ITS ACTION PLAN

FRAMEWORK SERVICE CONTRACT TREN/G4/FV-2008/475/01

D8 – FINAL REPORT

Study regarding guaranteed access to traffic and travel data and free provision of universal traffic information

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VERSIONING AND CONTENT REVIEW INFORMATION TABLE

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Disclaimer

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M A N A G E M E N T   S U M M A R Y

An efficient transport system for passengers and goods is of major importance to the European economy. The steady economic growth in the last decades was accompanied by a substantial increase in transport volumes. Road transport was responsible for a major share and is expected to grow by a further 55% (freight) and 36% (passengers) (2000-2020).

The challenge for the European Union is to accommodate the increasing demand for road transport while reducing road fatalities, congestion and environmental impact. Intelligent Transport Systems are seen as a key element in the answer to this challenge.

Following the publication of the ITS Action Plan (COM(2008)886) and the Directive 2010/40/EU, the European Commission (EC) is working in partnership with Member States and European road operators, service providers and industry to provide the efficient, safe, and environmentally friendly intelligent transport systems which best serve the needs of society. These systems will encourage travellers to make best use of the available transport modes and to support an integrated, sustainable transport system throughout Europe.

Guaranteed Access to Traffic and Travel Data

Advanced traffic and travel information services enable a more efficient use of the transport system and add to the safety and comfort of travellers. One of the key obstacles for the development of high quality information services is the difficulty that service providers face to get access to traffic and travel data. This is particularly the case for services with a European coverage, as access to many different sources of information with a variety of commercial and legal conditions has to be established.

Some traffic information can be categorised as 'safety-related', meaning that its swift dissemination to road users will reduce the risk of (further) accidents. Such information serves a major public interest and therefore justifies a strong public involvement. Whereas public bodies have been the traditional sources of safety-related information, new traffic monitoring technologies can turn private companies into important sources of safety-related information in the near future. Harmonisation is required to guarantee optimum public access to safety-related information collected by the private sector.

Action 1.1 of the ITS Action Plan aims to identify a set of measures that will provide public and private organisations with access to travel and traffic information on a consistent, fair and transparent basis.

It is expected that this action will facilitate the introduction of new, innovative services involving new partnerships between the public and private sector based on realisable business models. The new approach is multi-modal in nature to ensure that intelligent transportation systems (ITS) serve the needs of a fully integrated transport system.

The main issues to be addressed are:
- Fair and transparent access and reuse of Traffic and Traveller information held by public authorities, with harmonised conditions and standards of exchange
- Facilitating a transparent market for reuse of Traffic and Traveller information held by commercial organisations, stimulating harmonised conditions and standards of exchange.

The recommended arrangement to achieve this is a common European Framework that places obligations on Member States to establish regulated markets for the provision of traffic and traveller information. This framework respects the co-existence of public and commercial information value chains. The private sector is currently reshaping the market for the collection, aggregation and dissemination of information. The role of public data sources is however unlikely to disappear as commercial services may not be viable for all parts of the road network, and journalistic and traffic management information can most efficiently be sourced from public authorities.

The proposed European Framework defines the following:
- Organisational Roles within the Traveller Information Environment
- Requirements for the publication of Common Data Service Descriptions
- The data exchange framework
- Requirements for access and reuse of publicly held traffic and traveller information
- Requirements for the access and Re-Use of private sector data
- Common requirements for access ad Re-Use of safety-related information
- Common non-exclusive licence agreements

The proposed approach will allow existing market models to be supported whilst providing the simplest and most cost-effective implementation path for guaranteeing pan-European access to Traffic and Traveller information.

Free Provision of Minimum Universal Traffic Information

There is a common understanding that accidents can be avoided by better informing motorists. Timely warning for unexpected traffic situations will allow motorists to better anticipate or even avoid potentially dangerous situations. As safety is a public concern, there is a public interest to ensure that reliable safety-related information is available free of charge to all motorists in the European Union (EU). Action 1.4 of the ITS Action Plan asks for the definition of requirements for providing road safety-related 'universal traffic information', where possible, free of charge to all users.

The proposed solution is to establish a free broadcast service to end-user devices and free feed to service providers in each Member State, providing - as minimum - safety-related information on the full Trans-European Road Network. The two services are referred to as the Traffic Safety Information Services, or TSI services.

The suggested broadcast service is based on the Traffic Message Channel (TMC) of the Radio Data System (RDS), which makes use of coded traffic information transmitted with FM radio. TMC is proven technology; public and private TMC services are already operational in various Member States, serving a large installed base of TMC-enabled car radios and navigation devices. Because TMC encodes the information, the information can be presented in the language preferred by the end-user, and can be used for the calculation of optimal routes in navigation systems.

The proposed information feed to service providers is based on DATEX-II. DATEX is a standard for encoding traffic information in more detail than TMC and is commonly used by traffic information centres and service providers throughout Europe to exchange traffic data and information.

