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ITS Deployment and Benefit KPIs definitions

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Preface

Activity 5 of the EU EIP project has as one of its core objectives to specify a definitive list of ITS Deployment and Benefit KPIs.

This document has been produced with the intent of providing a single convenient reference point to evaluators, including KPI definitions and suggested estimation methods.

The content of this document draws significantly on various sources and work on the subject, in particular the ITS KPI definitions developed by DG MOVE as well as the definitions contained in the body of work relating to the EasyWay and EIP+ studies.

Also, for ease of reference, DG MOVE's KPIs have been included at the end of this report. The report also provides a comparison of related, if not directly corresponding, EU/EIP and DG MOVE KPIs (deployment and benefit).

It is important to note that while some differences have been acknowledged, these do not represent 'mistakes or omissions' but should be considered within the context of applicability of said KPIs; specifically:

- EU/EIP KPIs are, generally speaking, more detailed and should be used primarily for evaluation purposes;
- DG MOVE KPIs are more 'generic' and should continue being employed by Member States as part their reporting duties to the Commission.

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1. Introduction

This draft document, produced as part of EU EIP Activity 5, intends to provide ITS evaluators with a comprehensive but also concise and practical list of ITS Deployment and Benefit KPIs.

The KPIs presented have resulted from a review of the following relevant documents:

- EIP+_A5_02_Evaluation KPI Definition - v6;
- AECOM's Key Performance Indicators for Intelligent Transport Systems – Final Report (2015);
- EasyWay Deployment KPIs (various); and
- DG MOVE's report: Intelligent transport systems Key performance indicators for the EU JUNE 2016 V0.0

A comparison of related, if not directly corresponding EU/EIP and DG MOVE's KPIs has also been included in this document for ease of reference. This has been based on DG MOVE's 2016 report's shortlist. Please note that further KPIs are included in the 'Recommended Shortlist' (see tables 4.1 and 4.2 of the 2015 AECOM report). However, a full comparison was outside EU/EIP's scope.

In the table below we provide a summary of ITS Priority Areas or Benefit categories (AECOM 2015 report) which EU EIP has decided to retain and apply going forward in the classification of KPIs.

ITS priority/Benefit Code	ITS priority/Benefit Code brief description
O	**O**ptimal use of road traffic and travel data (Deployment KPIs – comprehensiveness of offering of ITS data to users)
C	**C**ontinuity of traffic and freight management ITS Services (Deployment KPIs – seamless ITS Services to Private/Public Transport/Freight users)
R	**R**oad safety and security applications (Deployment KPIs – comprehensiveness of offering of ITS equipment to users)
L	**L**inking the vehicle with the transport infrastructure (Deployment KPIs – comprehensiveness of offering of ITS equipment to users)
N	**N**etwork efficiency and congestion (Benefit KPIs)

ITS priority/Benefit Code	ITS priority/Benefit Code brief description
E	Improving **E**nvironmental impacts (Benefit KPIs)
S	Improve road **S**afety (Benefit KPIs)
I	Enhance modal **I**ntegration (Benefit KPIs)

In Appendix A we have included some examples/guidelines relating to the calculation of specific benefit KPIs.

Appendix A provides also some guidelines relating to: a) the likely data required for the calculations and b) the timeframes and physical coverage over which the data should be collected. These examples do not represent mandatory requirements but, for the sake of consistency, it is strongly advised that evaluators adopt such methodologies wherever possible. Where alternative methodologies are adopted by evaluators, it is required that any significant divergence remains well documented and the consequent impact, at least, is qualitatively described.

Appendix B provides a summary of DG MOVE's deployment and benefit KPIs shortlist (Intelligent Transport Systems Key Performance Indicators for the EU JUNE 2016 V0.0), as issued by the Commission to EU/EIP on 18 October 2016.

Appendix C provides a summary of EU/EIP comments relating to the EU/EIP and DG MOVE comparison exercise.

In the two tables immediately below we have provided a correspondence matrix between the current EU/EIP KPIs and DG MOVE's KPI shortlist. It should be noted that the KPIs being compared are not necessarily equivalent but, in some instances, they represent closely related items. Alpha-numeric indices in the table's cells can be used to navigate to the KPI comparison tables of Appendix C.

DG MOVE Deployment KPIs :		Information gathering infrastructures / equipment (road KPI)	Incident detection (road KPI)	Traffic management and traffic control measures (road KPI)	Cooperative-ITS Services and applications (road KPI)	Real-time traffic information (road KPI)	Dynamic travel information (multimodal KPI)	Freight information (multimodal if possible or road KPI)	112 eCalls (road KPI)
EU/EIP Deployment KPIs :		Alpha-numeric characters in the boxes below provide indices for navigating EU/EIP-DGMOVE KPIs comparison tables of Appendix C							
Incident detection and incident management	EUEIP-DKPI-R1		✓ A1						
Automated speed detection	EUEIP-DKPI-R2	✓ B1							
Dynamic public transport traveller information	EUEIP-DKPI-O1						✓ C1		
Traffic condition and Travel Time Information Service (TIS DG03_05)	EUEIP-DKPI-O2					✓ D1			
Adaptive Traffic Control or prioritisation	EUEIP-DKPI-C1			✓ E1					
Intelligent vehicles	EUEIP-DKPI-L1								✓ F1
Intelligent Services in accordance to Delegated Regulations under the ITS Directive	EUEIP-DKPI-L2					✓ G1	✓ G2	✓ G3	

DG MOVE Deployment KPIs :		Information gathering infrastructures / equipment (road KPI)	Incident detection (road KPI)	Traffic management and traffic control measures (road KPI)	Cooperative-ITS Services and applications (road KPI)	Real-time traffic information (road KPI)	Dynamic travel information (multimodal KPI)	Freight information (multimodal if possible or road KPI)	112 eCalls (road KPI)
EU/EIP Deployment KPIs :		Alpha-numeric characters in the boxes below provide indices for navigating EU/EIP-DGMOVE KPIs comparison tables of Appendix C							
Speed Limit Information	EUEIP-DKPI-R3			✓ H1					
Variable Speed Limits	EUEIP-DKPI-R4			✓ I1					
Forecast and Real Time Event Information	EUEIP-DKPI-O3	✓ J1				✓ J2			
Weather Information Service	EUEIP-DKPI-R5	✓ K1				✓ K2			
Co-Modal Traveller Information	EUEIP-DKPI-I1	✓ L1					✓ L2		
Dynamic Lane Management	EUEIP-DKPI-O4			✓ M1					
Hard Shoulder Running	EUEIP-DKPI-O5			✓ N1					
HGV Overtaking Ban	EUEIP-DKPI-R6			✓ O1					
Traffic Management Plan Service for Corridors andNetworks	EUEIP-DKPI-O6			✓ P1					
Dynamic Information	EUEIP-							✓ Q1	

DG MOVE Deployment KPIs :		Information gathering infrastructures / equipment (road KPI)	Incident detection (road KPI)	Traffic management and traffic control measures (road KPI)	Cooperative-ITS Services and applications (road KPI)	Real-time traffic information (road KPI)	Dynamic travel information (multimodal KPI)	Freight information (multimodal if possible or road KPI)	112 eCalls (road KPI)
EU/EIP Deployment KPIs :		Alpha-numeric characters in the boxes below provide indices for navigating EU/EIP-DGMOVE KPIs comparison tables of Appendix C							
on Intelligent Truck Parking	DKPI-R7								
Ramp Metering	EUEIP-DKPI-O7			✓ R1					
DATEX II Data Exchange Services (*)	EUEIP-DKPI-C2	-	-	-	-	-	-	-	-
Cooperative-ITS Services and Applications (road KPI)	EUEIP-DKPI-L2				✓ T1				

(*) Note : DATEX II KPI is outside scope of DGMOVE's KPIs

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DG MOVE Benefit KPIs :		Change in travel time (road KPI)	Change in traffic-CO2 emissions (road KPI)	Change in road accident resulting in death or injuries numbers (road KPI)
EU/EIP Benefit KPIs :		Alpha-numeric characters in the boxes below provide indices for navigating EU/EIP-DGMOVE KPIs comparison tables of Appendix C		
Change in traffic flow	EUEIP-BKPI-N1	-	-	-
Change in road traffic journey time variability	EUEIP-BKPI-N2	-	-	-
Change in Bottleneck Congestion	EUEIP-BKPI-N3	-	-	-
Change in Journey Time	EUEIP-BKPI-N4	✓ X1		
Change in demand for travel	EUEIP-BKPI-N5	-	-	-
Change in mode share	EUEIP-BKPI-I1	-	-	-
Change in accident numbers and severity	EUEIP-BKPI-S1			✓ AA1
Change in CO2 emissions	EUEIP-BKPI-E1		✓ AB1	
Public eCall timeliness	EUEIP-BKPI-S2	-	-	-

