments across Europe. It is now possible to take the logical next step and actually start recommending those elements of service deployment that have proven their contribution to both the success of the local deployment, as well as the European added value of harmonised deployment for seamless and interoperable services.

1.1.2 Applying Deployment Guidelines – the “comply or explain” principle

The step from descriptive best practice towards clear recommendations is reflected in the document structure used for this generation of the Deployment Guidelines. Apart from introduction and the annexes that cover specific additional material, the Deployment Guidelines consist of two main sections:

Part A – this part covers the recommendations and requirements that are proven to contribute to successful deployment and have been agreed by the EasyWay partners as elements that should be part of all deployments of this particular service within the scope of EasyWay. Thus, the content of this section is prescriptive by nature. EasyWay partners are expected to ensure that their deployments are compliant with the specifications in this section. Wherever concrete circumstances in a project do not allow these recommendations to be followed fully, EasyWay partners are expected to provide a substantial explanation for the need for this deviation. This concept is known as the “comply or explain” principle.

Part B – this part offers an opportunity to provide more valuable but less prescriptive information. Supplementary information may be contained including – but not limited to – regional/national examples of deployment and business model aspects like stakeholder involvement or cost/benefit analysis results.

1.1.3 Use of Language in Part A

It is essential for every prescriptive document to provide specifications in a well-defined and unambiguous language. There are various definitions that clarify the use of particular words (such as those listed below) within their prescriptive texts.

For the purpose of the EasyWay Deployment Guidelines, the well-established provisions of the RFC 2119 (http://www.ietf.org/rfc/rfc2119.txt, see (1)) are used, which is used to specify the basic Internet standards:

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

An overview of the keywords, their meaning and the possible answers in the context of part A provides the following table. In general, the keywords in brackets are possible, but their use is not recommended in order to avoid confusion which may arise as a consequence of different common linguistic usage of the terms in the different EU member states.

Requirement wording	Meaning in RFC 2119	Meaning in EasyWay	Possible checklist answers
MUST (REQUIRED, SHALL)	the definition is an absolute requirement	there may exist insurmountable reasons to not fulfill (e.g. legal regulations…)	**fulfilled: yes** **or** **Fulfilled: no - explanation of insurmountable reasons**
MUST NOT (SHALL NOT)	the definition is an absolute prohibition		
SHOULD (RECOMMENDED)	there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.	The Definition is very close to a "MUST", "MUST NOT" Meaning in EasyWay conform to RFC 2119	**fulfilled: yes** **or** **Fulfilled: no - with explanation**
SHOULD NOT (NOT RECOMMENDED)	there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label		
MAY (OPTIONAL)	The item is truly optional. One deployment may choose to include the item because of particular local circumstances or because it is felt to deliver a special added value	Meaning in EasyWay conform to RFC 2119	**fulfilled: yes - with explanation** **or** **Fulfilled: no**

Table 1: Part A - requirement wording

Note: the capitalisation of these keywords that is frequently used in IT standards is not recommended for EasyWay Deployment Guidelines.

The use of this 'requirements language' allows the direct transfer of the requirements stated in part A to a compliance checklist.

The following paragraph gives an example for a functional requirement:

Functional requirement:

- **FR2:** Data and information collected by both automatically and non-technical sources must be based upon both a consistent geographic reference model and a time validity model, which both **must** be part of data description.

Beneath "Requirement" a new semantic element "Advice" is proposed for part A, which has not the character of a hard requirement but of a "recommendation" and hence must not be listed in the compliance checklist. "Advice" is not immediately related to the three pillars of ITS-service harmonization (Interoperability, Common look & feel, Quality criteria) but to "inner features" of an ITS-service. Nevertheless, such an element delivers a European added value and hence should be addressed by the deployment guidelines.

The notation for using the advice element in the text is as follows:

Organisational advice:

- Clear definitions of organisational aspects are a crucial precondition for the successful implementation of a "Forecast and real-time event information service" and should be documented and accepted of all involved parties/partners in form of a Common partner arrangement/MoU - Memorandum of understanding, which establishes the details of co-operation.

1.2 ITS-Service Profile

1.2.1 ITS-Service Strategy

1.2.1.1 General Service Description

During peak or congested periods on the main carriageway, HGV Overtaking may cause vehicles to break or change lanes, giving rise to higher occupancy and lower headways. This causes drivers to reduce their speed.

This speed reduction often causes following vehicles to brake, resulting in a propagation wave of slowing vehicles that travels back along the line of traffic on the main carriageway upstream where the HGV overtakes.

Traffic congestion on the network due to HGV overtaking with a low speed differential result in traffic slowdown in the middle and/or left lanes. The major impact is a decreased capacity of the network.

Additionally, during peak periods when congestion is increased there may also be a higher risk of accidents.

The HGV overtaking ban service is implemented through the deployment of ban signals on the main carriageway. This service intends to organize flow of heavy goods vehicles on the motorway network by channelling them onto a single lane (slow lane) in order to improve the traffic flow conditions.

1.2.1.2 What is the Vision?

Public opinion considers that heavy goods vehicles are dangerous and disturb the traffic when overtaking. This fact requires research for means to improve journey times and safety by reducing vehicle queues caused by slow lorries overtaking while ensuring a better acceptance of heavy goods vehicles by the other road users.

Heavy goods vehicles overtaking ban implementation on long distances (several kilometres) is a traffic management measure enabling traffic managers and road operators to propose solutions for a better fluidity of their network during peak periods. This measure constitutes one of the priority services to improve cohabitation between heavy goods vehicles and private car drivers on high traffic networks.

The overtaking ban is implemented during periods where the network capacity reaches its saturation point or when trucks are too numerous. According to the context and objectives, the deployment of overtaking ban can be managed in static way (the overtaking can be permanent or intermittent) or in dynamic way.

Permanent overtaking ban: the oldest and more frequent. It is signalled by a fixed road sign which can be completed by a sign specifying the tonnage of the concerned vehicle (without additional sign ban concerns HGV> 3.5t.).	
Intermittent overtaking ban: additional information related to the applicable ban hours (or specific day, i.e., working day) transforms this permanent ban to an intermittent one	
Dynamic overtaking ban: information is transmitted to HGV drivers through Variable Messages Signs (VMS). The system requires data collection and analysis of traffic condition tools to activate the measure in accordance with the thresholds (i.e., flow or percentage of HGVs). The overtaking ban can be managed in real time or during planned peak traffic periods.	

Recommendations and requirements presented in Part A of this Guideline mainly concern the dynamic overtaking ban service.

An HGV overtaking ban can be deployed on 2 and 3 lane (or more) highways. Nevertheless, due to national regulations, such a service is only allowed on 2 lane highways in some countries (Netherlands for example).

The deployment of an HGV overtaking ban is generally assessed against the following parameters:

- network typology (number of entrances and exits, slopes, etc.),
- percentage of HGVs,
- number of HGVs,
- traffic flow,
- period (in some countries no ban is issued during the weekend)

1.2.1.3 What is the Mission?

The deployed HGV overtaking ban intends to:

- Monitor and manage the HGV traffic flow onto the motorway network,
- Improve journey duration and safety for personal vehicles by reducing queues caused by slow lorries overtaking,
- Ensure a better acceptance of heavy goods vehicles by other road users.

1.2.1.4 EasyWay harmonization focus

The main focus of this EasyWay Deployment Guideline stands in displaying dynamic an HGV overtaking ban service on Variable Message Signs (VMS). These VMS should be operated along the route in a harmonized European way.

A mid-term focus is to ensure coherent information coordination with other devices when the service is activated. This means that the on-trip Internet and navigation information services managed by service operators must be able to display the same information displayed by road operators on VMS support.

1.2.1.5 Distinctiveness from other ITS-services

Relevant information for this service is:

- Status of traffic conditions on the network (percentage-number of HGVs, traffic flow, period)

Relevant complementary information, which is not the content of this Deployment Guideline and will be covered by other DGs, is:

- Pre-trip and on-trip information services which may be used to inform on-trip or pre-trip users about the current operational status of the HGV overtaking ban (see TIS DG01-DG02).
- Recommendations about VMS use (see VMS DG01-DG02).
- Information provision should be coordinated with traffic management plans (TMP, see TMS-DG07) operated by road authorities or traffic management centres.
- In practice, an HGV overtaking ban is often an integrated part in a larger traffic management system:
  - Hard shoulder running
  - Dynamic lane management
  - Variable speed limit
  - Dynamic incident warning

1.2.2 Contribution to EasyWay Objectives

1.2.2.1 Service radar

HGV overtaking ban evaluation objectives, methodologies and methods of data collection differ from country to country. The figure below sketches the relationship between HGV overtaking ban and the EasyWay objectives. Network efficiency and safety are the main benefits of the service.

The graph below provides a quantification of the service added value regarding the three main objectives of EasyWay which are: safety, efficiency and environment.

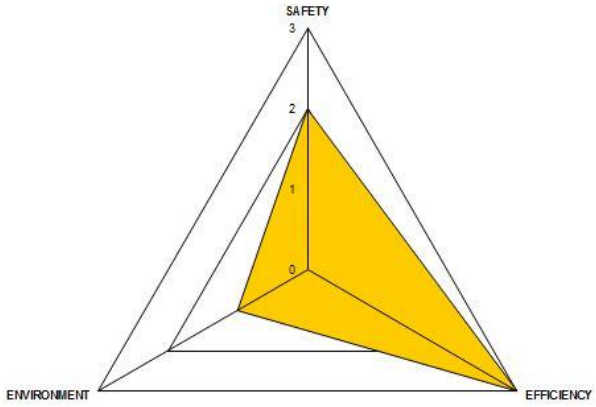


Figure 1: Service radar "HGV Overtaking ban"

Note: the applied scales for the service radars are based on expert view and not on specific scientific analysis

1.2.2.2 Safety

The previous deployments of HGV overtaking bans have demonstrated safety improvement. This is particularly accurate on sections where the percentage of accidents due to a high level of lorry traffic is high.

One additional major impact of this measure concerns the psychological comfort brought to car drivers. Investigations in some countries show that dynamic overtaking bans for HGVs (concentrated on peak hours) provide considerably better results than static overtaking bans for HGVs.

1.2.2.3 Environmental impact

Improved network efficiency and network management help to reduce vehicles' emissions. Following the French experimentation of this service on ASF network during summer 2007 peak traffic periods a decrease of polluting emissions was recorded (-500 tons of CO2) due to the congestion drop (-7%).

1.2.2.4 Network efficiency

An HGV overtaking ban positively impacts the network in terms of efficiency. The existing deployments and evaluations show:

- A speed homogenisation on each lane,
- An average speed increase on each lane in the case of light traffic (< 2000 veh/h for 2 lanes),
- An increase of light vehicle speed in the case of heavy traffic (> 2000/h for 2 lanes),
- A decrease of traffic jams during peak traffic periods.

The service contributes to optimise the use of the network, especially on sections where the percentage of HGV traffic superior to 10%. This potentially concerns a substantial part of the TEN-T Road Network.