This proposed approach will allow rapid deployment of the TSI services in Member States with well-developed traffic information markets, while allowing less-developed Member States to implement the TSI services with limited investments. Seamless safety-related traffic information services on the complete Trans-European Road Network can thus be established within a limited time span. The proposed approach leaves developed

markets with sufficient leeway to implement and develop more advanced TSI services.

The proper and timely implementation of the TSI services in the Member States requires central co-ordination. It is proposed the EC takes on this TSI Coordinator-role. The TSI Coordinator will maintain a central services registry, establish the legal framework, establish and monitor the rollout planning, and create awareness among EU citizens through promotion of the services.

The specifications of the service shall deal with a number of technical issues such as the definition of 'safety-related' information, the specification of a service quality level, uniform information presentation, and the availability of TMC location tables.

It is believed that the proposed measures will offer the best guarantee for the rapid and harmonised development of the TSI services in all Member States, as well as provide a fertile basis for the further development of traffic information services in Europe.

T A B L E   O F   C O N T E N T

1. Introduction

1.1. Background

Intensive transport of people and goods is essential for a level of prosperity that people in the EU have grown accustomed to. Enormous volumes of products and raw material are transported over long distances to enable a global economy. Even more important, an efficient transport system allows for the redistribution of production assets, and people's knowledge and experience. The free flow of goods and people is an important driver of economic growth and prosperity in the European Union. Road transport has a major share of both passenger and freight transport within the EU and has been growing almost continuously over the last decades. It is expected that freight road transport will increase with 55% and passenger road transport by 36% (2000-2020). The expected increase in road transport is much stronger than for other modalities. The downside of our intensive and ever growing road transport is also well known. According to [4]:

- Road congestion costs amount on average to 1 % of GDP in the EU.
- Road transport accounts for 72 % of all transport-related CO_2 emissions, which have increased by 32 % in the period 1990-2005. In spite of continuous improvements in the fuel efficiency of vehicles, CO_2 emissions from transport are expected to grow by a further 15% by 2020.
- Road transport has a major share in other negative environmental effects, such as NO_x emissions, fine dust and noise.
- In the EU, 73% of all oil (and about 30% of all primary energy) is consumed by the transport sector [23].
- Road fatalities still amount to 35,000 in 2009. This is far above

Figure 1   Key indicators sustainable road transport (Eurostat 2010, EU27)

the EC target set in 2001 to reach 25,000 in 2010 (a 50 % reduction from 2001). The target of halving the overall number of road casualties in the EU by 2020 has just been renewed [34].

The challenge for the European Union is to facilitate the free flow of goods and people while reducing road fatalities, congestion and minimising the damage to the environment.

1.1.1. Investment in ITS in Europe

The European Commission has had a major programme to support investment in the provision of ITS services across the Trans-European Road Network since 1995.

In addition, there has been significant investment in national ITS systems and services by Member States across the European Union regarding the infrastructure to monitor and manage road traffic. The private sector has been increasingly involved in the development of ITS services, particularly in relation to in-vehicle technologies and traveller information services.

1.1.2. Lack of progress with pan-European services

Despite the efforts of the Member States, the industry and the European Commission, progress with the deployment of ITS services has not lived up to expectations. The 2001 White Paper [18] already highlighted a lack of synchronisation and harmonisation. The private sector continues to experience difficulty in providing pan-European traveller information services.

Information services for road transport have so far been managed by a relatively small number of road operators. Multi-modal travel information, involving a much larger number of operators and data owners, has proven even more complex to organise at an international level. Lack of integration of road-based information with information on other travel modes continues to be a concern.

1.1.3. The ITS Action Plan

The ITS Action Plan [1] reiterated the concern over the continuous growth of traffic and its environmental and social impact. It also stressed that traditional investment in infrastructure can't provide an efficient and sufficient answer.

In response to this challenge, the European Commission is planning to work in partnership with Member States and European road operators, service providers and industry to provide the efficient, safe, and environmentally friendly intelligent transport systems which best serve the needs of the travellers, transport operators, service providers and industry, and society at large. These systems will encourage travellers to make best use of the available modes and to support an integrated, sustainable transport system throughout Europe.

The ITS Action Plan defines a number of priority areas. One of the priority areas is dealing with the optimal use of road, travel and traffic data. This priority area action aims at fostering the development of Europe-wide real-time traffic and travel information services.

1.1.4. Access to Travel and Traffic Information

One of the key obstacles to the growth of new services is the difficulty faced by service providers in gaining access to travel and traffic data. This is particularly difficult for the potential development of travel and traffic information services to support pan-European travellers, as it involves the need to access many different sources of information and a variety of (different) commercial arrangements.

Information held by private content owner can be beneficial for traffic management purposes, and even essential for road safety. In practice, public authorities often have no access to these data. Clear regulations on the rights to access these data do not exist.