2. EU EIP Deployment KPIs

2.1. Summary table

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
Incident Detection and Incident Management	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by incident detection and incident management.	○ **Incident detection:** Any road based ITS infrastructure which is used to detect traffic incidents (e.g. accidents and congestion) on a section of road network. Technologies can include: Sensors, Cameras, e-Call and/or Floating Car data ○ **Incident management:** is defined as the implementation of a systematic, planned and coordinated set of responsive actions and resources to prevent accidents in potentially dangerous situations and to handle an incident safely and quickly. It proceeds through a cycle of several stages: from incident detection to the restoration of normal traffic conditions, including the use of immediate and advance notice of possible dangers or problems, i.e. warnings, in order to prevent accidents. Stages include: Detection/Discovery, Verification, Road Clearance, Traffic Management, Emergency Rescue, Road User Information, Site Investigation, Salvage/Recovery, Repairs of Road Damage, Logging and Monitoring, Evaluation. Please note that whilst parts of Incident Management are not related to the deployment of ITS (road clearance/emergency rescue/site investigation/salvage/recovery/repairs of road damage, activities commonly part of the road operator's everyday job) when these activities are carried out as an immediate response to an accident (e.g. the road surface clearance and vehicle(s) removal), then they are part of IM. If repairs can be carried out at a later date they become 'normal operations'. In summary, IM is linked to getting the situation back to normal as soon as possible.	**R**	**EUEIP-DKPI-R1**
Automated Speed Detection	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by automated speed detection.	○ Automated speed detection: Any road based ITS infrastructure which is used to detect the speed of passing vehicles.	**R**	**EUEIP-DKPI-R2**
Dynamic Public Transport Traveller Information	Number and % of urban, inter-urban and/or rural public transport stops for which dynamic Traveller information is made available to the public. Stops include those provided with dynamic Traveller information in the form of both physical infrastructure (variable message signs) and virtual infrastructure (apps and/or other means). Report separately by public transport mode where possible.	○ Public transport stops: Any public transport stops including bus stops, rail and bus/coach stations and other multimodal interchanges ○ Public transport: Where possible public transport modes should be reported separately i.e. bus, coach, rail (light, heavy), tram/ metro. ○ Dynamic Traveller information: Information providing up to date estimates of public transport Services i.e. arrival, delays or cancellations. ○ Multimodal interchanges: Any public transport node that facilitates interchange between modes i.e. bus and rail stations.	**O**	**EUEIP-DKPI-O1**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
Traffic Condition and Travel Time Information Service (TIS DG03_05)	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by websites/over-the-air Services offering traffic and travel information. Report separately: 1) Travel information 2) Traffic information 3) Integrated traffic and travel information 4) Freight specific information 5) Traffic management plan(s) incl. cross border TMP 6) Traffic management and control measures / equipment 7) Infrastructure or equipment on the network to enable Cooperative-ITS 8) Intelligent safety Services for disabled and vulnerable road users	Specifically, "Traffic Condition and Travel Time Information Service" means the provision of information about traffic conditions (LoS) and travel times on covered or impacted road segments of the TEN-T or National road networks and interfaces. This predictive or real-time information could be provided on-trip and pre-trip using different information channels, accessible by the road user via different end-user devices. The service is directed to the road user and may comprise common as well as individual (personalised, on-demand) information. Relevant information for this service is: • status of the current traffic conditions (LoS - Level of traffic service1) and travel times (from free flow to congested conditions, whether there are incidents, events, adverse weather conditions affecting traffic etc.) • current changes in and forecast of traffic conditions and travel times Traffic management and traffic control measures means any measures derived from road based ITS enabling the control of traffic movements. It includes for instance hard shoulder running, ramp metering, dynamic lane management, HGV overtaking ban, variable speed limits, as well as parking management, vehicles / fleet prioritisation.	O	EUEIP-DKPI-O2
Adaptive Traffic Control or Prioritisation	Number and % of signal controlled road intersections using adaptive traffic control or prioritisation on the TEN-T and/or National road networks, as applicable.	○ Signal Controlled road intersection: Any signalised junction between two or more roads including signalised roundabouts. ○ Adaptive Traffic Control: Any ITS technology controlling junction flow that is able to adapt to traffic levels or prioritise certain movements and certain vehicle fleets / type of users. This could include technologies such as SCOOT21 or MOVA22.	C	EUEIP-DKPI-C1
Intelligent Vehicles	Number and % of new vehicles including the following intelligent vehicle features (if and when data becomes available). Report separately for each country: 1) safety readiness 2) automated operation 3) cooperative systems 4) Public (112) systems 5) Private eCall systems In the case of 112 eCalls, measure also the number of annual eCalls and the % eCalls over the total number of emergency calls for the same period. Report separately by vehicle types where possible, see breakdown by	It is recognised that EU EIP partner would not typically be collecting / providing this type of data. However, it is possible to get information from manufacturers or national bodies; including, for example, national insurance providers associations. Collection of these data is not considered a priority at this stage but, nevertheless, it is potentially very important and should therefore be included wherever possible. ○ Individual systems may be reported on by prioritising more traditional intelligent vehicle features and then more innovative systems, as more data becomes available. ○ New vehicles: The number of vehicles that have entered into use in a Member State during the year. This could be the number of vehicles sold by manufacturers or the number registered by the government, depending upon the most appropriate source of this data. ○ Intelligent Vehicle features: Any technology which facilitates safety readiness, automated operation, cooperative systems or eCall	L	EUEIP-DKPI-L1

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
	vehicle classification section.	○ Safety Readiness: Any in vehicle technology which facilitates safety benefits. Examples include Alcohol Interlocks, Adaptive Headlights, Local Danger Warnings, Collision avoidance and automated breaking, Lane keeping and blind-spot monitoring. ○ Automated operation: Any in vehicle technology that facilitates automated operation. This could include automated parking and platooning capabilities, but must be beyond the capabilities outlined in Safety Readiness. SAE international standard J3016 provides further details of what constitutes automated operation. ○ Cooperative systems: Any technology utilising infrastructure to vehicle, vehicle to infrastructure or vehicle to vehicle cooperation in determining vehicle behaviour. ○ eCall: referred to in EU Directive 2010/40/EU as 'interoperable EU-wide eCall') means an in-vehicle emergency call to 112, made either automatically by means of the activation of in- vehicle sensors or manually, which carries a standardised minimum set of data and establishes an audio channel between the vehicle and the eCall PSAP via public mobile wireless communications networks		
Intelligent Services in accordance to Delegated Regulations under the ITS Directive	Provision of intelligent Services on the TENT-T core and comprehensive networks that are compliant with the Delegated Regulations of the ITS Directive: 1) Length and % of TEN-T network and % of transport nodes covered by real-time traffic information Services that are compliant with the requirements of Delegated Regulation 962/2015 2) Length and % of TEN-T network covered by road safety related traffic information Services available free of charge to users that are compliant with the requirements of Delegated Regulation 886/2013 3) Length and % of TEN-T network and number and % of freight nodes covered by information Services for safe and secure parking places for trucks and commercial vehicles that are compliant with the requirements of Delegated Regulation 885/2013. 4) Provision of EU-Wide multimodal Travel Information Services *(to be advised, pending publication of Delegated Act xx/2017)*	○ Please see the 'Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport' and its Delegated Regulations for precise definitions of the above technologies and the standards required to be in compliance with the Directive and its Delegated Regulations	**L**	**EUEIP-DKPI-L2**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
Speed Limit Information	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Speed limit information, including : 1. In-vehicle systems.	○ Speed limit information deals with different ways to inform the driver that must know, always and wherever he is, the speed limit which applies on the section he's driving. In this case it relates to Static speed limit information (to be made available in a central database) or ○ Speed limit information conveyed via in-vehicle systems to inform drivers about the speed limit in force (i.e. inclusive of wintertime reduced speed limits) and even send a warning if speeding. The development and use of in-vehicle systems as a means of informing drivers about the speed limit in force on a road section continues to grow rapidly. This type of in-vehicle information system makes use of detailed speed limit databases that are linked to digital maps. In view of missing and/or poor quality speed limit information, some vehicle manufacturer use for their in-vehicle systems data collection by video cameras capable of detecting the speed limit values from the speed limit signs via image processing. Such systems, provided they are accurate, enable the drivers to get information on the speed limit in force, wherever they are on a network.	**R**	**EUEIP-DKPI-R3**
Variable Speed Limits	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Variable Speed Limits, including : 1. Variable Message Signs; 2. Spot Speed Enforcement (SE) Cameras; and 3. Average Speed Enforcement (SE) Cameras	○ Variable speed limits (VSL) use Variable Message Signs (VMS) to display speed limits (mandatory or advisory), that are adapted to the particular road and/or traffic conditions. ○ In some cases, VSL is supported by Speed Enforcement (SE), which mostly uses cameras to identify speeding vehicles and/or drivers. ○ Speed enforcement (SE) covers violations of speed limits either on a spot or over a defined section of the road, also called section control. Depending on the strategy, mobile and/or stationary speed enforcement is used.	**R**	**EUEIP-DKPI-R4**
Forecast and Real Time Event Information	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Forecast (pre-trip) and Real Time (on-trip) Event Information about both expected and unexpected abnormal events (situations) faced by road users	○ A general overarching description of TIS-Services is outlined in the "Traveller Information Services REFERENCE DOCUMENT, TIS Deployment Guideline Annex, Version 02-00-00": • Executive summary and • Chapter 2.1" General Service Description" ○ Specifically "Forecast and Real Time Event Information Services" means the provision of information about both expected and unexpected events to road users on identified road segments of the TEN-T network and interfaces. ○ "Events" are defined as - expected or unexpected – abnormal situations, which may lead to adverse effects on the road as regards to traffic safety, efficiency and the environment. ○ There are two categories of events: ○ expected events, e.g.:	**O**	**EUEIP-DKPI-O3**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
		• Road works, traffic jams, closures, parking rest info, strikes, protest rallies, major events (sports games, concerts, festivals...), and frequent overloading (commuter and holiday travel), parking rest area information, road/bridge/tunnel/lane/border closures... ○ unexpected events, e.g.: • incidents, accidents, road/bridge/tunnel/lane closures, objects on the road (objects, animals, people), ghost-drivers, parking and rest area information, sudden end of slow or stationary traffic, reduced vision, slippery surface (aquaplaning, ice, oil…), sudden severe adverse weather, long delays at borders... ○ As part of a global information strategy, forecast and real-time event information Services shall provide: • Pre-trip warnings to drivers about upcoming expected events and known unexpected events • On-trip warnings to drivers about expected and unexpected events		
Weather Information Service	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Forecast (pre-trip) and Real Time (on-trip) Weather Information Service	○ Specifically " Weather Information Services " means the provision of advanced forecast (pre-trip) and real time (on trip) warnings to travellers, dispatchers and operators about a weather-induced event that could impact both safety and journey efficiency/reliability, including : • Real Time road weather condition class/category (e.g. green = normal condition, yellow = hazardous condition, red = very hazardous conditions) • Expected road weather condition class/category (e.g. green = normal condition, yellow = hazardous condition, red = very hazardous conditions) • Closures and Lane Restrictions • Obstructions Hazards • Road Conditions • Temperatures • Precipitations and Visibility • Wind and Air Quality • Delays • Weather Forecast • Road Conditions Forecast • Environment • Wind Forecast	**R**	**EUEIP-DKPI-R5**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
		• Temperature Forecast • Delay Forecast		
Co-Modal Traveller Information	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Co-Modal Traveller Information ; i.e. offering parallel information for more than one mode/means of transport. Inter-modal Services offer in addition the combination of several modes/means of transport within one route.	○ Co-modal traveller information Services offer in parallel comparative information of different modes/means of transport (multi-modal) and/or the combination of different modes/means of transport within the same route (inter-modal). The Services offer information for at least public transport, car transport and usually pedestrian and bicycle transport. ○ The term "co-modal" was coined by the European Commission as an umbrella term integrating the more common terms multi-modal and inter-modal. The term multi-modal is commonly used within the area of traveller information Services in the meaning of offering parallel information for more than one mode/means of transport. Inter-modal Services offer in addition the combination of several modes/means of transport within one route. ○ Co-modal traveller information Services require data from the different transport modes road, rail, water- and airborne transport, walking, cycling and additional Services such as parking. ○ The development of co-modal Services has to be divided into two general parts: • Data gathering, data processing and data transmission within the technical system of a co-modal traveller information system itself, the “backend system” of the service. • Processed data provision to user interfaces (e.g. internet portal). This means that the processed data has to be transmitted in a certain format (e.g. xml) via a certain protocol and finally the data will be presented in the user frontend interface. ○ By entering travel demands (i.e. travelling from A to B within a certain time frame) on the Internet or on a mobile device the user receives co-modal information on travel options for road, rail, public transport, including if applicable water and air transport (including walking and cycling, e.g. to the first public transport stop on the route). The service normally includes pre-trip (and on-trip if available) public transport information as well as – if available up-to-date or predicted - road traffic information. Information given to the users can include: trip itineraries with predominantly static travel times; parking information/guidance; environmental impact; to a certain degree estimations of travel costs (e.g. for car traffic). The backend system combines all the different data sources to enable the comprehensive co-modal service provision as just described. ○ With the service frontend users interact directly and co-modal Services are provided by the following carriers, e. g. • Internet • mobile devices	I	EUEIP-DKPI-I1