1.2.3 Current status of deployment

Many trials and deployments of this service have been achieved over Europe. Evaluations have been conducted for some deployments and experimentations. The main results and effects of the HGV overtaking ban evaluations conducted in Europe are presented in Part B of this guideline.

The different trials provide results which underline the main advantages or disadvantages of this traffic management service implementation from a user point of view as well as from the road traffic manager perspective.

1.2.4 European Dimension

There are numerous aspects of HGV overtaking ban that differ from one installation to another across EasyWay regions. In the current practice there are still many differences in thresholds, considered vehicles, VMS-use and information approaches. Harmonisation relating to HGV overtaking bans should be focused on end-user aspects, ensuring road users across Europe encounter similar conditions when driving on the TERN network. This includes:

- Pre-signing on the motorway access and service or rest areas exit – see 2.5 Common Look and Feel
- VMS– see 2.5 Common Look and Feel
- Use of icons recommended by the Vienna Convention exit – see 2.5 Common Look and Feel

In a mid-term perspective coherence with on board devices and online information must be ensured. Therefore, a dynamic HGV Overtaking ban service should be displayed real time on-board (navigation systems, smartphones) when activated. For this purpose, the use of DATEX II guarantees:

- A solid standardisation and harmonisation basis,
- Information exchange between traffic managers,
- Large dissemination thanks to standardised DATEX II publications for service providers.

Note: due to legal restrictions, HGV overtaking ban signs integrated in Variable Messages Signs are only considered as advice for following bans in certain countries.

2 Part A: Harmonization Requirements

2.1 Service Definition

An HGV Overtaking ban service means to channel the heavy goods vehicles in a single lane (slow lane). This measure improves the traffic flow conditions by reducing vehicle queues caused by slow HGV overtaking. It also contributes to ensuring a better acceptance of heavy goods vehicles by the other road users.

The heavy goods vehicles overtaking ban implementation is one of the traffic management measures allowing traffic managers and road operators to propose solutions for a better fluidity of their network during peak periods. This traffic control measure constitutes one of the priority services to improve the cohabitation of heavy goods vehicles and private cars on networks with high traffic levels.

2.2 Functional Requirements

2.2.1 Functional architecture

The following table and diagrams show the typical functional and information architecture of the HGV Overtaking ban service.

Functional requirement:

FR1: it is recommended to prepare HGV Overtaking ban service implementation with an easy functional decomposition. The proposed seven sub functions **may** be followed when implementing the service.

A0	Prepare the HGV Overtaking ban implementation
A1	Collect and analyse data transmitted from monitoring systems
A2	Decide the relevant HGV Overtaking ban implementation strategy to apply
A3	Inform partners and users about implementation
A4	Make the users aware of the measure and enforce the implementation
A5	Track the decision for assessment use
A6	Evaluate and assess, measure the impacts in order to provide recommendation and improvement

Table 2: sub-functions

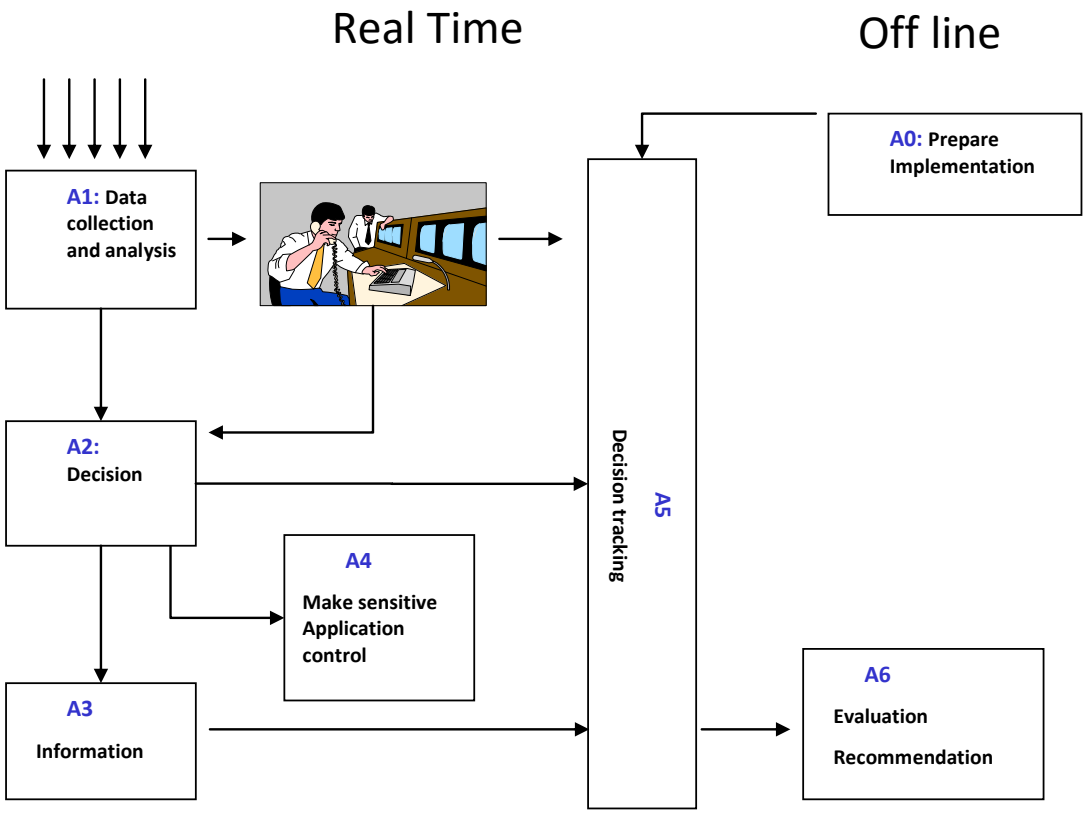


Figure 2: functional architecture

2.2.2 Functional decomposition[1] and interfaces

Sub-function A1 "Data collection and analysis"

The devices and methodologies for traffic data collection are not covered by this guideline. They depend, among other things, on the particular data collection system used and are left to the operator to select.

Functional requirement:

- **FR2:** for the dynamic service it is recommended that the data collection system **may** be able to detect real time vehicle flow, speed and HGV%.

[1]The ITS service is "distributed" over more than one administration (cross-border, cross-regional) for operation, i.e. different road operators and other parties are involved, providing "logical sub-functions". Between the distributed functions interoperability must be guaranteed by properly specified interfaces.

2.3 Organisational Requirements

Depending on the traffic conditions and periods:

- Improve network fluidity,
- Improve safety,
- Improve user comfort.

Whatever the initial objectives, the anticipated benefits of the service rely on stakeholders' involvement for its implementation and road users' acceptance on the network.

Organisational Architecture

Figure 3: organisational architecture

Organisational requirement:

- **OR1:** the organisational and operational structure of the service, as well as the role of each organisation/body and its tasks, **must** be defined.

Organisational advice:

The service implementation requires the involvement of various organisations which are in charge of the following general roles:

- **Road authorities:**

For the HGV overtaking ban the subsidiarity principle applies, i.e. Member States decide for themselves whether and how a truck overtaking ban is applied. The road authorities are responsible for the decision and the deployment of the service. They have to conduct preliminary studies:

  - Launch a detailed traffic study in order to define exactly the area where the service will be implemented,
  - Identify the level of accidents on the network (with regard to HGV involvement),
  - Identify the existing collection systems, control systems and information systems,
  - Identify the existing HGV ban regulations and constraints regulation for implementing the service.
  - Select the sections where the ban will be implemented,
  - Validate the thresholds for the strategy activation (permanent, intermittent, dynamic),
  - Study and estimate the necessary additional equipment and systems to install,
  - Plan the organisational and technical aspects of the evaluation,
  - Involve partners,
  - Communication actions,
  - Establish the administrative and regulation procedures before installing such a ban on the network.

- **Road operators**

Following decision taken by the road authorities they are mainly responsible to:

  - conduct the relevant studies,
  - implement the technical equipment and systems,
  - record data for evaluation purposes,
  - inform partners when the ban is operated (especially Police) in the case of dynamic bans,
  - inform service operators when the ban is operated.

Organisational requirement:

- **OR2:** In the case where road operators have to exchange data requiring interoperability between two or more different organisations[2], they **must** enable their system to use DATEX II".

Organisational advice:

- **Law and order forces**

Police are mainly responsible for HGV overtaking ban enforcement. In the case of permanent or intermittent bans they can plan enforcement actions of their own.

Nevertheless, dynamic ban implementation requires specific information actions from the Road operators: the ban is only operational when thresholds for strategy activation are reached. In the case of enforcement implementation, Police patrols need to be informed by road operators in real time in order to plan intervention. Enforcement may concern different types of control:

  - HGV overtaking ban compliance
  - Speed compliance
  - Inter-vehicle distance respect (mainly for HGV)

- **HGV representatives**

Positive impacts of the service result from respect of the ban by HGV drivers. Such a measure requires coherent communication actions towards HGV representatives. In the case of dynamic bans, road operators manage real time on-trip information through VMS. It is important to stress to HGV operators and drivers the benefits of accident savings and the very small increase to journey times for HGVs.

HGV representatives have to be engaged as soon as possible in the ban process so that they can facilitate information transfer to their HGV members.

- **Media**

Operators inform users of the existence of the measure, along with its interest and objectives, in order to increase respect for it in the future.

- **Services operators and on board navigation systems**

These operators need to be aware of the measure to integrate it in the pre-trip or real time services they manage. This implies that road operators make dynamic information available through a relevant interface providing, for instance, real time DATEX II publications.

Permanent bans may be integrated as restrictions in the navigation systems. Dynamic bans must be disseminated to on board units through real time services using DATEX II interfaces.

Organisational requirement:

- **OR3:** Along the same line of OR2 (In the case that road operators have to exchange data requiring interoperability between two or more different organisations, they **must** enable their system to use DATEX II).

  Services operators **must** be able to integrate the DATEX II publications provided by the road operators when they publish the ban information measure.

[2] In the TIS context, 'organisations' mean Traffic and Traveller Data providers and Service providers.

2.4 Technical Requirements

2.4.1 ICT Infrastructure requirements

Static overtaking ban deployment does not require specific ITS infrastructure. Deployment of dynamic systems can make use of ICT infrastructures developed for other ITS services. For this dynamic service the required infrastructures are:

Data collection

Technical advice:

- Traffic counting stations

Traffic counting stations constitute the essential data collection entry for the functioning of this traffic management measure. Precision and quality of measures are essential for the ability to react as well as for the response time of the HGV overtaking ban, which has been determined according to flow level or HGV percentage.

Technical requirements:

- **TR1:** the data collection system **may** be able to detect in real time the following parameters: vehicle flow, speed and HGV%.
- **TR2:** the data collection system **may** be installed:
  - before the ban (at least one counting point)
  - along the ban (at least one counting point between each entry / exit of the motorway network)
- **TR3:** After the ban area a station to collect journey time information for the evaluation purposes **may** be implemented.