Action 1.1 of the ITS Action Plan [1] addresses these obstacles and aims at identifying measures to provide the market with access to travel and traffic information on a consistent basis.

It is expected that this action will facilitate the introduction of new, innovative services involving new partnerships between public and private sector, based on feasible business models. The new approach is multi-modal in nature to ensure that ITS serves the needs of a fully integrated transport system.

The key expected beneficiaries of the new services will be the people and goods which need to move and be moved across Europe, particularly when these journeys involve long distances and travel across different countries.

Travellers need journeys to appear seamless across modes and countries. The present barriers to the free movement of people and goods (such as lack of availability, timeliness or appropriate language of the information) are considerable. The lack of harmonisation between modes often implies that the traveller makes uninformed and thus sub-optimal choices for transport modes and routes – both before and during a journey.

Once travel decisions have been made, and the people or goods are in transit, lack of accessible real-time information on the state of the network may result in unnecessary additional congestion and delay. The main barriers to improve the situation are:

- Lack of traffic and travel data
- Lack of access to traffic and travel data
- Lack of a viable commercial business case for service delivery

These barriers are closely linked, as the viability of the business case depends crucially on the cost of collecting, maintaining, analysing and disseminating traffic and travel information as well as the potential value of that information to the traveller.

By significantly reducing the barriers in terms of accessibility and cost of data, and the introduction of sustainable commercial arrangements, it is expected that the costs of data collection can be significantly reduced, and that the improved business cases will stimulate the market to provide the desired services.

1.1.5. Free Universal Minimum Service

Road traffic information plays a crucial role in the improvement of road traffic safety. Though the timely provisioning of reliable information on dangerous traffic situations, and road and weather conditions, motorists are in a better position to avoid or anticipate on dangerous traffic situations.

Action 1.4 of the ITS Action Plan [1] requires the definition of specifications for data and procedures for the free provision of minimum universal traffic information services. The purpose of these services is to provide motorists on the European roads with continuous, seamless cross-border access to safety-related road traffic information.

It is expected that this action will increase road safety in the European Union. The key beneficiaries of these free universal minimum services will

be the motorists on the European roads, but it will also bring benefit to the European road authorities, emergency services and insurance companies.

It is foreseen that the following challenges will have to be met to achieve the envisaged benefits:
- Establishing an uniform definition for the universal minimum services in technical and functional terms
- Agreement on an overarching European deployment plan
- Solving potential issues of interference in existing traffic information services markets.

1.2. Scope

The scope of this study includes real time information regarding all European transport network connections. In particular it focuses on the Trans-European Road Network (TERN) as well as its interfaces with urban networks and other transport modes, especially public transport (PT) [33].

2. Management Section

2.1. Background

Under the framework contract "Technical, Legal and Organisational Support for the Implementation of the ITS Action Plan", the consortium led by Algoé supports the European Commission in the development of policy regarding the ITS Action Plan.

This report concerns actions 1.1 and 1.4. of the ITS Action Plan [1], as described in the Task Specification for the Guaranteed Access To Traffic And Travel Data, and Free Provision Of Universal Traffic Information [33]:

Action 1.1   Definition of procedures for the provision of EU-wide real-time traffic and travel information services, addressing notably the following aspects:
  - provision of traffic information services by the private sector
  - provision of traffic regulation data by the transport authorities
  - guaranteed access by public authorities to safety-related information collected by private companies
  - guaranteed access by private companies to relevant public data

Action 1.4   Definition of specifications for data and procedures for the free provision of minimum universal traffic information services (including definition of the repository of messages to be provided)

This chapter provides an overview of the study's objectives, methodology, activities, deliverables and use of resources. It assesses the effectiveness of the consortium in achieving the objectives and answering the key research questions.

2.2. Study Objectives

The Task Description [33] defined the study objectives:

Objectives Action 1.1 - Guaranteed Access to Data
  - Make private, especially safety-related, traffic information available to public authorities
  - Ensure a fair and transparent access to public traffic and travel related data

- Promote public-private co-operation to improve traffic and travel information
- Increase data quality and improve multi-modal co-operation
- Encourage (cross-border) data exchange

Objectives Action 1.4 - Free Universal Minimum Service
- Ensure free minimum traffic services for all travellers
- Harmonise a Europe-wide free minimum service
- develop suitable organisational models

2.3. Key Research Questions

The Task Description [33] further posited a number of key research questions:
- What is the state-of-the-art concerning traffic and travel data availability and access, co-operation and data exchange between the public and private sector across the EU?
- What is the state-of-the-art concerning the definition of safety-related traffic information across the EU?
- What is the current status of free universal traffic information across the EU?
- How can public traffic and travel related data (including road and public transport) be made available in a fair, transparent and harmonised way across the EU?
- How can privately held safety-related traffic information be made available to public authorities?
- What are the most appropriate instruments for Community action for the two issues above? Are new and/or revised legal instruments necessary?
- How can the integration of road traffic and travel information and public transport information be improved?