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
		• in-car devices (radio, navigation systems) • VMS (for VMS please refer to the EasyWay Deployment Guideline TMS-DG05-08 “Incident Warning and Management”) o Internet portals (websites) offer a well-structured access to co-modal traveller information. There are two options for the design of such portals: • User can be directed to Internet-sites with appropriate traveller information via appropriate links (collection of links in one portal) • The system integrates all co-modal information directly either o by on-the-fly calculation on decentralised systems o by integration of different service providers` data into one database o Portals can offer Traveller Information Services with static and/or dynamic data. Information can be given at the regional, national and particularly at the international level.		
Dynamic Lane Management	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Dynamic Lane Management	o Dynamic lane management (DLM) enables the number of lanes in one direction at a given point of the network to vary. Dynamic Lane Management techniques include the use of traffic guidance panels, permanent light signals, multiple-faced signs or prisms, lane lights, closing and directing installations and so on. o Dynamic lane management can be activated at fixed times or in particular conditions of heavy volumes of traffic, usually by means of variable message signs or other typologies of road signs. o To ensure that there are no broken down vehicles or other objects on the lane or hard shoulder to be allocated, permanent video surveillance using Automatic Incident Detection is recommended, in particular for temporary activated systems (like reverse lane use). o Dynamic lane management also includes an added lane or hard shoulder when dedicated to a specific type of user (buses, taxis, etc)	**O**	**EUEIP-DKPI-O4**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
Hard Shoulder Running	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Hard Shoulder Running	○ The hard shoulder running service enables dynamic temporary use of hard shoulders. ○ Hard Shoulder Running should only be implemented when the safety level remains the same or improves. It can be applied on network areas, route sections and junctions prone to capacity problems. The capacity problems can be on a regular basis (e.g., Tuesday versus Friday, peak hour versus off peak hour) or for a longer period (major road works). The roads are able to cope with extra capacity on trunk roads and in urban areas each both upstream and downstream. ○ The measures must include strict safety precautions in order to maintain the existing safety levels and can only be deployed if special criteria are met, such as 'no expected increase in emission levels'. ○ In a normal situation a hard shoulder has a specific set of users, mainly road users in emergency/breakdown situations. Opening the hard shoulder to all road users can cause problems for its regular users and therefore their needs must always be considered. ○ Opening the hard shoulder for regular traffic without additional measures could give the hard shoulder an ambiguous character. This can cause confusing situations for road users, some examples of which include: • A commuter accustomed to an open hard shoulder during peak hours, may also expect it to be open during off peak hours. • A commuter who is accustomed to an open hard shoulder during peak hours may use it while it is closed due to an emergency/breakdown situation downstream. • Road users who are unaware you are allowed to drive on the hard shoulder will not adapt to a new lane, which can cause dangerous situations and under-utilisation of the hard shoulder lane by the user. ○ Good unambiguous instructions and education can counter these problems.	**O**	**EUEIP-DKPI-O5**
HGV Overtaking Ban	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Dynamic HGV Overtaking Ban	HGV overtaking bans to apply in case of dynamic systems only.	**R**	**EUEIP-DKPI-R6**
Traffic Management Plan Service for Corridors andNetworks	Length and % of road network (**TEN-T and/or National, as applicable)** covered or impacted by Traffic Management Plan Service for Corridors andNetworks	○ "Traffic Management Plan for Corridors and Networks" means the elaboration, application and quality control of Traffic Management Plans (TMP) for the management of the European network and corridors including multi-modal capacities to allow for a more efficient use of the road network in Europe (and not restricting measures to country or local basis). ○ A TMP is the pre-defined allocation of a set of measures to a specific situation in order to control and guide traffic flows as well as to inform road-users in real-time and provide a consistent and timely service to the road user. Initial situations can be unforeseeable (incidents3, accidents) or predictable (recurrent or non-recurrent events4). The measures are always applied on a temporary basis.	**O**	**EUEIP-DKPI-O6**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
		○ Four spatial levels are suited to the elaboration of such complex TMPs: • Regional TMPs: for networks within areas or regions on the TERN that can be extended, under certain conditions, to link with neighbouring regions for cross-regional and cross-border levels. • Cross-regional TMPs: for national networks and key corridors on the TERN covering multiple regions • Cross-border TMPs: for cross-border networks and key corridors on the TERN and • TMPs for conurbations: conurbations and the urban/inter-urban expressways network with relevance to long-distance traffic.		
Dynamic Information on Intelligent Truck Parking	Length and % of road network (TEN-T and/or National, as applicable) covered or impacted by Dynamic information on Intelligent truck parking (for ITS Parking Guidance Systems). Number and % of rest areas on the road network (TEN-T and/or National, as applicable) covered or impacted by Intelligent Truck Parking and Secure Truck Parking (for ITS reservation systems). As an alternative use to truck parking lots.	○ The objective of parking area operators is to make the optimum use of the existing truck parking capacities along the highways and to improve safety and security on their (truck) parking area. “Intelligent Truck Parking” will contribute towards optimising the use of available parking areas, which are a limited resource in many corridors today. The service will also enable efficient management of roads and parking areas which may become congested or overloaded with goods vehicles at certain times due to traffic/driving restrictions, weather or road conditions. ○ On-site guidance allows the goods vehicles to park without spending a long time looking for a place. ○ End users may receive all of the information they require to park their goods vehicles through various information channels, if necessary across borders. Access to properly equipped parking and rest areas will reduce the risk for driving on “overtime”, will reduce driver fatigue, improve cargo security, and solve other problems relating to excessive driving periods and “wild” overnight parking. This in turn will reduce the sanitary, safety and security problems affecting truck drivers. ○ The specific needs of individual operators need to be borne in mind, such as those carrying dangerous goods or abnormal loads. ○ Reservation Services support the individual reservation of a truck parking space with the help of telematics Services on board of the goods vehicle via internet, call-centre and smartphone app. The parking space on site is reserved (blocked) and kept free for the identified goods vehicle.	**R**	**EUEIP-DKPI-R7**
Ramp Metering	Number and % of access points on the road network (**TEN-T and/or National, as applicable)** equipped with Ramp Metering	○ During peak or congested periods on the motorway, the addition of traffic from on-ramps causes vehicles to break or change lanes giving rise to higher occupancy and lower headways. Shorter headways cause drivers to reduce their speeds; resulting in a sustained loss of throughput. ○ 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 of the on-ramp. This speed adjustment can occur over a distance of up to 2 km prior to the on-ramp. During this time more vehicles will be attempting to join the main carriageway, and if vehicles continue to join, the speed on the main	**O**	**EUEIP-DKPI-O7**

Deployment KPI Short Name	Deployment KPI Long Name	Deployment KPI Definition	ITS Priority/Benefit Code	EU EIP CODE
		carriageway will fall to a point where flow breakdown occurs. Additionally, during peak periods when congestion is increased there may also be a higher risk of accidents. ○ Ramp metering (RM) is implemented via the installation of traffic signals on the on-ramps which regulate the flow of traffic joining the motorway during peak or congested periods. It does this by controlling the discharge of vehicles from the on-ramp, holding vehicles back and breaking up on-ramp platoons, thus reducing the interference of merging vehicles and helping maintain the flow of traffic on the main carriageway. ○ The traffic signals are generally operated in dependence of the currently prevailing traffic conditions on both the main carriageway and the on-ramps.		
DATEX II Data Exchange Services	Traffic Centres / Data Exchange / Traffic Control and Information Centres KPIs: ○ Provision of data exchange Services via DATEX II at traffic centres (No. and % of traffic centres equipped with minimum level of service) ○ Length and % of TEN-T network covered by traffic centre data exchange Services via DATEX II ○ Number of: DATEX II links/content access points/connected nodes to access points/nodes at TCC	○ A DATEX II service exchanges information for road traffic which can be dynamic and is usually relevant for traffic management and traffic information. This exchanged data is modelled and structured in a common and standardised way, which facilitates its re-use and lowers development costs. Collecting information is only part of the story – in most cases data needs to be exchanged with both other centres and, in more recent developments, with those developing pan-European Services provided directly to road users. ○ The first generation of DATEX was designed and developed during the nineties as a traffic and travel data exchange solution by a European task force set up to standardise the interface between traffic control and information centres. It has been the reference for applications that have been developed and implemented in Europe. The existing DATEX network consists of 50 to 60 operational nodes organised in different network and node types throughout Europe. The majority of nodes are used for national exchange of data, but some of them support international exchange.	**C**	**EUEIP-DKPI-C2**
Cooperative-ITS Services and Applications (road KPI)	Length and % of TEN-T and/or National road network (in km) covered by C-ITS Services or applications. PLEASE ALSO refer to DGMOVE KPI in Appendix B.	○ Cooperative-ITS Services or applications means road based ITS infrastructure enabling Services or applications using infrastructure to vehicle or vehicle to infrastructure communication. ○ It is acknowledged that technologies can differ from one country / network / area to another. ○ Tolling does not fall within the scope of these indicators / calculations.	**L**	**EUEIP-DKPI-L2**