Technical advice:

- Video surveillance

Video surveillance may be of interest to traffic managers in order to assess the measure on vehicles inter-distance (implementation of chevron road markings can be used to improve vehicle spacing) and potential difficulties related to the exit of personal vehicles.

- Control system

The system may be adapted to the characteristics of the road section as well as to the existing computerised systems and the current equipment. Two solutions are relevant:

  - An autonomous analysis system, recommended when all equipment systems are dedicated to the measure or in transitory phase for experimentation.
  - An integrated solution which is generally better because it offers the possibility to interact with other traffic management measures and equipment

- Information

It is quite important to largely inform users of the activation of the measure. Two main objectives for the information:

  - Acquaint the users with the existence of the measure, with its interest and objectives in order to ensure compliance
  - Inform users in real time trough VMS, dedicated road traffic radio, on board devices, ...

Regarding the timing and area, the following table presents the different information means which may be used:

LOCATION	VMS (DYNAMIC SERVICE)	FIX ROAD SIGN	IN VEHICLE (RDS-TMC FOR EXAMPLE)	RADIOS	INTERNET
Before departure				X	X
Before the measure area	X	X		X	
In the measure area	X	X	X	X	
In exit area	X	X		X	
At the motorway access	X	X	X	X	

Table 3: possible information means

2.4.2 Standards and Agreements: Existing and Required

Standards concern the technical equipment (traffic stations / Video / VMS...).

Technical requirement:

- **TR4:** The display of signs/pictograms on VMS or other end-user devices **should** be in accordance with prevailing national road codes and where applicable in line with the requirements of the EW-DG for Variable Message Signs Harmonisation VMS-DG01:
  - MS which ratified the 1968 Convention MUST respect the 1968 Convention and SHOULD consider the Consolidated Resolution on Road Signs and Signals (R.E.2);
  - MS which did sign but not ratify the 1968 Convention SHOULD follow the 1968 Convention and also consider the R.E.2.

Technical advice:

- Equipment which needs to be installed must be compatible with the Traffic Control Centre. This compatibility will ensure the interoperability of systems and will allow the possibility to use the dedicated HGV overtaking ban's equipment for another types of traffic management actions if needed.

2.4.3 DATEX II Profile

One of the major deliverables of the DATEX II specifications is to offer a toolbox for applying one of the most common IT technologies for data definition: The Unified Modelling Language (UML, ISO/IEC 19501:2005).

The use of DATEX II is required for the service implementation. Providing formal data definition for all implementations ensures technical interoperability (i.e. "Plug & Play"). Interfaces generated from the same data definition ensure that road operators have the ability to exchange and process data.

This integration of the DATEX II profile in the DG provides a solid dimension in terms of service standardisation and harmonisation. It also guarantees information exchange between traffic managers and a wide dissemination of traffic information and traffic management services thanks to standardised DATEX II publications.

An HGV overtaking ban is characterised by the following elements:

- Location of the ban
- Length affected by the measure
- Type of vehicle concerned by the ban

Technical requirement:

- **TR5**: According to the OR2 requirement (In the case road operators have to exchange data requiring interoperability between two or more different organisations, they **must** enable their system to use DATEX II) elements of the overtaking ban **must** be described in the DATEX II Model as follows:

Location

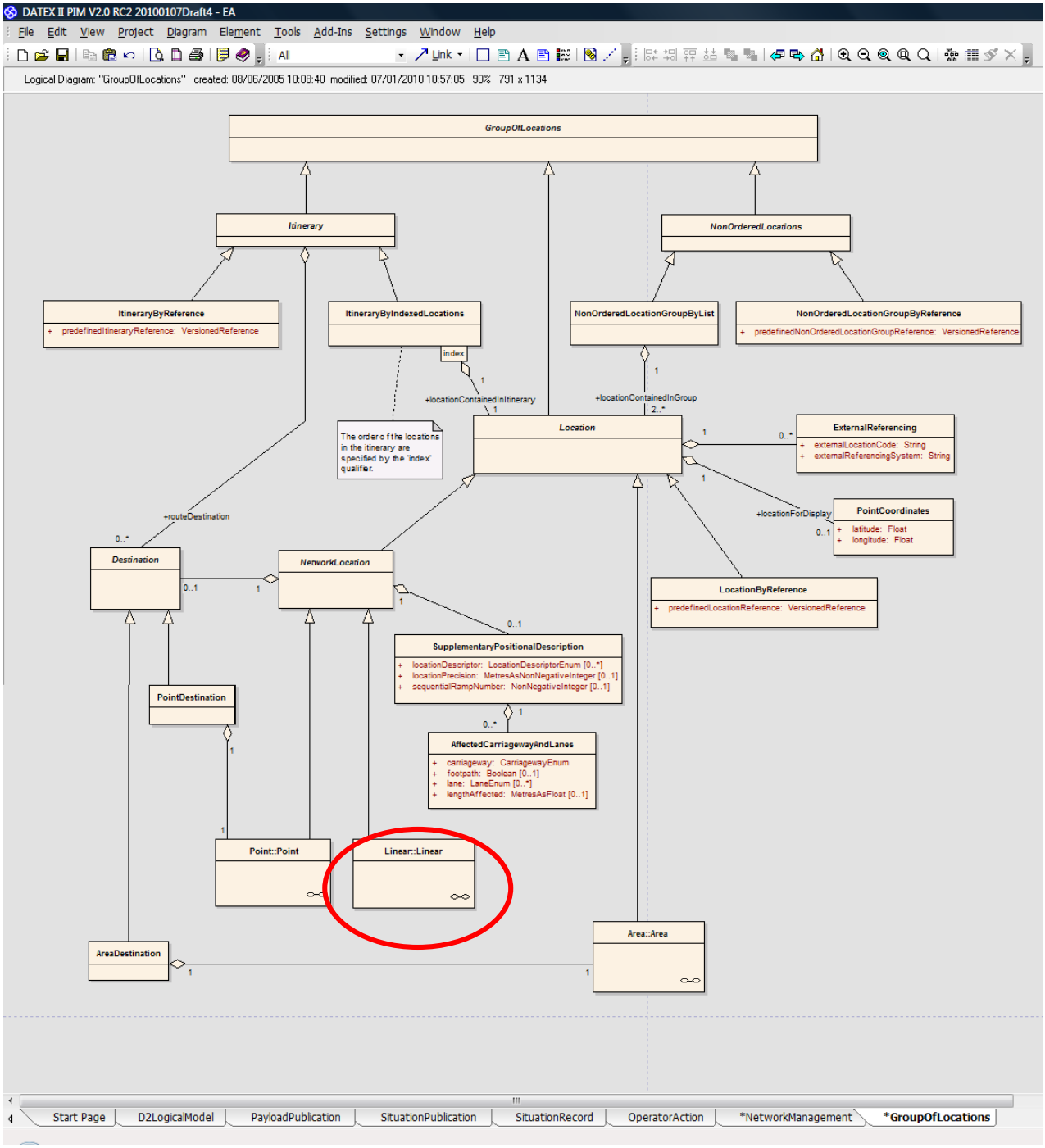


Figure 4: location DATEX II Profile

The DATEX II model offers various possibilities for describing location. Location referencing can be restricted to linear locations. The **SupplementaryPositionalDescription** feature is needed to specify the length of the ban.

Length

Description of the Overtaking length ban has to be specified with the attribute **lengthAffected** and defined in metres.

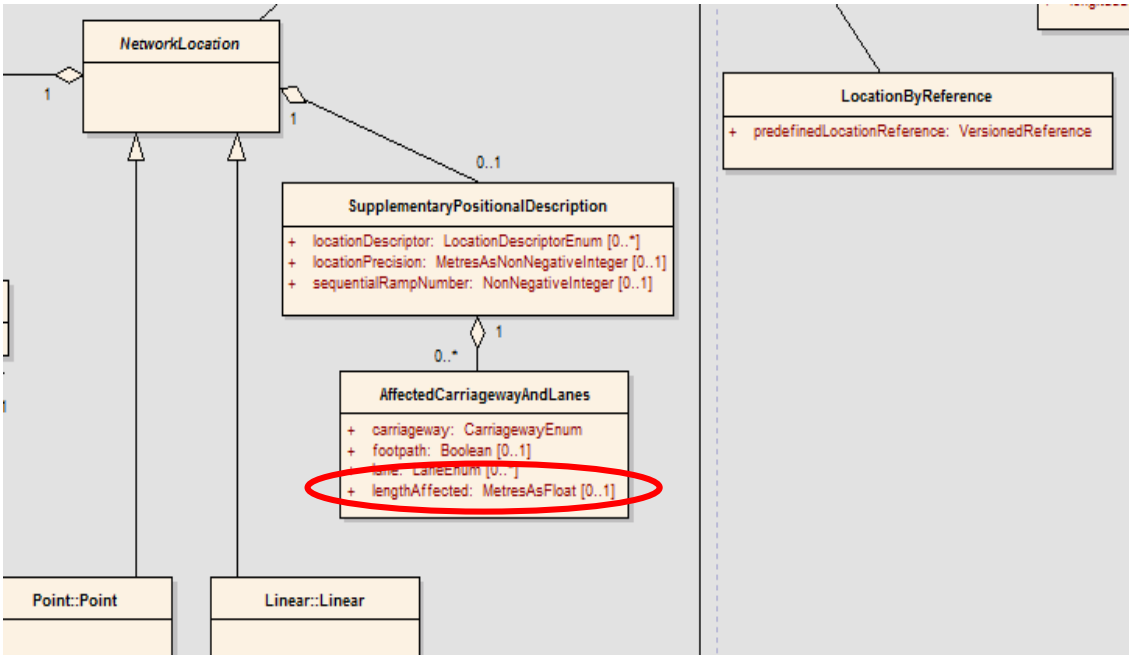


Figure 5: length DATEX II Profile

Type of vehicle

The restriction of measures for particular types of vehicles needs to be described in the **VehicleCharacteristics** class. Select lorry in the **VehicleTypeEnum** of this class. Tonnage of the concerned vehicles must be specified in GrossWeightCharacteristic