2.4. Methodology

The study team developed a methodology consisting of a set of activities as represented by the diagram below.

ITS AP 1.1
GUARANTEED ACCESS TO DATA – FREE TIS PROVISION

- **0/ General Project Management**
- **A/ Guaranteed access to data**
  - A1/ Status quo analysis
  - A2/ Specs & pro definition
  - A3/ Stakeholders consultation
  - A4/ Policy draft
- **B/ Free provision of TIS**
  - B1/ National practices analysis
  - B2/ Free minimum ITS proposal
  - B3/ Outline of specifications
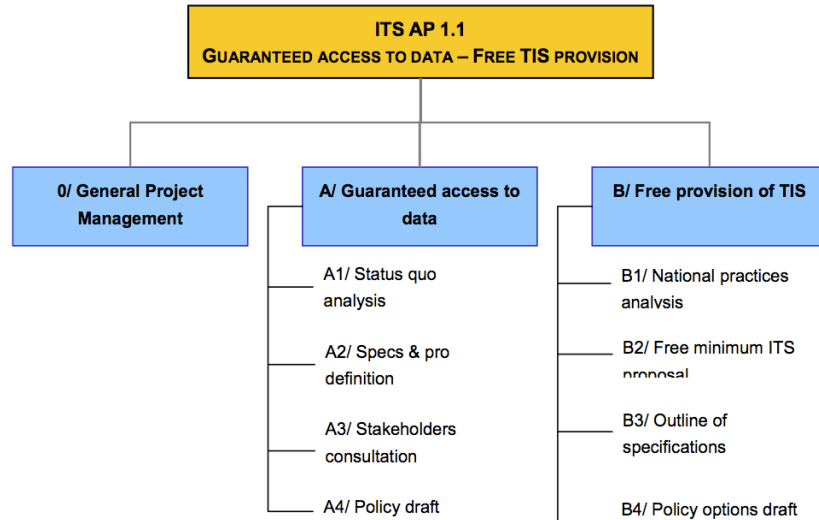 - B4/ Policy options draft

Figure 2   Overview of study methodology

The two topics are covered through two different study paths and accompanying sets of activities, for respectively Action 1.1 and Action 1.4 of the ITS Action Plan [1]. Both study paths relied on:

- Desktop research into related projects, standards, legislation and policy
- Consultation through face-to-face interviews, online questionnaires and a workshop in June 2010 in Brussels
- Analysis of findings resulting in a conceptual EU policy framework
- Drafting of specifications, proce-dures and recommendations

The workflow and methodology of the individual activities is described in the Inception Report [5]. In practice, activities A1, A3 and B1 have been combined. This allowed the consultation of stakeholders through a single questionnaire.
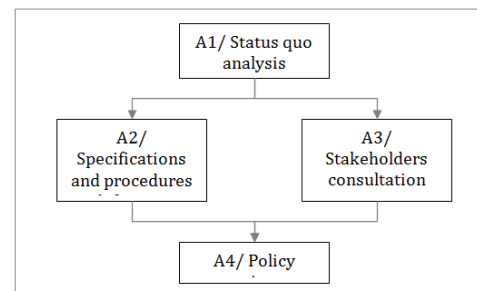

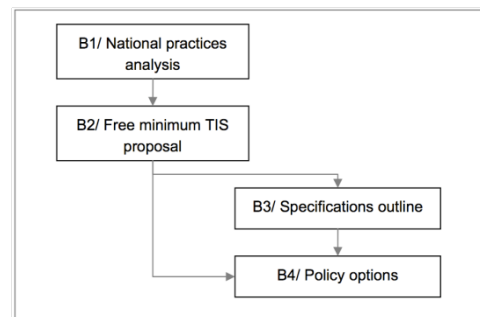Figure 3   Work flow diagram activities Action 1.1

Figure 4   Work flow diagram activities Action 1.4

2.5. Deliverables

The study produces the following deliverables.

Nr	Deliverable Content	Date
D1	**Inception Report**: problem analysis and context, objectives methodological approach, work plan and project organisation (including allocation of resources and schedule), additional need for information, key stakeholders, contact persons, actions required to be taken by the Commission etc.	Mar-2010
D2	**State-of-the-art** (covering both Tasks A.1 and B.1)	Oct-2010
D3	**Draft Specifications & Procedures – Guaranteed Access to Traffic and Travel Data** (Task A.2)	Nov-2010
D4	**Workshop**: organisation of a one-day stakeholder workshop in Brussels (part of Task A.3)	Jun-2010
D5	**Consultation Report**: analysis of the Internet consultation and results of the Workshop (Task A.3)	Oct-2010
D6	**Proposal for the scope of free minimum universal traffic information** (Task B.2)	Dec-2010
D7	**Draft Final Report**: final results and recommendations of the study, especially draft policy options for implementing measures: Part 1: Guaranteed access to traffic and travel data (Task A.4) Part 2: Free provision of minimum universal traffic information (Task B.4) It will cover all points of the work plan and shall include sound analysis of findings and factually based conclusions and recommendations. The report should contain a management section on the achievement of study objectives including all deliverables, differences between work expected to be carried out and actually carried out, an explanation of the use of the resources etc.	Jan-2011
D8	**Final report:** takes into account comments made by the Commission on the draft final report. It will be written of publishable quality and delivered both in paper and electronic form	Feb-2011