3. EU EIP Benefit KPIs

3.1. Summary table

Benefit KPI Short Name	Benefit KPI Long Name	Benefit KPI Definition	KPI Calculation	EU EIP Code
Change in Traffic Flow	Change in traffic flow (e.g. vehicles per hour/day at spot location), measured at specific locations of the road network (TEN-T and/or National) affected by the implementation of the relevant ITS system. Estimates to cover instances where changes in traffic flows are also linked to wider re-routeing effects. Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change in traffic flows can easily be derived from the measured spot/network traffic flows if the selected timeframes are defined consistently. Report separately by vehicle type where possible and provide clear descriptions of adopted vehicle classifications.	○ Traffic Flow: The number of vehicles passing a set point in the transport network within a given period of time. ○ Peak period: The period or hour with the highest flow during a weekday. The period used can vary by route, but must be fixed between before and after surveys. ○ Vehicle Types: All (but a disaggregation by vehicle type can also be provided if appropriate) ○ Routes where ITS has had or it is expected to have had an effect: Member States should specify which routes will be included within this KPI. This could be based upon those outlined in the associated Deployment KPIs, but sufficient data is unlikely to be available in all instances. The selection of key points between which the change in traffic flow will be measured should be defined in relation to the nature of the ITS implemented on the route. Typically, this would be the flow between key junctions.	Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-N1**
Change in Road Traffic Journey Time Variability	Change in journey time variability as measured coefficient of variation (standard deviation of the measured travel times for a certain route or a part of a route). Change in coefficient of variation measured along the road network (TEN-T and/or National) affected by the implementation of the relevant ITS system. Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change in journey time coefficient of variation can easily be derived if the selected timeframes are defined consistently. Report separately by vehicle type where possible and provide clear descriptions of adopted vehicle classifications. for a longer period (e.g. a few weeks or a month) the journey times should be put into one set and then the standard deviation should be taken.	○ Journey times: The time it takes to go between set points along a route ○ Journey time variability: A measure of the level of variability of journey times at a section of road through time. ○ Coefficient of variation: The ratio of the standard deviation between observed journey times against the mean journey time. ○ Vehicle Types: All (but a disaggregation by vehicle type can also be provided if appropriate) ○ Routes where ITS has been implemented: Corridors/Member States should specify which routes will be included within this KPI. This could be based upon those outlined in the associated Deployment KPIs, but sufficient data is unlikely to be available in all instances. The selection of key points between which the journey time variability will be measured should be defined in relation to the nature of the ITS implemented on the route. Typically, this would be the journey time variability between key junctions.	Coefficient Standard Deviation of journey time observations/mean journey time observation Please refer to Appendix A of this document for a suggested calculation methodology. Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-N2**

Benefit KPI Short Name	Benefit KPI Long Name	Benefit KPI Definition	KPI Calculation	EU EIP Code
Change in Bottleneck Congestion	**Congestion (LOST VEHICLE HOURS / TIME SAVING):** Total delay or vehicle hours lost expressed as the difference between the total time spent and a weighted (with the flow) reference (free-flow) journey time. Estimates can refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc) and a specified time period (e.g. working days, excluding holidays).	○ Lost vehicle hours represent a measure of localised or spot delay conditions. ○ Estimates to be provided over an entire 12-month period, including monthly variations and annual estimates.	Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-N3**
Change in Journey Time	**JOURNEY TIME:** Journey time is the indicator to determine the impact of a measure on the road users. It is measured **along the road network (TEN-T and/or National Road networks) affected by the implementation of the ITS system.** Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change in journey times can easily be derived from the measured journey times if the selected timeframes are defined consistently.	○ Journey time changes represent a measure of overall network efficiency at route and/or network level. ○ Estimates to be provided over an entire 12-month period, including monthly variations and annual estimates.	Please refer to Appendix A of this document for a suggested calculation methodology. Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-N4**
Change in Demand for Travel	**Difference in Vehicle-km driven:** The distance travelled or vehicle kilometres driven is a network indicator and is defined as the product of the length of a road section and the flow on that road section. Change in vehicle-km travelled measured along the road network (TEN-T and/or National) affected by the implementation of the relevant ITS system. Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change in vehicle-km travelled can easily be derived if the selected timeframes are defined consistently. The summation of all or a part of the road sections gives the total distance travelled in the network or study area.	○ Traffic Flow: The number of vehicles passing a set point in the transport network within a given period of time. ○ Peak period: The period or hour with the highest flow during a weekday. The period used can vary by route, but must be fixed between before and after surveys. ○ Vehicle Types: All (but a disaggregation by vehicle type can also be provided if appropriate) ○ Routes where ITS has had or it is expected to have had an effect: Member States should specify which routes will be included within this KPI. This could be based upon those outlined in the associated Deployment KPIs, but sufficient data is unlikely to be available in all instances. The selection of key points between which the change in traffic flow will be measured should be defined in relation to the nature of the ITS implemented on the route. Typically, this would be the flow between key junctions.	Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-N5**

Benefit KPI Short Name	Benefit KPI Long Name	Benefit KPI Definition	KPI Calculation	EU EIP Code
Change in Mode Share	Change in mode share (% mode share points) on corridors where ITS has been implemented. Report percentage mode share separately for each mode, see breakdown by vehicle classification section.	○ Modes: The method of transport used, i.e. walking, cycling, cars and light vehicles, trucks and commercial vehicles, bus, tram and train. All relevant modes should all be reported. Whether to include certain modes of transport is likely to be dependent upon the corridor geography, for example walking and cycling are not likely to be significant modes on an inter-urban corridor. ○ Mode share: The percentage of journeys on a corridor undertaken by a specific mode of transport. ○ Corridors where ITS has been implemented: A key route between two places. This could be a road but can also be widened to include public transport routes, such as rail lines. Member States should specify the multi-modal corridors that will be included within this KPI and the points between which mode share will be measured. This could be based upon locations outlined in the associated Deployment KPIs, but it is not anticipated that sufficient data will be available to calculate this KPI in all instances.	Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-I1**
Change in Accident Numbers and Severity	Absolute and % change in number of reported accidents of all severities as well as accident rates (i.e. accidents per vehicle-km travelled) measured along the road network (TEN-T and/or National) affected by the implementation of the relevant ITS system. Absolute number of accidents Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change in accident and accident rates can easily be derived if the selected timeframes are defined consistently. Report separately by vehicle type and severity where possible and provide clear descriptions of adopted accident classification assumptions. Report separately by accident severity where possible.	○ Reported accidents: The number of accidents of all severities (by severity) on a route as reported by the emergency Services. Typical reporting timeframes : monthly and annual. ○ Routes where ITS has been implemented: Member States should specify which routes will be included within this KPI and the points between which accident numbers will be measured. This could be based upon those outlined in the associated Deployment KPIs. ○ Accident severity: Accidents should also be reported based upon their severity (fatalities, serious injuries, light injuries) where possible following the latest definitions used as part of the Community database on Accidents on the Roads in Europe (CARE)26. The CADAS glossary also provides guidance in the calculation of these statistics.27 ○ Accident rates : typically number of accidents per million or billion vehicle-km travelled per month/year. In this case, the vehicle-km travelled would need to be estimated over the TEN-T and/or National Road network affected by the ITS system. ○ The following definitions will be used in evaluation: • Killed in road accident: Any person who died within 30 days as a result of the accident. • Injured in road accident: Any person who was not killed, but sustained as a result of the accident injuries requiring treatment or observation in hospital (for at least 24 hours). ○ Definitions of terms: • Personal Injury Accidents involve at least one victim (fatal or injured) and one vehicle (i.e. pedestrians falling are out of the scope) • Fatality = victim dying within 30 days following accident • Serious injury = victim in treatment/observation at hospital for at least 24h	Please refer to Appendix A of this document for a suggested calculation methodology. Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-S1**

Benefit KPI Short Name	Benefit KPI Long Name	Benefit KPI Definition	KPI Calculation	EU EIP Code
Change in CO2 emissions	Change in annual CO2 emissions (Tons) (absolute and % difference) measured along the road network (TEN-T and/or National) affected by the implementation of the relevant ITS system. Estimates to refer to any evaluator's specified timeframe (e.g. the morning peak from 06:00 until 09:59 hrs, inter-peak 10.00 until 16.00, 24hr period, etc). The change CO2 emissions can easily be derived if the selected timeframes are defined consistently. Report separately by vehicle type where possible and provide clear descriptions of adopted vehicle classification and emission rate assumptions.	○ CO2 emissions: The amount of carbon dioxide emitted collectively by the vehicles utilising a route. This should be aggregated up to produce an annual figure. for transport CO2 emissions are typically estimated based upon fuel consumption at the pump and therefore cannot easily be directly measured at a network level. At a network level emissions are therefore typically inferred based upon traffic flows, speeds and assumptions regarding average vehicle efficiency per kilometre for the different vehicle types using a route. Where available national guidance should be used in the calculation of CO2 emissions to take account of variations in national vehicle fleet makeup. Where suitable national guidance does not exist UK guidance provides an appropriate starting point28. ○ Routes where ITS has been implemented: Member States should specify which routes will be included within this KPI and the points between which carbon emissions will be calculated. This could be based upon those outlined in the associated Deployment KPIs.	Please refer to Appendix A of this document for a suggested calculation methodology. Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-E1**
Public eCall Timeliness	Total time taken between : accident occurrence to initiation of public (112) eCall to the presentation of the content of MSD in an intelligible way at the operator's desk in the Public Safety Answering Point. The aim of eCall is to shorten the time between the accident and the dial of the call – not the length of the transmission.	○ eCall: referred to in EU Directive 2010/40/EU as 'interoperable EU-wide eCall') means an in-vehicle emergency call to 112, made either automatically by means of the activation of in- vehicle sensors or manually, which carries a standardised minimum set of data and establishes an audio channel between the vehicle and the eCall PSAP via public mobile wireless communications networks.29 ○ Public Safety Answering Point (PSAP): A physical location where emergency calls are first received under the responsibility of a public authority or a private organisation recognised by the Member State. ○ Minimum set of data (MSD): The information defined by the standard 'Road transport and traffic telematics – eSafety – eCall minimum set of data (MSD)' (EN 15722) which is sent to the eCall PSAP.	KPI = Average time (seconds) from time of accident occurrence to presentation of the content of MSD in an intelligible way at the operator's desk in the PSAP. Absolute and % difference for Corresponding timeframes before and after ITS implementation (where applicable).	**EUEIP-BKPI-S2**
Change in Noise Pollution	**Noise Reduction:** ITS impact considered negligible	A 30% reduction in traffic flows would approximately result in a drop of 2Db in terms of noise emissions. As such ITS Services are considered to result in a negligible impact and the Noise Reduction Benefit KPI is not recommended for further consideration.	n/a	n/a