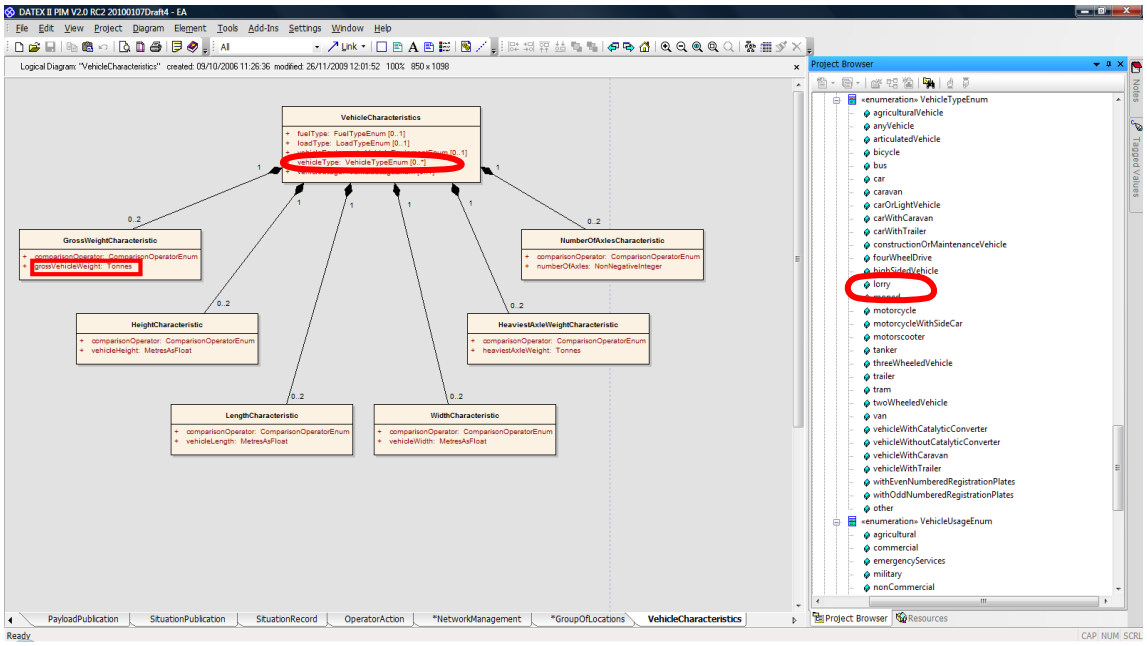


Figure 6: vehicle DATEX II Profile

Overtaking ban

The mapping of information related to overtaking bans into the DATEX II level A is easy. DATEX II has a dedicated class for this type of information called **GeneralNetworkManagement**. In this class, select the attribute **noOvertaking** in the **generalNetworkManagementTypeEnum**.

Important: this class is a specialisation of the SituationRecord class, hence the information regarding Overtaking bans shall be published via a SituationPublication for any dissemination of the information.

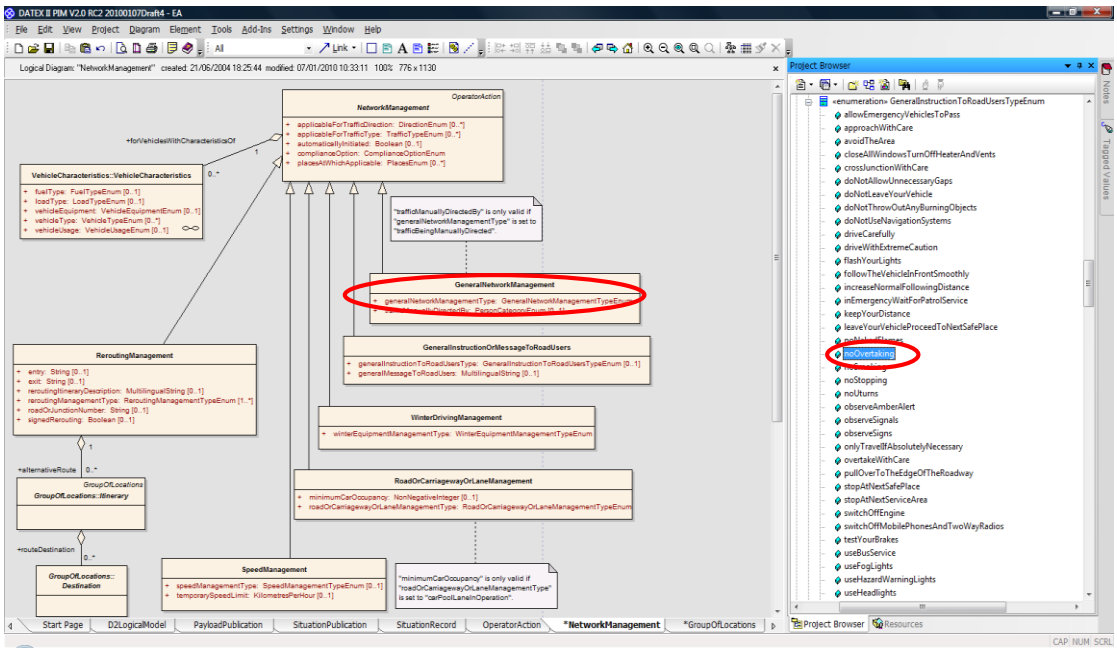


Figure 7: Overtaking ban DATEX II Profile

2.5 Common Look & Feel

2.5.1 Length of the ban section

Some evaluation results showed that for a better acceptance of the service, the ban should be implemented on sections from 5 to 20 km long. Above this distance, HGV drivers tend not respect the ban. One observes that it depends on the drivers' cultural approach, which can vary from one country to another. For instance, in Netherlands, the ban is applied on longer sections with a good level of truck drivers' respect.

Common Look & Feel requirement:

- **CL&FR1:** A wide area deployment of this service **may** limit the length of the ban to 20 km on a section

The following figure summarises this recommendation:

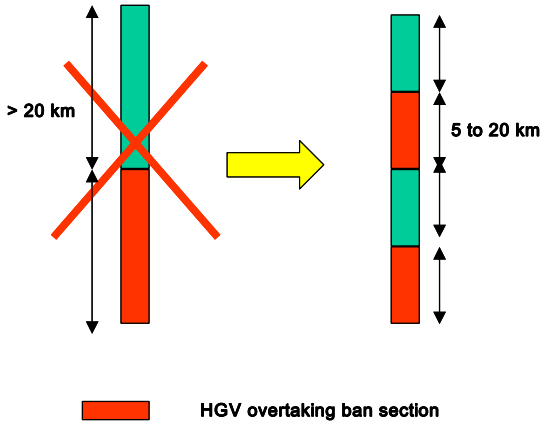


Figure 8: length of ban configuration

2.5.2 VMS Information signalisation

Important note: all requirements presented in this chapter need to be considered with the following reserve: For the use of VMS, in accordance with prevailing national road codes and in line with the requirements of the EW VMS Guideline part 1 and 2:

- MS who ratified the 1968 Convention MUST respect the 1968 Convention and SHOULD consider the Consolidated Resolution on Road Signs and Signals (R.E.2)
- MS who did not ratify the 1968 Convention SHOULD follow the 1968 Convention and also consider the R.E.2

2.5.2.1 Beginning of the ban VMS

Common Look & Feel requirement:

- **CL&FR2:** The dynamic HGV overtaking ban **must** require the use of VMS display. The icon is the **C, 13ba** panel

Figure 9: C, 13ba panel

In the instance that the HGV ban is implemented for specific categories of lorries (> 12 Tonnes for example), in addition to the use of the C 13ba panel (which corresponds to a ban for HGV > 3.5 t.), it is strongly recommended to clearly specify the type of vehicles concerned by the ban.

Common Look & Feel requirement:

- **CL&FR3:** In the case that the HGV ban is implemented for specific categories of lorries (> 12 Tonnes for example), the C 13ba panel **must** be completed with an additional panel type **H,1** which will specify the tonnage of HGV concerned (without tonnage precision the ban applies for HGV > 3.5t)

Figure 10: H,1 panel

Example of overtaking ban for HGV > 12 tonnes:

Figure 11: HGV Ban panel for 12t

When buses, caravans or vehicles with trailers are concerned by the ban measure the additional panel type **H,5** should be used. However, dedicated icons for buses, caravans or trailers need to be studied with ESG4 “Mare Nostrum”.

Figure 12: H5 panel

2.5.2.2 End of the ban VMS

Common Look & Feel requirement:

- **CL&FR4:** the end of the dynamic ban section **must** be signalled, when this end is provided with VMS. The panel to be used is the **XC17 d** panel:

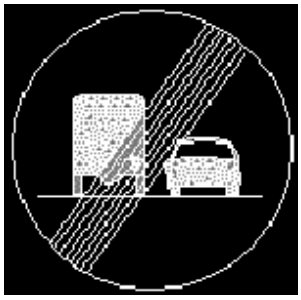


Figure 13: XC17 d panel

2.5.3 Location of the signalisation

On the motorway section

Common Look & Feel requirement:

- **CL&FR5** In order to remind drivers of the dynamic ban when driving, VMS **should** be installed no more than 10km apart.

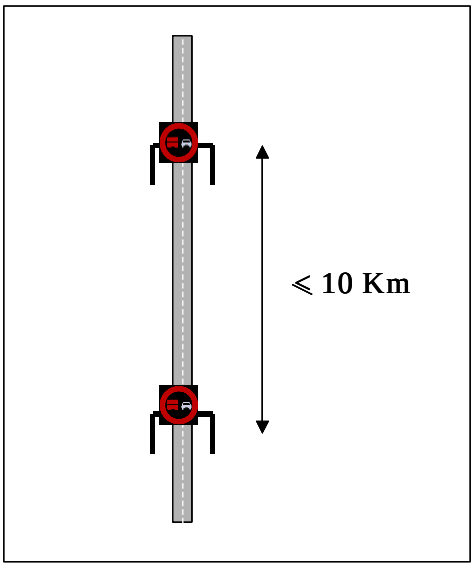


Figure 14: VMS Configuration A

At the motorway entrance

Common Look & Feel requirements:

- **CL&FR6:** For the dynamic overtaking ban, a VMS **should** be installed on the motorway section just after the entrance.
- **CL&FR7:** Additional dynamic information using VMS **may** also be installed on the motorway access

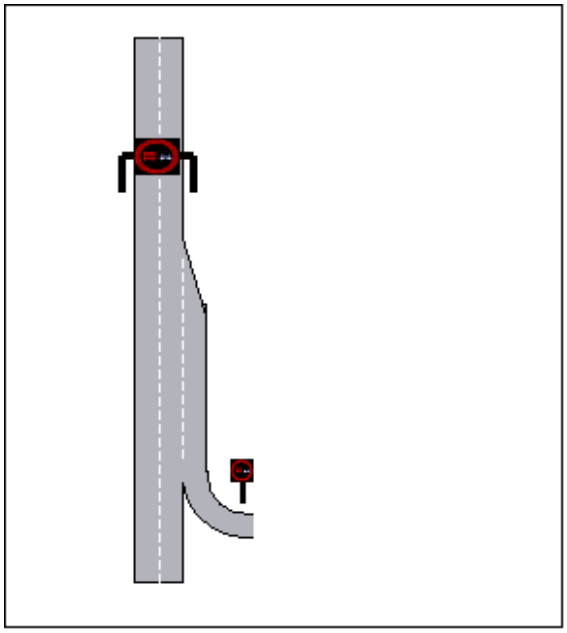


Figure 15: VMS Configuration B

At the exit of rest and service areas

Users stopped on rest and services areas must be informed when restarting their trip. A ban-activation could occur while drivers are taking a rest and they need to be informed when leaving service areas.