2.6. Expectations and Realisation

The study has achieved all study objectives, answered all key research questions, as defined in the Task Specification [33]. Chapter 5 (Conclusions) elaborates on the study objectives and achieved results, and provides answers to the key research questions.

Apart from the final report (D7/D8) all deliverables have been delivered to, and approved by the European Commission. During the project two factors led to a delay:

- Difficulties in the timely acquiring of information from member states during the consultation phase
- Personal difficulties of one of the key collaborators.

In a joint decision by the consortium and the European Commission it was decided to extend the project by two months.

3. Part 1 - Guaranteed Access to Traffic and Travel Data

3.1. Understanding the Need

One of the key obstacles to the growth of new pan-European Traffic and Traveller Information services is the difficulty faced by potential service providers in gaining access to the required travel and traffic information. This is particularly difficult for the potential development of travel and traffic services to support pan-European travellers, as it involves the need to access many different sources of information and the associated (different) commercial arrangements.

Once travel decisions have been made, and the people or goods are in transit, lack of accessible real-time information on the state of the network may result in unnecessary additional congestion and delay. As a result, the transport systems across Europe operate inefficiently, with detrimental impacts on the environment and economy.

If travellers could be better informed, they could make better decisions, whether before the journey, or in the course of a journey.

The underlying objective to be addressed is the enabling of more coherent European services, by creating consistency in the way that the public and private sector can access relevant traffic and travel data.

On first examination, the traffic and travel information sector appears to be reasonably similar from country to country. Public authorities are involved in regulation, collection and dissemination. Sufficient commercial opportunities exist through value added services to motivate the involvement of private companies (some for core business and others as a useful supplement to their business proposition). Travellers have access to varying levels of information through the radio, the internet, in-car systems, and a range of new media.

However, on closer examination, there are substantial differences from country to country, starting with the legal and regulatory framework, and progressing to the balance between public and private sector in the market. Differences also exist in the level of integration between modes, the extent of cross-border activity and the application of national and international standards.

However, the core issue remains that of inconsistency between Member States. In situations where traffic management and traveller information is technically available, the key questions are:

- How to make the data available to public and private bodies in order to foster the deployment of traveller information services?
- What EU actions are relevant for helping consistent traffic and travel services to be deployed in all countries of the Union?
- How can a common level of service be reached across all member states?

Where information is not technically available, the collection and storage of such information becomes the primary issue.

The State-of-the-art Review [6] revealed that there are a number of existing Traffic and Traveller information services that are currently being provided at local, regional, national and international level. Key private service providers are expanding their road traffic information services coverage, which will likely result in full coverage of the larger EU Member States in 1 to 3 years.

The services that are currently provided can be split down into three main categories:
- Road Traveller Information Services
    - Static route guidance service
    - Planned event information service
    - Real-time event and traffic information
    - Journey time information service
    - Dynamic route guidance service
    - Parking information and guidance service
- Public Transport Traveller Information Services
    - Public transport journey planning service
    - Planned events and disruptions
    - Real-time passenger information service
- Multi-Modal Traveller Information Services
    - Static multi-modal journey planner
    - Real-time multi-modal journey assistant

These services all require some supporting data. Any decision to provide pan-European coverage for such services would require the availability of the associated data services identified in Figure 5. The requirements for

Multimodal Services have the greatest requirements for the availability of data.

	Road Network	Restrictions & Speed Limits	Roadworks	Incident Information	Current Journey Times	Predicted Journey Times	Traffic Management Information	Parking Locations	Parking Space Availability	Public Transport Routes	Public Transport Stops	Public Transport Schedules	Planned events & disruptions	PT Incident Information	Real-Time arrival & departure times
Static Route Guidance Service	X	X													
Planned Road Event Information Service	X		X												
Real-Time Event Service	X		X												
Journey Time Information Service	X	X	X	X	X	X	X								
Dynamic Route Guidance Service	X	X	X	X	X	X	X								
Parking Information and Guidance Service	X							X	X						
Public Transport Journey Planning Service										X	X	X	X		
PT Planned Events and Disruptions													X		
PT Real-Time Passenger Information Service										X	X	X	X	X	X
Static Multi-Modal Journey Planner	X	X								X	X	X	X		
Real-Time Multi-modal Journey Assistant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Figure 5   Traffic and Traveller Services Data Requirements

Table 1 below provides a description of the data services that are required to support the identified Traffic and Traveller Information Services.