4. Appendix A – Benefit KPIs estimation, methodologies

a) Prevention of Road Accidents

Prevention of Road Accidents AND Casualties			
Data Measurement, where (as defined by owner)	Data Required for Measurement of KPI	Measured over what Timescale (as defined by owner)	Calculations (based on current DfT methodology)
Along homogeneous sections of road subject to ITS service implementation. This is likely to relate to both directions of travel along said section. In case of motorways likely to be taken as junction-to-junction stretches.	**Total two-way travelled Vehicle-km on the road section of interest (assuming this needs to be estimated from counting loops):** • **Traffic Flow:** Vehicles per hour per lane per direction (by hour of the day) over 24 hours • Lane-km per direction (over road section of interest) • Average hourly Traffic Speed (km/hr) by direction of travel • Number of accidents/Casualties (by type) per annum (pre/post ITS implementation) ensuring that impact of any other road-scheme is, as far as practically possible, removed from the analysis	• Traffic flows and speeds: hourly over 24 hours • Accidents to be measured over period of 3-5 years (pre and post ITS implementation) • Should pre-implementation data not be available the relevant accident rates should be estimated using empirical data from similar roads (including similar traffic /weather conditions) and areas types where No ITS scheme has been in place	Accident/Casualty Rates (Pre-Post ITS implementation) ❑ Step 1: Traffic Density (vehicles/lane-km) = Traffic Flow (vehicles/hr/lane) / traffic speed (km/hr) ❑ Step 2: No. of vehicles travelling on lane in the hour of reference (vehicles/lane) = Traffic Density (vehicles/lane-km) x lane length (km). ❑ Step 3: Vehicle-km (Traffic) = (vehicles/lane) x lane-km ❑ Step 4: Add the vehicle-km over all lanes and then over all 24 hours and days of the year. This would provide the estimated ANNUAL VEHICLE-KM. *(If data from only a specific month(s) is available consider estimation of expansion factors to estimate yearly values)*. ❑ Step 5: Divide the observed pre/post ITS implementation number of annual accidents/casualties (by casualty type) by the annual Vehicle-km to obtain accident/casualty rates per Vehicle-km. ❑ Step 6: Estimate the yearly net accident/casualty rate change based on the pre/post ITS service implementation accident/casualty rates. Trending analysis of accident rates for the reference scenario, i.e. accident rate trends based on pre-ITS implementation data, would be required to determine whether accident rates are falling irrespective of implementation of ITS. This would reduce risk of overestimation of ITS-related benefits. ❑ Estimate the annual fall in number of accidents, due to the implementation of the ITS service, by multiplying the net accident/casualty rate difference by the annual vehicle-km **in the year n of ITS service implementation**. Please note that the above approach may underestimate the accident saving benefits. This is because the post-ITS service accident rate reduction could be limited by the natural growth in traffic volumes which could, in turn, drive up the number of accidents. In this case it may be advisable to collate accident rates data on similar roads without ITS Services but with similar traffic levels and travel conditions in order to provide a benchmark for a No-ITS implementation scenario.

Prevention of Road Accidents AND Casualties

Casualties defined as:

- **Fatality:** any death that occurs within 30 days from causes arising out of the accident;
- **Serious injury:** records casualties who require hospital treatment and have lasting injuries, but who do not die within the recording period for a fatality; and
- **Slight injury:** where casualties have injuries that do not require hospital treatment, or, if they do, the effects of the injuries quickly subside.

Accident defined as:

- **Personal Injury Accidents (PIAs)** are incidents where **casualties** occur. They are categorised by the most severe casualty caused by that accident. *for example, a Severe Accident will have no fatalities, at least one severe injury and none or more slight injuries.*
- Accidents may also be **damage-only**, where no personal injuries are sustained.

2.1.2 Transport accidents impose a range of impacts on people and organisations. The types of impacts are shown Table 2.1 below.

Table 2.1 Accident impacts of transport

Related to number of casualties	Related to number of accidents
Pain, grief and suffering	Material damage
Lost economic output	Police costs
Medical and healthcare costs	Insurance administration
	Legal and court costs

Table A 4.1.1: Average value of prevention per casualty by severity and element of cost £ (2010 prices and 2010 values)

Casualty type	Lost output	Human costs	Medical & ambulance	Total
Fatal	565,777	1,079,073	971	1,645,822
Serious	21,797	149,942	13,205	184,944
Slight	2,304	10,976	977	14,257
Average, all casualties	9,648	36,906	2,417	48,971

Table A 4.1.3: Average value of prevention of road accidents by severity and element of cost, £ (2010 prices & 2010 values)

Accident severity	Casualty related costs			Accident related costs			
	Lost output	Human costs	Medical & ambulance	Police cost	Damage to property	Insurance & admin	TOTAL
Fatal	613,609	1,204,968	5,341	17,235	11,028	302	1,852,483
Serious	24,301	165,522	14,581	2,014	4,981	188	211,587
Slight	3,056	14,559	1,296	524	2,993	114	22,542
All injury	12,972	49,621	3,249	925	3,369	127	70,263
Damage only	-	-	-	34	1,890	54	1,978

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Note that a PIA can include more than one type of casualty: ***for example, in the UK in 2010, 1.0 fatal road accident on average involved 1.07 fatalities, 0.31 serious casualties and 0.50 slight casualties.***

*These proportions/weights may vary with time and across countries due, for example, to impacts of vehicle technology. Should country-specific **PIAs and Accident Only Costs** not be available, the UK values could be used at starting point by adjusting the monetary values in terms of the relative GDPs and exchange rates. Please also refer to EIP+ Cost/Benefit Analysis Methodology.*

Example Fatal PIA estimate for Lost Output Component using Casualty-Lost-Output values: 1.07 x £565,777 + 0.31 x £21,797 + 0.5 x £2,304 = £613,290 ≈ (£613,609 of table above)