Common Look & Feel requirement:

- **CL&FR8**: a VMS **should** be installed on the motorway section after the exit (in order to minimise the number of VMS to install the localisation of this VMS can be combined with the CL&FR5 requirement).
- **CL&FR9:** Additional dynamic information using VMS **may** also be installed at the exit of the rest and service areas.

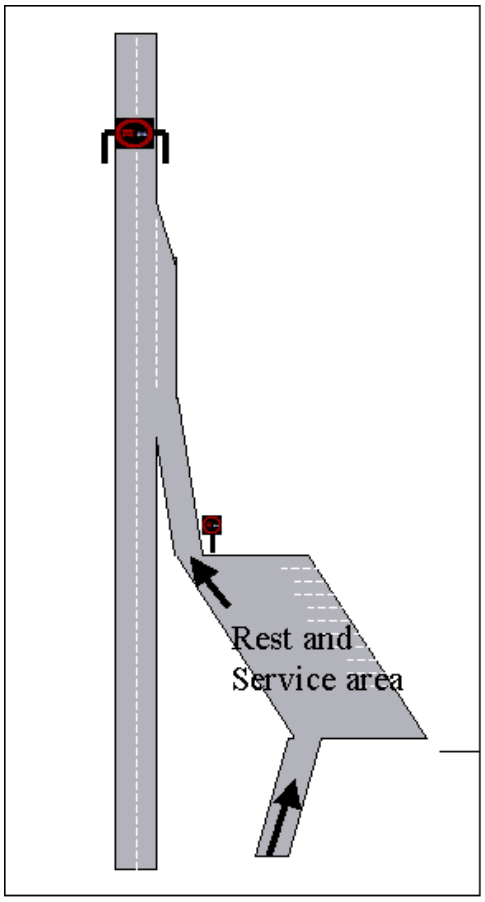


Figure 16: VMS Configuration C

2.6 Level of Service Definition

2.6.1 Preliminary remark

The scope of EasyWay is to provide Core European Services to the European road users. These services are harmonized in content and functionality, but also in their availability: The road users shall be able to expect certain services to be offered in a specific road environment. In order to provide a basis for the harmonization process EasyWay needs a tool to define such environments in an agreed manner. This tool is the Operating Environments – a set of pre-defined road environments combining physical layout of the road and network typology with traffic characteristics.

In essence, EasyWay has agreed on a set of 18 pre-defined Operating Environments (OE) where each OE is a combination of three criteria:

- Physical characteristics – Motorways, other 3/4 lane roads or 2-lane roads
- Network typology – Corridor, Network, Link or Critical spot
- Traffic characteristics – Traffic flow and road safety situations (with optional additions)

For more information and details, visit https://dg.its-platform.eu .

2.6.2 Level of Service Criteria

Depending on the operational environment and the local context, the HGV overtaking ban service can be deployed according to 3 levels of service. These levels are defined as such:

Levels of Service table: HGV overtaking ban			
Core Criteria	**A**	**B**	**C**
Monitoring	Manually on site	Semi-automatic	Automatic through loops, sensors and/or cameras
Overtaking area signing	Fixed (permanent or intermittent service)	Prism or VMS (Dynamic service)	VMS (Dynamic service)
Activation and de-activation **(decision and action)**	Manual	Manual and remote controlled	Manual, based on decision support systems and remote controlled

Table 4: Level of Service

2.6.3 Level of Service Criteria related to Operating Environment

Level of Service requirement:

- **LoSR1:** The Level of Service to Operating Environment mapping table does not imply any obligation to deploy ITS services. However, if services are deployed they **should** comply with the table. These requirements apply only to deployments to be carried out by EW or its successor process in 2013 or later on the OE in question. Given that pre-deployment surveys / evaluations provide the necessary evidence to proceed with the deployment, the minimum and optimum LoS **should** respect the Level of Service to Operating Environment mapping table.

ELEMENT OF HGV OVERTAKING BAN			EasyWay OPERATING ENVIRONMENT																
Criteria for the Levels of Service [reference TMS - DG06]			C1	T1	T2	T3	T4	R1	R2	R3	R4	R5	R6	R7	R8	S1	S2	N1	N2	P1
activation and de-activation	C	Manual, based on decision support systems and remote controlled	O			O	O									O	O			
	B	Manual and remote controlled																O	O	O
	A	manual	M		OM	M	M						OM	OM	OM	M	M	M	M	M
	/	*Service non applicable*		NA				NA	NA	NA	NA	NA								
Overtaking area signing	C	VMS (dynamic service)														O	O			
	B	Prism or VMS (dynamic service)	O		O	O	O						O	O	O			O	O	O
	A	Fixed (permanent or intermittent service)	M		M	M	M						M	M	M	M	M	M	M	M
	/	*Service non applicable*		NA				NA	NA	NA	NA	NA								
Monitoring	C	Automatic via cameras, loops, sensors														O	O			
	B	Semi-automatic	O		O	O	O						O	O	O			O	O	O
	A	Manually on site	M		M	M	M						M	M	M	M	M	M	M	M
	/	*Service non applicable*		NA				NA	NA	NA	NA	NA								

Recommendations for LoS per OE:				
	M	Minimum LoS recommended	O	Optimum LoS recommended
	OM	Minimum = Optimum	NA	Non applicable

Table 5: Level of Service to Operating Environment mapping table

The Operating Environment classification of the TERN Network depends on the category of roads and the level of traffic or safety problems they are faced with. The following table synthesises the different Operating Environment classifications.

OE	Explanation
C1	critical spots, local flow-related traffic impact and/or potential safety concerns
T1	motorway (link), no flow-related traffic impact and no major safety concerns
T2	motorway (link), no flow-related traffic impact, potential safety concerns
T3	motorway (link), seasonal or daily flow-related traffic impact, no major safety concerns
T4	motorway (link), seasonal or daily flow-related traffic impact, potential safety concerns
R1	two-lane road (link), no flow-related traffic impact, no major safety concerns
R2	two-lane road (link), no flow-related traffic impact, potential safety concerns
R3	two-lane road (link), seasonal or daily flow-related traffic impact, no major safety concerns
R4	two-lane road (link), seasonal or daily flow-related traffic impact, potential safety concerns
R5	three-/four-lane road (link), no flow related traffic impact, no major safety concerns
R6	three-/four-lane road (link), no flow related traffic impact, potential safety concerns
R7	three-/four-lane road (link), seasonal or daily flow related traffic impact, no major safety concerns
R8	three-/four-lane road (link), seasonal or daily flow related traffic impact, potential safety concerns
S1	motorway corridor or network, at most seasonal flow-related impact, possibly safety concerns
S2	motorway corridor or network, daily flow-related traffic impact, possibly safety concerns
N1	road corridor or network, at most seasonal flow-related traffic impact, possibly safety concerns
N2	road corridor or network, daily flow-related traffic impact, possibly safety concerns
P1	peri-urban motorway or road interfacing urban environment, possibly safety concerns

OE type	Number	Flow-related traffic impact				Potential safety concerns	
		NO	SEASONAL	DAILY		NO	YES
Critical spots							
C	1		X	X	and/or		X
Motorway links							
T	1	X			and	X	
	2	X			and		X
	3		X	X	and	X	
	4		X	X	and		X
Road links							
R 2 lanes	1	X			and	X	
	2	X			and		X
	3		X	X	and	X	
	4		X	X	and		X
R 3 or 4 lanes	5	X			and	X	
	6	X			and		X
	7		X	X	and	X	
	8		X	X	and		X
Motorway corridor or network							
S	1		X		and		(X)
	2			X	and		(X)
Road corridor or network							
N	1		X		and		(X)
	2			X	and		(X)
Peri-urban motorway or road							
P	1				and		(X)

Table 6: Legend - EasyWay Operating Environments for Core European ITS Services

3 Part B: Supplementary Information

The EasyWay Deployment Guidelines contain two main elements:

- *Part A elaborates on the content of the ITS service addressed, describing the entire deployment framework including Requirements and Levels of Services.*
- *Part B is an appendix of informative content. Its objective is to illustrate part A with examples and feedback from deployments in the field.*

Part B is a lively chapter – in contrast to Part A, which by nature should be stable for a certain time – and subject to continuous development and update. The focus of Part B lies on national practices and experiences which, as cross-fertilisation material, can benefit any road operator in Europe and which are documented in Chapter "3.1 Best Practice" consisting of two main sections:

Examples of deployment 2010 - 2012

This section consists of contributions delivered by those EasyWay-Partners that have actively participated in the development and editing of the EW Deployment Guidelines 2012. Against this background, the examples - in detail listed in Chapter "3.1.1 Examples of deployments 2010 - 2012" – reflect the state of the art at the end of the year 2012. As such they delivered the basis for the discussion of the EW-deployment guideline development process and the setup of Part A "Harmonization requirements" at this point in time. But this means also that no direct relation or compliance to the harmonization requirements of Part A (as they are listed in the Compliance checklists in Annex A) can be assumed for these examples. Nevertheless, the given examples provide a concrete documentation of the state of the art at that time and in most cases, they can still be considered as current best practice.

EIP/EIP+ user and application survey 2013 - 2015

In trying to keep Part B up-to-date, the EasyWay follow up project EIP (European ITS Platform) – launched in 2013 – started two phases of activities to contribute to Part B by collecting user as well as application experiences (both technical and organisational) of national deployments that applied or at least considered the EW-DG 2012:

- *In the time period from the beginning of 2013 to the end of 2014, the EIP work programme provided essential post-processing steps to improve the usability of the DGs in ITS deployments and further to reflect the initial experiences and feedback gained with the guidelines since their release at the end of the year 2012.*
- *In 2015, the EIP+ work programme contained a follow-up activity with the goal to monitor and collect feedback on the application of the DGs in the five European ITS Deployment Corridor projects and to consolidate reporting of the results, lessons learned and best practices concerning the DG practicability and the compliance with the DG requirements on a European scale.*

The results of those two activities are based on responses on questionnaires which were circulated to national ITS deployment experts and European ITS corridor projects and finally are reflected in Chapter "3.1.2 EIP/EIP+ user and application survey 2013 - 2015".

3.1 State-of-the-art of evaluation

Several experiments and evaluations have been conducted on HGV overtaking ban deployments. The following tables underlines the main results of evaluations conducted in Europe. These experimentations help to identify the pro and cons of the service from road users' and from traffic managers' perspectives. Main results of these evaluations are presented in the following tables.