Data Service	Description
Road Network	Data set which provides details of the road network within a specified geographical area
Restrictions and Speed limits	Data set which provides meta information for elements of the road network which may include: legal speed limits, height or weight restrictions.
Planned Road works	Data feed providing information on the location, extent and duration of scheduled road works within a geographical area.
Current Incident information	Data feed providing information on incidents on the road network within a specified geographical area.
Current Journey times	Data feed providing current journey time information for sections of the road network within a geographical area.
Predicted journey times	Data feed providing predicted future journey time information for sections of the road network within a geographical area

Data Service	Description
Traffic Management Information	Data feed providing details of traffic management information associated with incident management, for example approved diversion information.
Parking Locations	Information on the location and number of spaces in a given geographical area. May also include details on access restrictions, opening times etc.
Parking Space Availability	Dynamic information on the current occupancy levels at parking locations. May also include predictions for future availability.
Public Transport Routes	Data set providing details of public transport routes
Public transport Stops/Stations	Data set providing details of public transport stops/stations
Public Transport Schedules	Data set providing scheduling information for public transport routes including timetabled arrival and departure times
PT Planned events and disruptions	Data feed providing details of planned PT events and disruptions which will have an impact on scheduled services within a geographical area
PT incident information	Data feed providing details of incidents and events which are impacting scheduled public transport services within a geographical area
Real-time arrival and departure times	Data feed providing details of predicted arrival and departure times for scheduled services at PT stops within a geographic area.

Table 1   Data Service Overview

The emergence of connected in-vehicle devices or mobile devices carried in vehicles has enabled private traffic information providers to efficiently collect road traffic data. Currently these *floating vehicle data (FVD) or floating phone data (FPD)* are mainly used for the collection of information on traffic flow. As vehicles are equipped with more and more sensors, a significant increase in the amount and variety of FVD- and FPD-data that is collected by private companies is expected. Some of these data could provide a clear safety benefit to motorists if made available immediately, e.g.:

- Road conditions detected by Anti-lock Braking System (ABS), temperature and windshield wiper sensors
- Tailback position, determined based on Global Navigation Satellite System (GNSS), route and road network data.

3.2. Issues to Be Addressed

Two of the main barriers to achieving the expected benefits from pan-European traveller information services are:
- Lack of availability of accurate traffic and travel data
- Lack of access to traffic and travel data
- Lack of a viable commercial business case for service delivery

These are closely linked, as the viability of the business case depends crucially on:
- The cost of collecting, maintaining, analysing and disseminating traffic and travel information
- The potential value of that information to the traveller

The present situation means that it is very difficult (and thus expensive) to collect and maintain travel and traffic data across Member States, and users are not (in general) willing to pay for the resulting limited services.

By significantly reducing the barriers in terms of access and cost of data, and the introduction of sustainable commercial arrangements, it is expected that the costs of data collection will be reduced, and that viable commercial business cases will emerge to encourage the market to provide the necessary services.

There is a public interest is assuring that privately held safety-related data is made available to public authorities and the general public. These data can be vital for road safety if made available to motorists. This requires clarification of access and re-use rights and conditions of public authorities to these data.

3.2.1. Legal Issues

3.2.1.1. European Directive 2003/98/EC

The key piece of legislation which relates to Access and Re-use of Public Sector Information is Directive 2003/98/EC [12] which is intended to harmonise (and promote) the re-use of public data across all Member States.

The Directive specifies that "Public Data" or "Public Sector Information" is:

- "existing documents held by public sector bodies of the Member States" (article 1).

where "public sector bodies", are:

- "State, regional or local authorities, bodies governed by public law and associations formed by one or several such authorities or one or several such bodies governed by public law".

And "bodies governed by public law", are:

- "established for the specific purpose of meeting needs in the general interest, not having an industrial or commercial character".

The Directive includes several exclusions to the right of Re-Use and Member States have transposed this definition, taking into account the exemptions. For example:

- The French Law n°78-753 1978 [19] (as amended by Ordonnance n° 2005-650) defines public data as documents "issued or received by public authorities or private companies acting within the scope of "public service" (article 1)
- The United Kingdom (UK) Statutory Instrument, "the Re-use of Public Sector Information Regulations 2005"[36] provides a comprehensive list of the "public sector body", which helps to clarify the identification of those bodies affected by the right of Re-Use.
- The Dutch Law number 25/2005 "Wet implementatie richtlijn inzake hergebruik van overheidsinformatie" [37] indicates bodies affected by the right of Re-Use.

3.2.1.2. Findings from the State-of-the-art Review

It is clear that there are some significant variations in the interpretation and proactive enforcement of the rights to Re-Use of Public Sector Information, as the European Directive 2003/98/EC [12] has reserved the Re-Use right subject to national legislation and contains many exceptions, for instance on intellectual property rights which applies also to public sector.