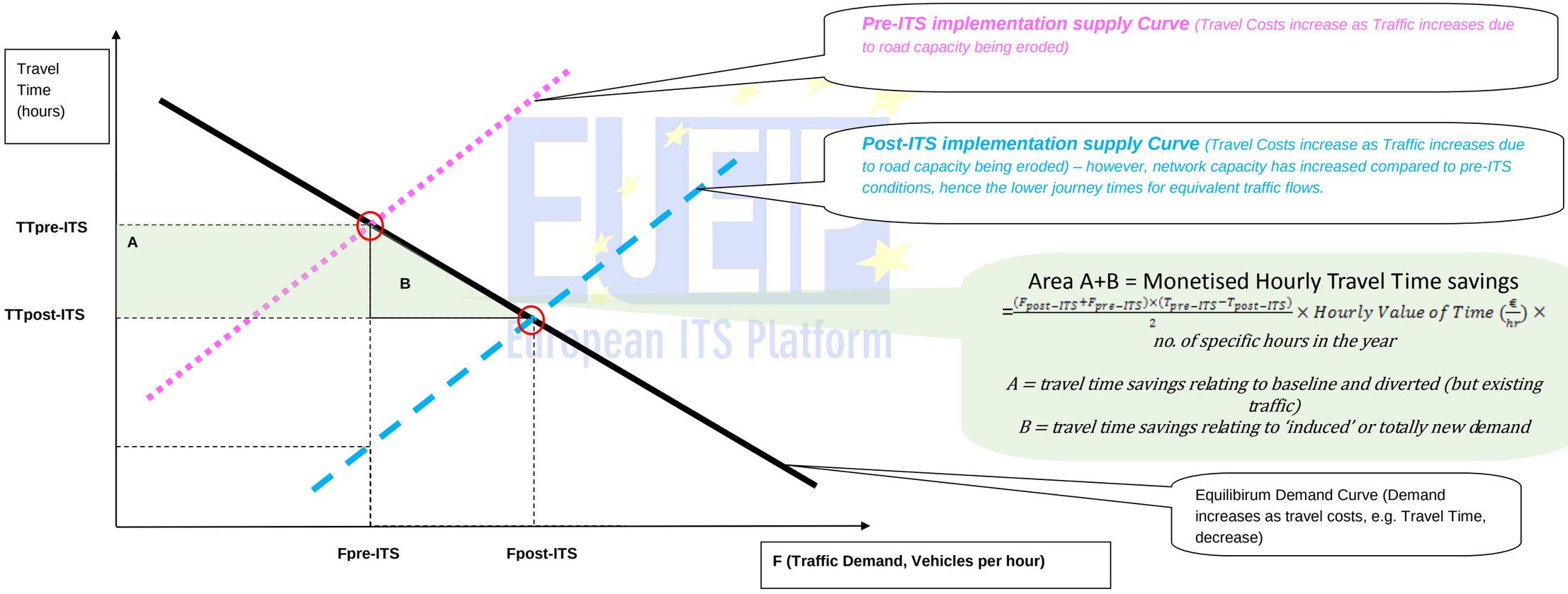
b) Congestion

Change in Hours Lost and Peak Journey Times			
Data Measurement, where (as defined by owner)	Data Required for Measurement of KPI	Measured over what Timescale (as defined by owner)	Calculations (based on current DfT methodology)
Along homogeneous sections of road subject to ITS service implementation. This is likely to relate to both directions of travel along said section. In case of motorways likely to be taken as junction-to-junction stretches.	❑ Average hourly Traffic Speed (km/hr) by direction of travel. ❑ Length of road section (centre-line length in km) by homogeneous section of road under ITS service ❑ Average hourly journey times measured either directly using: a) GPS/Mobile Data along the route of interest, b) journey time surveys; or extrapolated using speed data collected via traffic counting loops, provided that homogeneous sections of road are being monitored by the loops in order to derive reliable sectional journey times. ❑ **Traffic Flow:** Vehicles per hour per lane per direction (by hour of the day) over 24 hours in order to provide data about vehicle-type proportions and allow calculation of total lost hours.	❑ Data to be collected over entire 24 hour periods over the entire year. ❑ Data to be summarised on a monthly basis by hour of day of an average day in the month ❑ According to latest Reference speeds (pre ITS service implementation) should be estimated for each hour of each month using data from 6 years (this represents an ideal but not binding conditions in case of no data availability)	**Calculations below assume that data is collected via traffic counting loops (in both directions of travel) and that journey times are estimated by dividing the road section length (Centre-line length in Km) by the relevant speed values:** **Lost Vehicle Hours:** ❑ Step 1: Free Flow Speed (FFS, km/hr) = 85th percentile speed across ALL car observations and directions of travel over the last 6 years (if available), 'capped' to current speed limits. Data for FFS to be collected during whole 24-hr periods and for all available days within each month of the year. *The ITS service implementation should not impact the estimation of the FFS value.* ❑ Step 2: Average traffic speed (km/hr) by hour of day for an average day of each month by vehicle type on both directions of travel ❑ Step 3: **Vehicle-hours lost** (by vehicle type and direction of travel) within each hour of an average day in each month of the year = **Vehicle Flow (vehicles/hr) x Road section Length (km) x [(1/Average Hourly Speed) – (1/FFS)]** ❑ Changes in peak journey times would require the speeds and journey times estimation under step 2 to be undertaken for corresponding hours and months **pre/post ITS service implementation**. These differences could be used in conjunction with the relevant values of time in order to monetise the congestion benefits (see next page). Please note that the above approach may underestimate the journey time saving benefits. This is because the post-ITS journey time reduction could be limited by the natural growth in traffic volumes which could, in turn, drive up the journey times. Monetisation of benefit will require allocation of time savings to different vehicle classes using the avaiaible vehicle classification data and the relevant VOTs by vehicle class. The use of National/Supra-National VOTs by cehicle class is discussed in the EU/EIP+ Cost Benefit Analysis Guidance, however, irrespective of the adopted values, assumptions must be clearly presented by evaluators to facilitate due-diligence processes and allow the estimation of the same benefit under different assumptions.

Change Peak Hour Journey Times (example)

The changes in peak hour journey times can be used in order to monetised the ITS service benefits as indicated by the chart and formula below. The same calculations could apply to off peak hours; however, in this case, benefits would be reduced. Speed and flow data should allow the estimation to be carried out for different vehicle classes.

Please refer also to De-congestion benefit estimation (Chapter 5) of the **EIP+ Cost Benefit Analysis Guidance report** for alternative approaches to estimation and monetisation of de-congestion benefits. The Cost Benefit Analysis Guidance report also offers some suggestions (Chapter 4) about the baseline Values of Times for the monetisation



c) Journey Time reliability

Journey Time Reliability			
Data Measurement, where (as defined by owner)	Data Required for Measurement of KPI	Measured over what Timescale (as defined by owner)	Calculations (based on current DfT methodology)
Along homogeneous sections of road subject to ITS service implementation. This is likely to relate to both directions of travel along said section. In case of motorways likely to be taken as junction-to-junction stretches.	**Additional Travel Time compared to Free Flow Conditions measured between 6am and 8pm. Similar to Lost Vehicle Hours.** ❑ Hourly speed records for all hours in question (both directions of travel)	❑ Pre/Post ITS service implementation ❑ Ideally whole year but a complete number of corresponding months to allow like-for-like comparisons of data.	**Calculations below assume that data is collected via traffic counting loops (in both directions of travel) and that journey times are estimated by dividing the road section length (Centre-line length in Km) by the relevant speed values:** **Lost Vehicle Hours:** ❑ Step 1: Free Flow Speed (FFS, km/hr) = 85th percentile speed across ALL car observations and directions of travel over the last 6 years (if available), 'capped' to current speed limits. Data for FFS to be collected during whole 24-hr periods and for all available days within each month of the year. *The ITS service implementation should not impact the estimation of the FFS value.* ❑ Step 2: 95th percentile traffic speed (km/hr) by hour of day for an average day of each month by vehicle type on both directions of travel ❑ Step 3: translate speeds in Journey times over relevant section of road ❑ **Step 4: 95th Percentile Journey Time / Free Flow Journey Time ratio (this ratio can be compared as part of before and after ITS implementation).**

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d) Emissions

Emissions and Fuel Consumption			
Data Measurement, where (as defined by owner)	Data Required for Measurement of KPI	Measured over what Timescale (as defined by owner)	Calculations (based on current DfT methodology)
Along homogeneous sections of road subject to ITS service implementation. This is likely to relate to both directions of travel along said section. In case of motorways likely to be taken as junction-to-junction stretches.	**Total two-way travelled Vehicle-km on the road section of interest (assuming this needs to be estimated from counting loops):** • **Traffic Flow:** Vehicles per hour per lane per direction (by hour of the day) over 24 hours **pre-post ITS service implementation by VEHICLE TYPE** • Lane-km per direction (over road section of interest) • Average hourly Traffic Speed (km/hr) by direction of travel **pre-post ITS service implementation (possibly by VEHICLE TYPE)** • UK Consumptions and Emission curves by vehicle type: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4556/aeat-updated-vehicle-emission-curves.pdf and https://www.gov.uk/government/publications/road-vehicle-emission-factors-2009	❑ Data to be collected over entire 24 hour periods over the entire year. ❑ Data to be summarised on a monthly basis by hour of day of an average day in the month	Total annual emission values (CO_2, PM10, NOX, etc) estimated **pre-post ITS service implementation for corresponding time periods** ❑ Step 1: Traffic Density (vehicles/lane-km) = Traffic Flow (vehicles/hr/lane) / traffic speed (km/hr) by VEHICLE TYPE ❑ Step 2: No. of vehicles travelling on lane in the hour of reference (vehicles/lane) = Traffic Density (vehicles/lane-km) x lane length (km), BY VEHICLE TYPE. ❑ Step 3: Vehicle-km (Traffic) = (vehicles/lane) x lane-km ❑ Step 4: Add the vehicle-km over all lanes and then over all 24 hours and days of the year, by VEHICLE TYPE. This would provide the estimated ANNUAL VEHICLE-KM by VEHICLE TYPE pre-post ITS service implementation. *(If data from only a specific month(s) is available consider estimation of expansion factors to estimate yearly values)*. ❑ Step 5: using speed data for corresponding time periods in conjunction with the Emission curve data estimate the emission rates (by VEHICLE TYPE). ❑ Step 6: Multiply the vehicle-km by VEHICLE TYPE by the relevant consumption/emission rates and time periods and add estimates over the entire year. ❑ NOTE: the UK values have been calibrated using a set of assumptions relating to future vehicles' composition and consumption rates. These may require some form of high level checks to verify their transferability to other countries. Please note that the above approach may underestimate the air pollution saving benefits. This is because the post-ITS service emission rates reduction could be limited by the natural growth in traffic volumes which would, in turn, drive up emissions.

Change in Emissions (example)

The example below takes into account a nominal set of figures which are assumed to have been derived through traffic survey. **For the monetisation of the emission values refer to EIP+ Cost Benefit Analysis Report.**

- ❑ HGV articulated traffic Flow pre-ITS service implementation (Fpre-ITS) for a generic peak hour of a generic month of the year = 5000 vehicle per hour (both directions)
- ❑ HGV articulated traffic Flow post-ITS service implementation (Fpost-ITS) for a generic peak hour of a generic month of the year = 6000 vehicle per hour (both directions)
- ❑ Length of homogeneous stretch of road (centre line) = 10km
- ❑ Speed of traffic in generic peak hour pre-ITS service implementation = 40 km/hr
- ❑ Speed of traffic in generic peak hour pre-ITS service implementation = 60 km/hr
- ❑ Type of vehicle 'generic Artic HGV (Diesel)'
- ❑ Assessment year = 2020
- ❑ Assume that speeds are the same in both directions of travel (hence all calculations below relate to the total two-way traffic flow

Table 7: Speed-emission factor coefficients for fuel consumption from the fleet of rigid and artic HGVs in years 2003-2035. These coefficients are to be used in an equation of the form EF = (a + bx + c.x^2 + d.x^3 + e.x^4 + f.x^5 + g.x^6)/x where x is average speed in kph. The figures are consistent with the average mpg fuel efficiencies for HGVs given in DfT's CSRGT.

Region	Pollutant	Year	Vehicle type	Fuel type	Unit	Function	Coefficients						
						Type	a	b	c	d	e	f	g
GB	Fuel	2003	HGV - artic	Diesel	litre/100km	Polynomial	593.606	-15.7797	4.96073	-0.1902	0.0031933	-2.444E-05	7E-08
		2004	HGV - artic	Diesel	litre/100km	Polynomial	553.5392	-11.874	4.567523	-0.17682	0.0029754	-2.276E-05	6.5E-08
		2010	HGV - artic	Diesel	litre/100km	Polynomial	493.7537	-2.1118	3.85407	-0.15451	0.0026227	-2.002E-05	5.7E-08
		2015	HGV - artic	Diesel	litre/100km	Polynomial	478.6758	-0.19485	3.665079	-0.14827	0.0025222	-1.924E-05	5.5E-08
		2020	HGV - artic	Diesel	litre/100km	Polynomial	476.0918	0.127986	3.630602	-0.14712	0.0025036	-1.91E-05	5.4E-08

EXAMPLE: Articulated HGV (2020) Fuel Consumption Estimation		a	b	c	d	e	f	g		
		476.0918	0.127986	3.630602	-0.14712	0.0025036	-1.91E-05	5.40E-08		
X = (average speed)		a = Constant	b*X	c*X^2	d*X^3	e*X^4	f*X^5	g*X^6	Total consumption (Litres/100Km) = Sum of Polinomial / X	Total consumption (Litres/Km)
Average Speed pre-ITS (km/h)	40	476.0918	5.11944	5808.963	-9415.68	6409.216	-1.96E+03	2.21E+02	**38.73**	**0.39**
Average Speed post-ITS (km/h)	60	476.0918	7.67916	13070.17	-31777.9	32446.656	-1.49E+04	2.52E+03	**31.50**	**0.31**