IMPACTS OF THE HGV BAN OVERTAKING		Positive effects	Negative effects
		+	-
Consequences on traffic		Better flow	
Speed	General observations	Speed homogeneity on each lane	Speed of all heavy vehicles adjusted to that of the slowest
	Flowing traffic (flow<2000 veh/hr one way, on both lanes)	Average speed increased on both lanes	
	Dense traffic flow (flow>2000 veh/hr one way, on both lanes)	Speed of private vehicles	Speed of lorries
% of lorries on fast lane		decrease to reach approximately 2%	Reduced in case of dense traffic flow
Compliance with the interdiction		Good compliance in general	Progress margin (2% of lorries use the fast lane despite the interdiction)
			Less compliance in case of increase in the % of lorries in the traffic
Distance between vehicles			Tends to diminish for lorries
Reception from users		Measure seen as beneficial by private vehicle drivers	Measure sometimes seen as penalizing by lorry drivers
Safety		Safety improved on sections where accidents related to lorry traffic have occurred	Appearance of queues or "lorry walls" on the right lane which impedes the entry/exit of vehicles
		Reduction of traffic on regulated sections	"Elephant race"; out of regulated areas, lorries start overtaking again
Environment		Reduction of CO^2 emisson when measured	

Table 7: Synthesis of main impacts

Evaluation main results		France				Netherlands	Germany	Denmark
		A4	RN83	Poitiers/Spanish border	A7	A2		15% of the motorway network
Type of interdiction	Permanent		X	X	X		X	
	Intermittent	X (7 AM – 7 PM)		X (6 AM – 10 PM)				X (6 AM – 6 PM)
	Dynamic				X	X	X	
Weight threshold		> 3.5 T	> 19 T	> 12 T	> 12 T	> 7.5 T	?	> 3.5 T
Accrued length		7 km	20 km	150 km		90 km	75 km	100 km
Traffic data (each way)		AADT: 25000 veh/day and lorries=13% of traffic	AADT: 22000 veh/day and lorries=14% of traffic	AADT: 12500 veh/day and lorries=32% of traffic	AADT: 75000 veh/day and lorries=20% of traffic	From 2600 veh/hr and number of lorries included in predefined limits (upper and lower)	From 3200 veh/hr and lorries=25% of traffic	AADT ? 20000 veh/day and lorries?10% of traffic
Consequences on traffic		No noticeable impact	Traffic is perceived as better flowing	Improved traffic flow	More fluididy	Traffic is perceived as better flowing	More easy-paced and homogeneous	Overall improvement
Speed		Noticeable increase on both lanes in flowing traffic	Speed is (wrongly?) perceived as excessive on the fast lane	Speed of lorries decreases	9% increase of traffic average speed during peak period	Speed of lorries weakly decreases	Speed of lorries weakly decreases	Homogeneous speed on fast lane
		Limited increase when traffic is dense		Speed of private vehicles increases		Speed of private vehicles weakly increases	Speed of private vehicles increases	
% of lorries on fast lane & compliance with interdiction		Important decrease when % of lorries on fast lane > 5%	Good compliance with measure	Decrease of 4.5 points in 2 years (7% to 2.5%)	High compliance rate	no signifiant decrease	Decrease (no other data)	Decrease (% of lorries on fast lane < 2%)
		Decrease is reduced when lorry traffic is dense (lorries>15% of traffic)	Except by some foreign lorries					Decrease is reduced when lorry traffic is dense
Distance between vehicles		Few variations	Sometimes difficult to enter the right lane	Increase of no-compliance by lorries; Slow increase by private vehicles	Very weak decrease of distances between lorries	Very weak decrease of distances between lorries	Improvement	no data
User satisfaction		Lorry drivers find it useful in difficult weather conditions	Seen as beneficial by private vehicle drivers	Not validated by lorry drivers but accepted if justified. Unease related to the transport of dangerous goods(inferior maximum speed)	80% Sastisfaction for private vehicle drivers	Very well accepted by user. The dynamic aspect of the interdiction is appreciated.	"theoretical" satisfaction of users when flow > 2000 veh/hr each way	Seen as useful by most users
			Seen as penalizing by lorry drivers		50% satisfaction for lorry drivers			
Safety		no data	Feelings of insecurity due to the appearance of lorry walls	Appearance of lorry walls	33% decrease of incidents	No significant change	Efficient in case of high lorry accidents rate	Situations more prone to accidents when exiting "interdiction sections" because of overtakes. Appearance; of lorry walls
Environement		no data	no data	no data	- 500 tonnes of CO^2	no data	no data	no data

Colour codes:	positive	negative	neutral

Table 8: Synthesis of evaluation conducted on main experimentations

3.2 Best practice

3.2.1 Examples of deployment 2010 – 2012

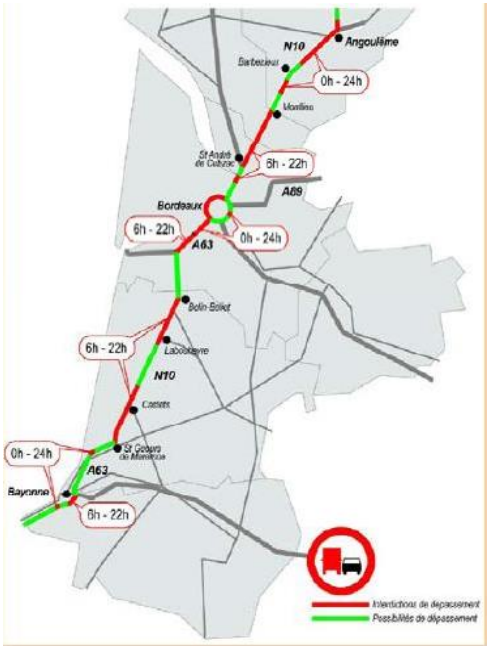
Contributions to this chapter were delivered by those EasyWay-Partners which have participated actively to the development and editing of the EW Deployment Guidelines 2012. Against this background, the listed examples reflect the state of the art at the end of the year 2012. As such they delivered the basis for the discussion of the EW-deployment guideline development process and the setup of Part A "Harmonization requirements" at this point in time. But this means also no direct relation or compliance to the harmonization requirements of Part A (as they are listed in the Compliance checklists in Annex A) can be assumed for these examples. Nevertheless, the given examples provide a concrete documentation of the state of the art at that time and in most cases they can still be considered as current best practice.

3.2.1.1 French experiences

Poitiers – Spanish Border corridor

An incessant increase of HGV traffic is recorded for several years, with a high level of difficulties (high speed level, important number of overtaking, no respect of inter-vehicle distances).

A first experimental HGV overtaking ban was conducted on several sections of this corridor early 2003 and today the measure is included on large part of the Poitiers – Spanish Border corridor. Sections where the service is applied have been chosen according to their main characteristics (traffic conditions, accidents,..).



The figure shows the areas where the ban is applied (red area), HGV overtaking possibilities (green area).

Evaluation of this experimentation was conducted through:

- Traffic condition comparison (before/after) with traffic station
- Dedicated surveys concerning number of HGV overtaking

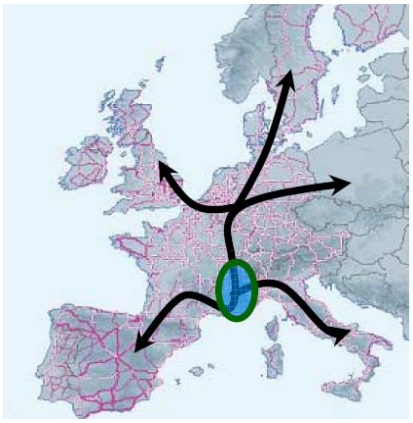
Results of HGV drivers surveys show:

They are not really in favour of the measure but they accept it mainly when level of traffic is important. They agree the measure provides good results concerning light vehicle fluidity.

A7 ASF Motorway in the Rhone valley

Another major experience was conducted in France on the A7 motorway network, this motorway is one of the busiest interurban roads in Europe with a 3-lane configuration carrying (2007 data):

- 75,000 veh/day (AADT)
- 115,000 veh/day (ASDT)
- 175,000 veh/day in peak-periods
- 20% of trucks (AADT)
- 30% of foreign drivers in summer

<table>
<tr>
<td>  </td>
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Main objectives of this experience were to:

- decrease the loss of capacity due to trucks and caravans overtaking in heavy traffic sections
- Improve safety in accident black spots

the vehicles concerned were trucks (heavier than 12 tons) and caravans

Evaluation allowed confirming the signage was efficient:

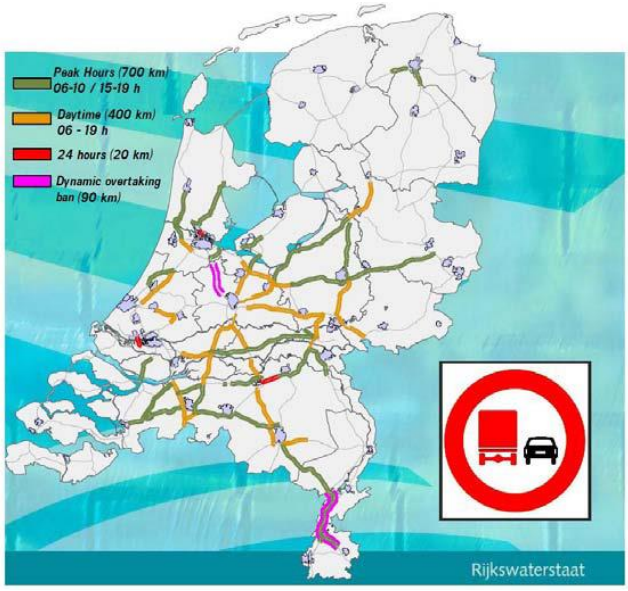
- 94 % of customers (96% of trucks drivers) were aware of the measure through the signs,
- 98% of customers (99% of trucks drivers) understood that the ban on overtaking applied to trucks and 87% to caravans,

The measure was well accepted:

- 80% of LV customers considered it improves safety, traffic conditions and driving comfort,
- 50% of truck customers found it useful
- High compliance rate: 50% of long vehicles driving on the middle lane moved to the right lane
- Increase of environmental quality with a reduction of polluting emissions (-500 tons of CO2) due to the congestion drop (-7%)
- Improvement of safety: 33% decrease of incidents and a higher driving comfort due to the congestion decrease
- More fluidity: 9% increase of traffic average speed in peak-periods
- No incidents due to the measure

3.2.1.2 Dutch experiences

Netherlands is one of the pioneer for the HGV overtaking ban experimentation and deployment in Europe. Today the HGV overtaking ban is applied on more than 50% of the motorway network in this country.



The first experiences started in 1997 on a 2x2 lane motorway network (185 km) by intermittent ban during daily peak period traffic.

The measure was extended in 1999 on additional 750 km motorway network and in 2002 and 2003 (400km).