In some Member States (e.g.: France, the Netherlands, Switzerland, UK), regulation regarding traffic data is primarily focussed on access by end-user to traffic and/or transport information, but not Re-Use, whilst the rights of Re-Use of Public Sector information may apply to traffic data and sharing of that information between public authorities. In the case of the UK, there are clearly defined licence agreements which extend this right to the applicant, and which are intended to promote appropriate Re-Use, rather than restrict it.

In some others (e.g.: Germany), model contracts also organize the exchange of information between public and private sectors. Some Member States are moving progressively towards this in all areas of the Public Sector (of which traffic and travel information will be just one beneficiary). Other Member States are more concerned with the sharing of information between public authorities, rather than provision of the data for wider use.

In some cases, the law obliges reporting of events, which in turn requires the collection and dissemination of data. In other cases, the law is primarily concerned with the release of sensitive documents, and may govern (for example) the use of camera images or release of number plate information, but these regulations may be difficult to apply in the case of traffic volumes or average speeds.

Data collected by the private sector, commissioned by the public sector, is usually governed by contracts that dictate the transfer of ownership. But as the data is not held by the Public Sector, this information cannot be regarded as public sector information as per the European Directive 2003/98/EC. Public Services that are tendered out to private companies and operated under a public service obligation in accordance with Regulation (EC) No 1370//2007 are also not automatically covered by 2003/98/EC.

From the State-of-the-art review conducted as part of this study it is concluded that:
- there are some significant variations in the interpretation and implementation of the rights to Re-Use of Public Sector Information in the National Legislation
- the European Directive 2003/98/EC allows many exceptions to permitting Re-Use, for instance intellectual property rights which applies also to public sector.
- there is no straightforward definition of "public data", in accordance with the European Directive 2003/98/EC,
- some Member States are taking a positive approach to make more public data available for re-use than strictly required by the Public Sector Information (PSI) Directive,
- a public task of a public sector body may not fall within the scope of the Directive if it is operated by a private sector organisation on behalf of the public body

Data held in the private sector whether for its own purposes or within an industrial and commercial public service is protected by intellectual property rights and other commercial considerations, assuming that the copyright and ownership is not transferred. Unless requested (for example) as part of a police investigation, there is very little power to extract information collected by the private sector, subject to competition rules, where the essential facilities theory[1] applies and under which the refusal to grant a license may be regarded as an abuse of a dominant position. However, in many cases private operators are keen to collaborate with public authorities in order to gain access to multiple data sources for validation of accuracy.

3.2.1.3. Key Legal Issues to be addressed

The state-of-the-art review [6] has revealed the areas of commonality and areas of difference between the approaches taken by different Member States.

To guarantee access to traffic and traveller information, certain legal issues need to be addressed:
- Agreement of legal definitions for Traffic data, Travel information, and safety-related information
- Fair and transparent access and reuse of Traffic and Traveller information held by Public authorities. The PSI Directive covers Re-Use but not access
- Fair and transparent access and reuse of Traffic and Traveller information held by commercial organisations. This is not covered by the PSI Directive.
- Intellectual Property Rights (IPR) and copyright licences
- Personal Data protection, in relation to Directive 95/46/EC.

3.2.2. Contractual Issues

3.2.2.1. Findings of the State-of-the-art Review

Since the emergence of traffic information services in Europe, roles and markets have changed profoundly. In the early stages of development, services were developed and operated by road and enforcement authorities. In general these services were provided for free. In recent years private companies have started to collect traffic information themselves on a large scale.

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[1] The essential facility theory, as explained in the State-of-the-artReport, refers to special circumstances under which the

In particular in the larger markets such as France, Germany and the UK, private companies quickly understood the business potential in developing new traffic information services for motorists. Voice response and Short Message Services (SMS) for example emerged in the 1990's providing traffic information on demand. Some of these companies also started to collect traffic data themselves with their own roadside infrastructure. Examples are Traffic Master in the UK and the T-Traffic in Germany. This effectively established parallel value chains in these countries. More recently companies like NavTeq, TomTom and INRIX have started to collect traffic data in all 'key' European markets.

It is important to realise that all these private data collection systems rely on automated systems that collect traffic flow data. Safety-related information does not focus on traffic flow but rather on events such as accidents, wrong-way drivers, objects on the road surface, instructions from road authorities, etc.

Currently, such information cannot effectively be collected by fully automated systems and private companies depend on public authorities for journalistic information. In the near future private companies will likely become important sources of safety-related information based on FVD. Public authorities will however remain a vital source for journalistic information on incidents, and traffic management information and instructions. Therefore there is increasing pressure from private traffic information providers to make public sector information freely available for re-use.

The State-of-the-art report [6] demonstrated the significant differences in the development stages of traffic information markets in the various Member States. Countries such as the UK, France, Germany, and the BeNeLux countries have well-established markets where private companies drive innovation, and an excellent infrastructure for the collection and dissemination of public and private journalistic traffic information exists. In some Member States no traffic information services exist to date.