Hourly Fuel Consumption	Pre-ITS	Post-ITS
2-way Flow (vehicles/hr)	5,000	6,000
Road Length (km)	10	10
Average hourly Speed (km/hr)	40	60
Vehicle-km	12,500	10,000
Consumption rate (litre/km)	39	31
Fuel consumption (litres) litre/km x Vehicle-km	4,875	3,100
CO_2 emissions rate conversion factor (from diesel litres/100km to gCO_2/km)	26.39	26.39
CO_2 emissions (g) =	128.6k	81.8k
CO_2 emissions saving (g) =		**46.8k**

5. Appendix B : DG MOVE KPIs shortlist

[Levels of Services might be indicated in conjunction with ITS deployment KPI. Levels of Services extend from "no service" to "basic", "enhanced", "advanced" as defined in EasyWay & EIP Guidelines]

5.1. DG MOVE Deployment KPIs

Short Name	Information gathering infrastructures / equipment (road KPI)
Long Name	% of road network type covered by information gathering infrastructures / equipment
Definitions	Information gathering infrastructures / equipment means any road based or mobile ITS enabling traffic monitoring, weather or environmental conditions monitoring, emissions monitoring, or forecasting of traffic conditions. It includes for instance sensors, cameras / CCTV, traffic control centres, floating car data. It is acknowledged that technologies can differ from one country / network / area to another. It is acknowledged that such infrastructures / equipment can serve several purposes (from traffic measures to information Services).
Figures to be provided	Length of road network type / road sections (in km) equipped with information gathering infrastructures & Total length of this same road network type (in km). Figures to be provided by type of network / zone. Figures to distinguish fixed and mobile equipment.
Calculation	KPI = (kilometres of road network type equipped with information gathering infrastructures / total kilometres of same road network type) x 100 KPI to be calculated by type of network / zone (when relevant).
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEDR / NRAs • CEF ITS corridors

Short Name	Incident detection (road KPI) Traffic management and traffic control measures (road KPI) Cooperative-ITS Services and applications (road KPI)
Long Name	% of road network type covered by: • incident detection • traffic management and traffic control measures • cooperative-ITS Services and applications
Definitions	Incident detection means any ITS used to detect traffic incidents (e.g. accidents, congestion) on a section of road network that can be used to trigger actions to manage the incident. Traffic management and traffic control measures means any measures derived from road based ITS enabling the control of traffic movements. It includes for instance hard shoulder running, ramp metering, dynamic lane management, HGV overtaking ban, variable speed limits, as well as parking management, vehicles / fleet prioritisation. Cooperative-ITS Services or applications means road based ITS infrastructure enabling Services or applications using infrastructure to vehicle or vehicle to infrastructure communication. It is acknowledged that technologies can differ from one country / network / area to another. Tolling does not fall within the scope of these indicators / calculations.
Figures to be provided	Length of road network type / road sections (in km) equipped with ITS to detect incident & Total length of this same road network type (in km). Length of road network type / road sections (in km) covered by traffic management and traffic control measures & Total length of this same road network type (in km). Length of road network type / road sections (in km) covered by C-ITS Services or applications & Total length of this same road network type (in km). Figures to be provided by type of network / zone.
Calculation	• KPI = (kilometres of road network type equipped with ITS to detect incident / total kilometres of same road network type) x 100 • KPI = (kilometres of road network type covered by traffic management and traffic control measures / total kilometres of same road network type) x 100 • KPI = (kilometres of road network type covered by C-ITS Services or applications / total kilometres of same road network type) x 100 KPI to be calculated by type of network / zone (when relevant).
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEDR / NRAs • CEF ITS corridors

Short Name	112 eCalls (road KPI)
Long Name	Annual number of automatic and manual 112 eCalls received, including number of false 112 eCalls.
Definitions	Automatic and manual 112 eCalls as defined by EU Legislation. False calls as defined in COCOM questionnaire on 112: False calls are calls which are not followed up with intervention or assistance from the PSAP or the emergency Services. Calls that report an emergency event which has already triggered intervention or assistance from the part of the PSAP, therefore not triggering separate intervention or assistance, will not be considered false calls.
Figures to be provided	• Total number of automatic 112 eCalls. • Number of false automatic 112 eCalls. • Total number of manual 112 eCalls. • Number of false manual 112 eCalls. • Figures to be provided at national level.
Calculation	N/A
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	With inputs from: • As from 2018, Member States (PSAPs) • Possibly COCOM questionnaire on 112 KPIs

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Short Name	Real-time traffic information (road KPI) Dynamic travel information (multimodal KPI) Freight information (multimodal if possible or road KPI)
Long Name	% of road / transport network type covered by: • real-time traffic information Services • dynamic travel information Services • freight information Services
Definitions	Real-time traffic information means information derived from any road and traffic data, or their combination thereof, provided by any road authorities, road operators or service providers to road users through usual communication channels. Real time traffic information relates to current traffic conditions on the road network. Such information includes for instance accident locations, incident warnings (incl. safety related events / conditions), road works, congestion hotspots, travel times / delays. Such Services fall within the scope of delegated Regulations 886/2013 & 962/2015. Dynamic travel information means up to date information derived from any travel data provided by any transport operators or service providers through usual communication channels. Such Services fall within the scope of delegated Regulation on multimodal travel information Services currently in preparation. Dynamic travel information relates to pre-trip and on-trip information to any travellers. Such information includes for instance disruptions, travel times / delays, vehicles positioning, accessibility of nodes and vehicles. Any information that is to be made available to users should be provided in such a form so that it can be received in full also by users might have specific requirements related to the data, for example people with reduced mobility, orientation and/or communication. Freight information means static and dynamic information tailored to the needs of the freight industry. Such information includes for instance parking / loading availability and cost, access restrictions, incident warnings and disruptions, travel times / delays, vehicles positioning. It is acknowledged that communication channels to provide above-listed Services can differ from one country / network / area / operator to another (e.g. VMS, digital / spoken radio, on-board devices, web sites, apps). The above Services have to be understood as at least the provision of public Services (although implementing bodies of such public Services might be private contractors operating under public-private contractual agreements).
Figures to be provided	Length of road network type / road sections (in km) with provision of real-time traffic information Services & Total length of this same road network type (in km). Length of transport network type (in km) with provision of dynamic travel information Services & Total length of this same transport network type (in km). Number of transport nodes (e.g. rail or bus stations) covered by dynamic travel information Services & Total number of the same transport nodes. Length of road network type / road sections (in km) with provision of freight information Services & Total length of this same road network type (in km). Number of freight nodes (e.g. ports, logistics platforms) covered by freight information Services & Total number of the same freight nodes. Figures to be provided by type of network / zone / node.
Calculation	• KPI = (kilometres of road network type with provision of real-time traffic information Services / total kilometres of same road network type) x 100 • KPI = (kilometres of transport network type with provision of dynamic travel information Services / total kilometres of same transport network type) x 100 • KPI = (number of transport nodes with provision of dynamic travel information Services / total number of same transport nodes) x 100 • KPI = (kilometres of road network type with provision of freight information Services / total kilometres of same road network type) x 100 • KPI = (number of freight nodes with provision of freight information Services / total number of same freight nodes) x 100 KPI to be calculated by type of network / zone / node (when relevant), and if relevant indicate the proportion of Services accessible to passengers with reduced mobility, orientation and/or communication.
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEDR / NRAs • CEF ITS corridors • Transport operators

5.2. DG MOVE Benefit KPIs

Short Name	Change in travel time (road KPI)
Long Name	% change in peak period travel time along routes / within areas where ITS has been implemented or improved.
Definitions	Peak period means the hour with the highest traffic flow during a week day. It is defined for each route / area individually. An aggregated average can be calculated for estimation of consolidated results at road network level. Routes / areas where ITS has been implemented or improved should be specified. Length along / area within which the change in travel time is measured should be long / wide enough to be representative.
Calculation	KPI = ((travel time before ITS implementation or improvement – travel time after ITS implementation or improvement) / travel time before ITS implementation or improvement) x 100 Figures to be provided also include vehicle.km for the route / area considered
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEF ITS corridors

Short Name	Change in road accident resulting in death or injuries numbers (road KPI)
Long Name	% change in number of reported road accidents resulting in death or injuries along routes / within areas where ITS has been implemented or improved
Definitions	Reported road accidents mean the number of accidents resulting in death or injuries on a route / within an area. If possible, accidents can distinguish fatalities, serious and slight injuries following the latest definitions used as part of the CADAS glossary[1] which also provides guidance in the calculation of these statistics. An aggregated average can be calculated for estimation of consolidated results at national level (i.e. aggregation of several routes / areas). Routes / areas where ITS has been implemented or improved should be specified.
Figures to be provided	Number of road accident resulting in death or injuries before ITS implementation or improvement Number of road accident resulting in death or injuries after ITS implementation or improvement Results shall be provided / aggregated at national level to be representative enough. If possible, distinction can be made between accidents resulting in deaths, serious injuries or slight injuries.
Calculation	KPI = ((number of road accident resulting in death or injuries before ITS implementation or improvement – number of road accident resulting in death or injuries after ITS implementation or improvement) / number of road accident resulting in death or injuries before ITS implementation or improvement) x 100 Figures to be provided also include vehicle.km for the route / area considered.
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEF ITS corridors

[1] http://ec.europa.eu/transport/road_safety/pdf/statistics/cadas_glossary.pdf

Short Name	Change in traffic-CO2 emissions (road KPI)
Long Name	% change in annual traffic CO2 emissions on routes / within areas where ITS has been implemented or improved
Definitions	Traffic CO2 emission means the amount of CO2 emitted collectively by road vehicles utilising a route / circulating within an area. This should be aggregated up to produce an annual figure. CO2 emissions are typically estimated based upon traffic flows and speeds coupled with assumptions regarding fuel consumption and/or average vehicle efficiency per kilometre for the different vehicle types using a route / circulating within an area. Routes / areas where ITS has been implemented or improved should be specified. Length along / area within which the change in CO2 emissions is calculated should be long / wide enough to be representative.
Calculation	KPI = ((traffic CO2 emissions[2] before ITS implementation or improvement – traffic CO2 emissions after implementation or improvement) / traffic CO2 emissions before ITS implementation or improvement) x 100
Responsible point of contact	ITS Committee (Member States)
Possible channels of collection	Possible inputs from: • CEF ITS corridors