Since 2005 two main dynamical HGV overtaking ban were conducted on 2 sections of the A2 motorway: the first experimentation on a 2x2 lane near Limburg, the second on a 2x3 lane near Utrecht. The threshold for the activation and deactivation of the measure depend on the traffic flow and the % of HGV on the network:

Profile characteristic		**2x2 lane near Limburg**	**2x3 lane near Ultrech**
Capacity weighted (veh/h per direction)		**4600**	**6700**
Activation	**Total flow**	2600	4500
	And HGV flow	250 (9.6% of total flow)	150 (3.3% of total flow)
Deactivation	**Total flow**	2300	4200
	Or HGV flow	230 (10% of total flow)	130 (3.1% of total flow)

Evaluation of these experimentations was conducted through:

- Traffic condition comparison (before/after) with traffic station
- Dedicated surveys HGV and LV drivers
- Video analysis

Main results of the experimentations are listed hereafter:

- Ban activation time: the systems is 3 or 4 times daily activated (during working days) and sometimes during week end period
- Ban respect: the ban respect rate is quite important (98%)
- Average speed: speed homogenisation recorded on the different lanes
- Inter- vehicle time: a slight reduction of inter-vehicle time

- Accident: no major change

Users acceptance:

- 80% of LV drivers and 70% of HGV drivers are satisfied with the dynamic ban
- 90% of HGV drivers prefer the dynamic ban rather than the static one's
- drivers feel a better traffic fluidity on the network

Experience gained in the Netherlands show the interest of the dynamic ban in place of the static one's. Thanks to an activation during appropriate period the ban is well better accepted by the users (LV and HGV drivers)

3.2.1.3 German experience

Due to a constant traffic increase and in order to find solution to solve the congestion problems Germany experimented this traffic management measures since 1990. Today HGV overtaking ban is deployed on 750 km in Bavaria as well as on the Baden-Württemberg network.

The German institute Bundesanstalt für Staßenwesen (BAST) conducted research to determine the appropriate threshold to optimise the measure activation in case of dynamic application. The following table present the main results according to the road profile:

Profile characteristic		**2x2 lane**	**2x3 lane**	**2x4 lane**
Activation	**Total flow (per direction)**	3200	4000	4400
	HGV %	25	20	20
Deactivation	**Total flow (per direction)**	2900	3600	3900
	HGV %	15	10	10

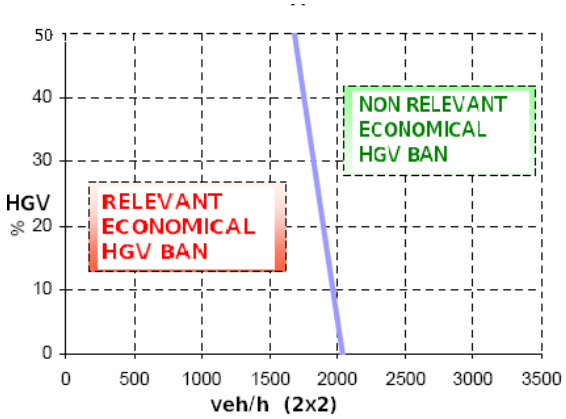
A dedicated evaluation was conducted on 75 km on the 2x2 lanes motorway (12 sections) in the West and South parts of the German network. The evaluation dealt with:

- Traffic condition comparison (before/after) with traffic station
- Accident analysis on the ban section but also on the sections located each part of the ban section
- An economic evaluation

Main conclusions of these evaluations are:

- An increase of LV speed
- A decrease of HGV speed
- A slight reduction of inter-vehicle distance
- An increase of occupancy rate on the right lane
- A good respect of the ban (national and foreign drivers)
- Incidence of the slope regarding the measure's effectiveness

The following figure presents the results of the social economic evaluation of the HGV overtaking ban according to the HGV % and traffic conditions on the section.

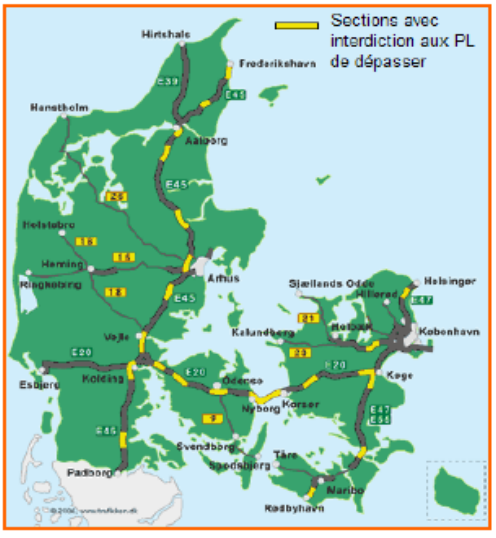


Results of this economical evaluation show that the measure is mainly useful for 2x2 lane sections over 2000veh/h traffic per direction.

3.2.1.4 Danish experiences

The first experimentations started between 2001 and 2003 on a huge part of the national motorway 2x2 lane network: 11 sections corresponding to 15% of the motorway network (100km) during working days (Monday to Friday from 6:00 am to 6:00 pm), ban concerned HGV, bus >3.5 t., all vehicles with trailer and caravans.

A second experimentation, based on the German experiences, was conducted in 2005 with the following criteria: 10km. maximal section length, flow> 20000 veh/h per direction, HGV rate > 10%

2001 – 2003 experimentation	2005 extension
	

Evaluation conducted for these experimentations mainly shows:

- trucks drivers respected the measure (no more than 2% on the left lane)
- users were well aware about the measure implementation
- users consider the measure improves the safety conditions
- No incidents detected due to the measure
- After the ban sections an increase of truck overtaking (elephant race phenomena)
- Some difficulties for the entry and exit

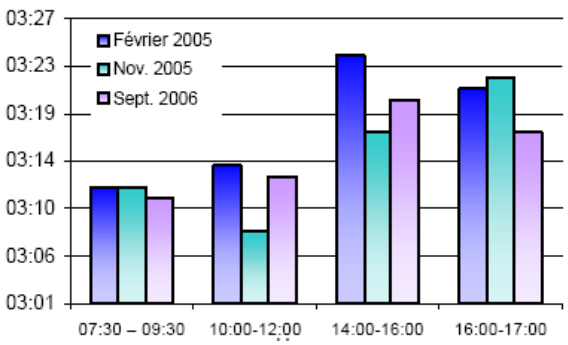
3.2.1.5 British experiences

The Highways Agency conducted a trial on a 3-mile section of the M42 northbound carriageway north of Birmingham between Junctions 10 and 11 where traffic flows are high (29,000 vpd (AADT) northbound; 23% HGV) and the road is on a rising gradient.

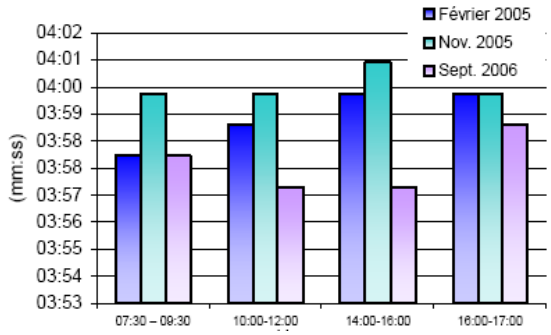
The main objective of this trial was to reduce the congestion due to the high percentage of relatively slow vehicles on this incline. Many HGV's tried to overtake on this incline when the speed differential was low causing frustration and congestion. Before the trial, many LV drivers experienced unsafe conditions, congestion and uncomfortable situations.

Experimentation was conducted between 7:00 am – 7:00 pm for HGV > 7.5t. on this 5km section of the M42 for an 18-month duration from October 2005.

Average LV time on the section



Average HGV time on the section



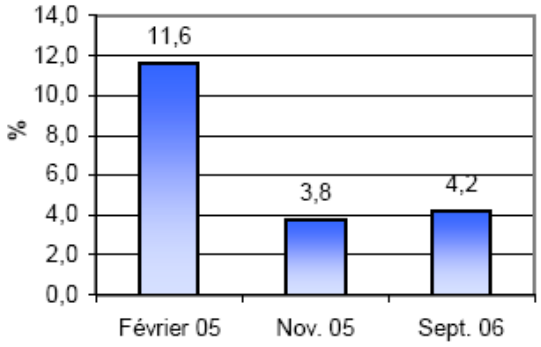


Figure 17: % of HGV on the Speed lane

The rate of HGV overtaking has reduced considerably (by two thirds). This could be reduced further with additional enforcement. The restriction is still in operation and has now been made permanent because the trial was considered to be a success. Similar restrictions have now been successfully introduced elsewhere on the Highways Agency's network.

3.2.1.6 Italian experience along the A22

Between the Brenner pass and Modena (314 km) the A22 uses permanent overtaking bans detailed as follows:

- from the Brenner pass (Austrian border) to Bolzano South (about 85 km) the Autostrada del Brennero applies 24 h an overtaking ban for HGV (> 7,5 t), caravans and trailers;

- from Bolzano South to Modena (about 229 km) applies from 6 a.m. to 22 p.m. an overtaking ban for HGV (> 12 t), caravans and trailers.

Autostrada del Brennero doesn't use dynamic overtaking bans and our permanent bans are displayed on VMS and signalled by fixed road signs as well. In both cases the tonnage of the concerned HVG is showed.

3.2.1.7 Spanish experience

GENERAL INFORMATION	
Name of service/project	HGV vehicles overtaking ban measure
Name of operator/organisation	
Web link	
Contacts	
Other	
Applicable Deployment Guideline	TMS DG06 HGV Overtaking Ban

GEOGRAPHICAL ASPECTS	
Country	Spain
Region of implementation	Spain
Networks concerned	All DGT road network
Deployment indicators	Number of kilometres

SERVICE DESCRIPTION	
Problem(s) addressed / Objectives (Relation to EW objectives. Background/motivation to the ITS application - basic question: WHY)	☒Reduction of congestion ☒Increase of safety ☐Reduction of environmental damage (%) ☐Other:
ITS service description (Description of ITS application, example of systems used functionality and technologies used, users involved, location, context within wider ITS system, current status of the application. (maximum 50 words)	A traffic management measure for the HGV overtaking ban has been deployed. This measure is included in all traffic management plans for adverse weather situations. When the road level of service for adverse weather situation reach green level, it is forbidden for all HGV to overtake. The measure uses the TMP ITS systems, CCTV and VMS.

IMPLEMENTATION ASPECTS	
Duration (start, end)	Start: 2004 End: The system is currently working in all TMP for adverse weather situations
Lessons learnt / factor of success (Key lessons learnt in various aspects of the planning and implementation process; could be technical, institutional/organizational, legal, financial – basic questions: Was the implementation a success / Were the objectives met? Why? What could be done differently next time?)	Technical HGV incidents have decrease after the TMP measure deployment. Traffic flows in adverse weather situations are improved. Video Enforcement is recommended. Institutional/organisational Legal

	Financial
Impacts assessment / results (Description of impacts in terms of safety, travel efficiency, environmental impacts, security, traffic management…)	Results are very positive. HGV incidents are decreased in the coverage area.