[2] Measured in metric tons CO2 equivalent

6. Appendix C: Summary of EU/EIP and DG MOVE KPI's comparison results

Comparison Index	EU/EIP Deployment KPI Title/Code	DG MOVE Deployment KPI Title	Description of Identified Discrepancy	Proposed Discrepancy Resolution
A1	**Incident detection and incident management**	**Incident detection (road KPI)**	No discrepancy, moreover the EU/EIP definitions are more detailed.	Not necessary
B1	**Automated speed detection**	**Information gathering infrastructures / equipment (road KPI)**	No discrepancy, moreover the EU/EIP definitions are more detailed.	Not Necessary
C1	**Dynamic Public Transport Traveller Information**	**Dynamic travel information (multimodal KPI)**	DG MOVE KPI description is wider. EU EIP KPI is explicitly focusing on urban public transport and is related to % of [mode-specific] stops providing dynamic travel information. Stops include those provided with dynamic traveller information in the form of both physical infrastructure (variable message signs) and virtual infrastructure (apps and/or other means). DG MOVE KPI proposes % of [mode] stops but also % of transport network equipped with dynamic travel information.	Resolution has been achieved by expanding coverage of the EU/EIP KPI to the entire public transport network (e.g. long distance bus lines, having included in the coverage: inter-urban and/or rural public transport stops). Deployment should in our opinion still be focussed on the number and % of stops on the network.
D1	**Traffic condition and Travel Time Information Service**	**Real time traffic information (road KPI)**	The KPI measurement is similar (% of network covered). The proposed reporting according to EU EIP is – to our understanding - more detailed, also addressing traffic condition / management related issues.	Maintain EU EIP additional detail as this is needed for distinguishing different types of Services.
E1	**Adaptive Traffic Control or Prioritisation**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	In the case of adaptive Traffic Control EU/EIP prefer the absolute number and % of intersections adaptively controlled. The evaluation refers to an interurban situation.
F1	**Intelligent Vehicles**	**112 eCalls**	Discrepancy exists in terms of reference value. EU/EIP KPI intends to measure the number of eCall equipped vehicles whilst DGMOVE's KPI intends to measure the number of eCalls made per annum (manual or automatic).	The network is task of the operator. Buying intelligent vehicles is private business which might be supported by the government. Statistics about number of equipped vehicles can be collected on a case-by-case basis depending on data availability and ease of access. DGMOVE's KPI can be used as interim proxy for system penetration, especially if eCalls are measured as a proportion of the reported accidents.
G1	**Intelligent Services in accordance to Delegated Regulations under the ITS Directive**	**Real-time traffic information (road KPI)**	Both deal with km and % of the network covered; EU EIP KPI differentiates between real-time traffic information and safety-related traffic information Services.	Not necessary

Comparison Index	EU/EIP Deployment KPI Title/Code	DG MOVE Deployment KPI Title	Description of Identified Discrepancy	Proposed Discrepancy Resolution
G2	**Intelligent Services in accordance to Delegated Regulations under the ITS Directive**	**Dynamic travel information (multimodal KPI)**	Although the delegated act on Multimodal Travel Information and Planning Services (priority action a) will be published in 2017, that particular type of service is not yet included in the EU EIP KPI. The DG MOVE KPI also proposes to use % of transport nodes with provision of dynamic travel information Services	The priority action a) type of service has been included as a separate type in the EU EIP KPI definition. The use of transport nodes in addition to length covered is now considered.
G3	**Intelligent Services in accordance to Delegated Regulations under the ITS Directive**	**Freight information (multimodal if possible or road KPI)**	The road KPI with length and % of road network covered is the same, but the multimodal DG MOVE KPI would require % of freight nodes with provision of freight information Services	Resolution has been provided by including number and % of freight nodes with provision of freight information Services in the EU/EIP KPI definition.
H1	**Speed Limit Information**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary
I1	**Variable Speed Limits**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary
J1	**Forecast and Real Time Event Information**	**Information gathering infrastructures / equipment (road KPI**	The EU/EIP definition is related to both % and Length. The DG MOVE definition only to %. The length is implicitly included. EU/EIP description is more detailed.	Suggest keeping both % and length as KPI (in some part of the network this service could not be necessary; so length information is more precise)
J2	**Forecast and Real Time Event Information**	**Real time traffic information (road KPI)**	The EU/EIP definition is related to both % and Length. The DG MOVE definition only to %. The length is implicitly included. EU/EIP description is more detailed	Suggest keeping both % and length as KPI (in some part of the network this service could not be necessary; so length information is more precise)
K1	**Weather Information Service**	**Information gathering infrastructures / equipment (road KPI)**	No discrepancy.	Not necessary
K2	**Weather Information Service**	**Real-time traffic information (road KPI)**	Although not mentioned in the description of the DG MOVE KPI, also weather information can be considered as real-time information. Both deal with % of the network	Not necessary
L1	**Co-Modal Traveller Information**	**Information gathering infrastructures / equipment (road KPI)**	No discrepancy	Not necessary
L2	**Co-Modal Traveller Information**	**Dynamic travel information (multimodal KPI)**	Co-modal Traveller information is somewhat more multi-modal (offering parallel information for different modes on one route), than dynamic travel information, which only states that it is necessary to provide travel data for every mode.	Not necessary, because it is easy to come from dynamic travel information to co-modal travel information. Both use the same indicator.
M1	**Dynamic Lane Management**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary.

Comparison Index	EU/EIP Deployment KPI Title/Code	DG MOVE Deployment KPI Title	Description of Identified Discrepancy	Proposed Discrepancy Resolution
N1	**Hard Shoulder Running**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary.
O1	**HGV Overtaking Ban**	**Traffic management and traffic control (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary
P1	**Traffic Management Plan Service for Corridors andNetworks**	**Traffic management and traffic control (road KPI) measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary
Q1	**Dynamic information on Intelligent truck parking**	**Freight information (multimodal if possible or road KPI)**	In EU EIP we say length and % of road network covered or impacted by Dynamic information on Intelligent truck parking (for ITS Parking Guidance Systems). But also number and % of rest areas on the road network covered or impacted by Intelligent Truck Parking and Secure Truck Parking (for ITS reservation systems). In DG MOVE they use % of road / transport network type covered by freight information Services. Freight information means static and dynamic information tailored to the needs of the freight industry. Such information includes for instance parking / loading availability and cost, access restrictions, incident warnings and disruptions, travel times / delays, vehicles positioning. Number of freight nodes (e.g. ports, logistics platforms) covered by freight information Services & Total number of the same freight nodes.	Not necessary. DG MOVE does not mention reservation of places but it is no problem if the KPI in EU EIP is more detailed and include information about priority action service).
R1	**Ramp Metering**	**Traffic management and traffic control measures (road KPI)**	No discrepancy as EU/EIP KPI represents a sub-set of DG MOVE KPI. In every subset case it is about length or numbers	Not necessary
T1	**Cooperative-ITS services and applications (road KPI)**	**Cooperative-ITS services and applications (road KPI)**	Adopted DGMOVE KPI in FULL	Not necessary

Comparison Index	EU/EIP Benefit KPI Title/Code	DG MOVE Benefit KPI Title	Description of Identified Key Discrepancy	Proposed Discrepancy Resolution
X1	**Change in Journey Time**	**Change in Travel Time (road KPI)**	DG MOVE limits calculations to Peak Period Travel. EU/EIP suggests data collection over additional time periods (however, this is not a mandatory requirement). Difference in definition of area coverage (DG MOVE specifies network over which the KPI is implemented whilst EU/EIP has a wider reach and asks to consider network which is 'affected' by the ITS service. DG MOVE calculation methodology is defined at very high level and as described it would limit the estimation of the travel time changes to the % difference between TTpost-ITS vs TTpre-ITS along the vertical axis of the diagram in Appendix A Part b (Congestion) of this document. EU/EIp requires the estimation of the vehicle-hours saved instead.	The fact that EU/EIP does not make the requirement to measure travel times outside peak periods a mandatory one it would still be considered ideal to create the opportunity to widen the scope for data collection and analysis. **Suggest to adopt EU/EIP time period coverage definition.** **The definition provided by EU/EIP represents a wider more encompassing coverage** and should be adopted insetad of that provided by DG MOVE. Should data collection provide to be problematic outside the area where the ITS system is directly implemented the fall-back position would then be that envisaged by DG MOVE. These two approaches are not mutually exclusive, however, the calculation defined by EU/EIP would then be adopted in order to estimate monetary benefits to road users. **Simple integration of DG MOVE's estimation approach may be recommended depending on reporting circumstances.**
AA1	Changes in accident numbers and severity	**Change in Road Accident resulting in death or injuries numbers (road KPI)**	Difference in definition of area coverage (DG MOVE specifies network over which the KPI is implemented whilst EU/EIP has a wider reach and asks to consider network which is 'affected' by the ITS service. DG MOVE methodology requires results to be reported at National Level, EU/EIP's methodology at corridor level. EU/EIP methodology requires the estimation and comparison of accident rates and not just of absolute accident numbers for pre-post ITS implementation. We note that DG MOVE require	**The definition provided by EU/EIP represents a wider more encompassing coverage** and should be adopted, where possible, for evaluation purposes. No major conflict as it depends on context. EU/EIP approach should be adopted for evaluation purposes as it is more comprehensive.

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Comparison Index	EU/EIP Benefit KPI Title/Code	DG MOVE Benefit KPI Title	Description of Identified Key Discrepancy	Proposed Discrepancy Resolution
			the estimation of vehicle-km ; however, there is no clear direct requirement to apply this statistic to the estimation of accident rates.	
AB1	**Change in CO2 emissions**	**Change in traffic-CO2 emissions (road KPI)**	EU/EIP suggests measuring emissions for different time periods as speed and hence travel time variations (pre/post ITS implementation) could provide very different results. DG MOVE savings are simply represented in % terms whilst EU/EIP approach would estimate difference in actual quantity (g) of CO2 emission.	EU/EIP approach is more detailed, however, it does not conflict with DG MOVE's KPI definition. Same information would need to be collected to provide each estimate. No conflict to be resolved.