REFERENCES	
Documentation available on the project	Title: Coordinación entre Administraciones. Respuesta ante situaciones de emergencia. Especial referencia al protocolo de nevadas Contact: A. Arnes. aarnes@dgt.es Language: Spanish ☐ EW/TEMPO evaluation

ILLUSTRATIONS

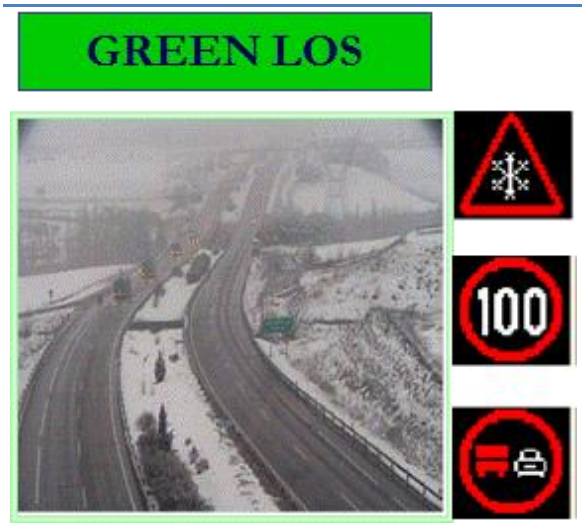


Figure 1.- Image of the road network with green level of service. On the right, the signals used in VMS.

Figure 2.- Example of VMS signalization

3.2.1 EIP/EIP+ user and application survey 2013 - 2015

3.2.1.1 Results “Concept and Practicability” questionnaire

The applicability questionnaire for the TMS-DG06 was answered by 4 projects. Overall, the requirements of the Deployment Guideline were easy to apply with exception of DATEX II profiles. The costs to apply the DG are low or none, which leads to a high acceptance.

3.2.1.2 Results "Compliance checklists” questionnaire

The compliance checklist for this DG was answered by 4 projects. Most of the functional requirements, technical and organisational requirements were met. Deviation mainly can be found at the look & feel and DATEX II related requirements. Here the main potential for future improvements can be found.

3.3 Business Model

3.3.1 Criteria and methods for the technical evaluation of the measure

An ante evaluation is required to define the major objectives of the service. This evaluation must be established before the implementation of the service, it requires to realize beforehand a traffic analysis which constitutes the state of the art of the current situation. This analysis allows to get the entry data for the service evaluation on the concerned section, in particular:

- Section characteristics: length, longitudinal profile, cross section, lane number, speed limit…
- Traffic characteristics: veh/h, HGV %, number of lorries.
- Accident characteristics: slight/injury/fatal accidents, HGV accident rate, period…
- Level of service: traffic jam, free flowing, travel time,
- Environmental characteristics: fuel consumption, CO^2 emissions….

For the post evaluation, assessment of the HGV overtaking ban's effects can be determined through the following 4 main indicator's family:

1) Spend time family: the time gained thanks to the service is measured by the reduction of the traffic jam (length and duration). The daily saving time is expressed in veh.h for a typical day, the global annual value is calculated depending on the number of working days

2) Safety family: it depends on the annual number of saved accidents related to the implementation of the service,

3) User's comfort and acceptability: this measure is ensured through dedicated survey

4) Environmental family: the main indicators for this family are:

- Emission of pollution (CO, CO^2, HC, NOx)
- Fuel consumption,
- Noise emission

Previous evaluation approaches in Germany:

- Comparison of accident development on sections without, with static and with dynamic HGV overtaking ban
- Before-After-Comparison of O-D diagrams in the concerned areas
- Comparison of speed level prior to and after installation of the HGV overtaking ban
- Analysis of HGV involvement in accidents during and outside the times of HGV overtaking ban

The evaluation has to be conducted on the ban's section, nevertheless a complete evaluation should be studied by integrating the adjacent networks in the process's assessment: the measure taken on the principal network can be estimated as too much constraining for the lorry's drivers, as consequence part of these drivers could decide to use parallel or alternative roads. Such a complete evaluation requires collecting quantitative data on these alternative networks too.

3.3.2 Cost / Benefit Analysis

Cost and benefit analysis result on the evaluation process (ex or post evaluation) which will allow to calculate:

Cost of the system which must integrate the following investment and operation cost components:

- Studies
- Monitoring equipment
- System for strategy implementation
- System and equipment's for user and partners information

- Data storage and transfer
- Maintenance and upgrade
- Staff
- Communication actions including engagement with HGV operators
- Evaluation studies
- Enforcement

Benefits components are:

- Safety
- Travel time
- Environment
- Comfort

The various experimentations presented in this document have already estimated some results concerning the cost benefit of the service deployment.

Nevertheless, it seems necessary to harmonise the methods used for the benefit cost calculation to effectively compare the different experimentations and deployments in Europe.

4 Annex A: Compliance Checklist

4.1 Compliance checklist "**must**"

#	Requirement	Fulfilled?		If no – quote of insurmountable reasons
		Yes	No	
Functional requirements				
None				
Organisational requirements				
OR1	The organisational and operational structure of the service as well as the role of each organisation/body and its tasks **must** be defined			
OR2	In the case road operators have to exchange data requiring interoperability between two or more different organisations[3], they **must** enable their system to use DATEX II".			
OR3	In the same line of OR2 (In the case road operators have to exchange data requiring interoperability between two or more different organisations, they **must** enable their system to use DATEX II") Services operators **must** be able to integrate the DATEX II publications provided by the road operators when they publish the ban information measure.			
Technical requirements				
TR5	According OR2 requirement (In the case road operators have to exchange data requiring interoperability between two or more different organisations, they **must** enable their system to use DATEX II") elements of the overtaking ban **must** be described in the DATEX II profiles (see figures).			
Common Look & Feel requirements				
CL&FR2	The dynamic HGV overtaking ban **must** require the use of VMS display. The icon is the **C, 13ba** panel,			
CL&FR3	In case of the HGV ban is implemented for specific categories of lorries (> 12 Tonnes for example), the C 13ba panel **must** be completed with an additional panel type			

[3] In the TIS context, 'organisations' mean Traffic and Traveller Data providers and Services providers.

	H,1 which will precise the tonnage of HGV concerned (without tonnage precision the ban applies for HGV > 3.5t)			
CL&FR4	the end of the dynamic ban section **must** be signalled, when this end is provided with VMS panel to be used is the **C17 d** panel			
Level of Service requirements				
none				

4.2 Compliance checklist "**should**"

#	Requirement	Fulfilled?		If no – explanation of deviation
		Yes	No	
Functional requirements				
none				
Organisational requirements				
none				
Technical requirements				
TR4	The display of signs/pictograms on VMS or other end-user devices **should** be in accordance with prevailing national road codes and where applicable in line with the requirements of the EW-DG for Variable Message Signs Harmonisation VMS-DG01: • MS which ratified the 1968 Convention MUST respect the 1968 Convention and SHOULD consider the Consolidated Resolution on Road Signs and Signals (R.E.2); • MS which did sign but not ratify the 1968 Convention SHOULD follow the 1968 Convention and also consider the R.E.2.			
Required Common Look & Feel				
CL&FR5	In order to remind drivers of the dynamic ban when driving VMS **should** be installed no more than 10km apart.			
CL&FR6	For the dynamic overtaking ban, a VMS **should** be installed on the motorway section just after the entrance			
CL&FR8	a VMS **should** be installed on the motorway section after the exit (in order to minimise the number of VMS to install the localisation of this VMS can be combined with the CL&FR5 requirement)			
Level of service requirements				
LoSR1	The Level of Service to Operating Environment mapping table does not imply any obligation to deploy ITS services. However, if services are deployed they **should** comply with the table. These requirements apply only to deployments to be carried out by EW or its successor process in 2013 or later on the OE in question.			

	Given that pre-deployment surveys / evaluations provide the necessary evidence to proceed with the deployment, the minimum and optimum LoS **should** respect the Level of Service to Operating Environment mapping table			

4.3 Compliance checklist "**may**"

#	Requirement	Fulfilled?		If yes –remarks
		Yes	No	
Functional requirements				
FR1	It is recommended to prepare HGV Overtaking ban service implementation with an easy functional decomposition. The proposed seven sub functions **may** be followed when implementing the service			
FR2	for the dynamic service it is recommended that the data collection system **may** be able to detect in real time vehicle flow, speed and HGV%.			
Organisational requirements				
none				
Technical requirements				
TR1	the data collection system **may** be able to detect in real time the following parameters: vehicle flow, speed and HGV%.			
TR2	the data collection system **may** be installed: • before the ban (at least one counting point) • along the ban (at least one counting point between each entry / exit of the motorway network)			
TR3	After the ban area a station to collect journey time information for the evaluation purposes **may** be implemented.			
Required Common Look & Feel				
CL&FR1	A wide area deployment of this service **may** limit the length for the ban to 20 km on a section			
CL&FR7	Additional dynamic information using VMS **may** also be installed on the motorway access			
CL&FR9	Additional dynamic information using VMS **may** also be installed at the exit of the rest and service areas.			
Level of service requirements				
none				

5 Annex B: Bibliography

1. Livre 1 de l'instruction interministérielle sur la Signalisation routière. Quatrième partie : signalisation de prescription – 31 juillet 2002 – article 52. Interdiction de dépasser.

2. De GONNEVILLE, P – CETE de l'Est (septembre 2001). Interdiction de dépasser pour les véhicules de marchandises de plus de 3,5 t sur A4 entre Brumath et Reichstett.

3. DUPONT-ROC, L, DDE du Haut Rhin (octobre 2002). Interdiction dépassement PL sur 2 x 2 voies. Evaluation de la mise en œuvre sur RN83 entre Colmar et Sélestat.

4. Sétra (octobre 2006). Interdiction temporaire de dépassement aux PL. Expérimentation sur l'axe Poitiers/frontière espagnole. Rapport d'étude Sétra.

5. BARTHE, C ZELT (août 2005). Règlementation de la circulation des poids lourds entre Poitiers et la frontière espagnole. Version 1.0 du 17 août 2005.

6. CETE de Lyon (janvier 2007). Interdiction de dépassement pour les poids lourds. Etude bibliographique du CETE de Lyon pour la DIR Centre Est.

7. HELLEMAN, B. Riijkswaterstaat, Ministerie van Verkeer en Waterstaat (janvier 2007). Active Traffic Management and Managed Lanes: Experiences and Future Directions in the Netherlands. An overview on TMS applications.

8. TOOL, O. et al. Rijkswaterstaat-Adviesdienst Verkeer en Vervoer (décembre 2005). Evaluatie inhaalverbod vrachtver-keer in Limburg en Utrecht Hoofdrapport.

9. DREWS, OJ (septembre 1999). Effects on Traffic of the setting of overtaking-by-trucks bans on Autobahn. Article présenté à la Conférence Européenne des Transports du 27-29 septembre 1999 à Cambridge.

10. Bundesanstalt fûr Stassenwessen (BAST). Merkblatt fûr die Ausstattung von Verkehrsrechnerzentralen und Unterzentralen. Cahier de consignes édité par BAST.

11. Vejdirektoratet (2004). Forsog med 80 km/t og overhalingsforbud pâ motorveje : dok og evalueringumentation. Rapport d'étude du ministère des transports danois. Available english summary.

12. Highways Agency (novembre 2006). M42 Junction 10 to Junction 11 Northbound – lane 2 HGV restriction : before after date analysis. Assessment report.

13. Sétra – note d'information n°126 – interdiction aux poids lourds de dépasser. Eléments d'aide à la décision. Août 2007.