Private companies dominate the most advanced traffic information services markets. These markets have developed their own momentum with rapid innovation based on the latest mobile communication, mapping and positioning technology. Private service providers are rapidly expanding their road traffic information services coverage. However, private service providers are unlikely to expand their services to sparsely populated regions unless there is a commercial benefit for doing so.

When pursuing the establishment of guaranteed access to traffic and traveller information throughout the Union, it is important to realise that different development levels will persist because of the inherent differences in population density, congestion levels, local geographic and meteorological conditions.

3.2.2.2. *Key Contractual Issues to be Addressed*

The main contractual issues identified in the Stakeholder Consultation [8] and The State-of-the-art Review [6] that need to be addressed are:

• Fair and transparent access and reuse of Traffic and Traveller information held by Public authorities. The PSI Directive covers Re-Use but not access
• Fair and transparent access and reuse of Traffic and Traveller information held by commercial organisations. This is not covered by the PSI Directive.
• IPR and copyright licences
• Exclusivity agreements
• Commercial agreements
    o Common method for the calculation of access fee to cover data collection or processing costs
    o Service Levels

3.2.3. Technical Issues

3.2.3.1. *Findings from the State-of-the-art Review*

Since the advent of traffic information services, technological developments have profoundly changed the way traffic information is distributed. In the early stages of development, traffic information was delivered using radio broadcasts. The introduction of RDS-TMC proved an important step ahead. It can be based on totally automatic data flow and enabled the real-time delivery of traffic information to vehicles. Since the RDS-TMC messages are sent in a standardised language independent coded form, the same single broadcasted message can be presented in the language determined by the in-vehicle device and also used in on-board navigation and fleet management devices.

The European Union has led the way in the development on standards for the exchange and dissemination of road traffic information. DATEX provides a standard for the language independent encoding of information on traffic incidents and traffic flow. DATEX I is widely used by traffic control

and information centres throughout Europe, and its successor DATEX II is being gradually adopted. RDS-TMC has proven itself as an excellent standard for the (near) real-time in-vehicle delivery of traffic information. The TPEG coding protocol provides a compact, bearer independent encoding protocol. It is promoted by the European Broadcasting Union and TISA.

The General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) standards have made mobile Internet pervasive in nearly all Member States. Private companies have been successful in the development of information services (e.g. traffic, weather, fuel prices) using mobile Internet as the delivery network. The rapid pace of development, and the expected focus shift of navigation providers to business models based on sponsoring and advertisement, will likely further stimulate the use of mobile Internet for the dissemination of traffic information in the coming years. However, mobile Internet is inherently inefficient for the dissemination of traffic information as it uses point-to-point connections.

Broadcasting technologies such as Digital Audio Broadcasting (DAB) and Digital video broadcasting (DVB) are more efficient than cellular communications for large-scale distribution of traffic information. DAB has been around for 10 years, but the take-up has been rather limited up till today. The UK may be the exception, planning to transfer all radio broadcasts to DAB and ending FM transmission by 2015.

3.2.3.2. Key Issues to be addressed

The main technical issues identified in the Stakeholder Consultation [8] and the State-of-the-art Review [6] that need to be addressed are:
- Understanding the Traffic and Traveller Data and Information services that are available
- Access and availability of TMC Tables
- Common Data Exchange standards
- Common Data Quality Definitions
- Service Certification Requirements

3.3. Policy Options Assessment

A number of Policy Options that could be used to harmonise the exchange of traffic and travel information between public and private sector parties in Europe were considered.

These models ranged from a fully centralised solution operated mainly by Public Authorities, to a free market model:

- Single public European Traveller Information Centre
- Network of National Traveller Information Centres
- Network of National Traffic Information Centres and registry of Travel Information Services
- Regulated European Electronic Market
- Free Market Model

3.3.1. Establishment of a Single Public European Traveller Information Centre

Description:-

Establishment of a single European Traveller Information Centre (ETIC) which provides a single information portal for the provision of Road Traffic and Public Transport Traveller information for the Trans-European Road Network (TERN) and international public transport connections. The principle of subsidiarity restricts coverage of the centre to the TERN. The centre is operated by a single public authority.

It provides a single European legal framework for the access to, and re-use of traffic and traveller information to and from both public and private bodies.

Public content owners are obliged to provide all information concerning traffic on the TERN, and related multimodal information to the ETIC. Private content owner have the obligation to provide safety-related information to the ETIC.

Advantages:-

- A single portal for traffic and traveller information.
- Allows for cross-border content validation and consistency check.
- Central monitoring and benchmarking of content and service quality.
- A central public body for the development of new policy on content production, content sharing and service providing.
- A central organisation to co-ordinate the development of new traffic and travel information standards.
- Service Providers only require one commercial agreement for access to data at a European Level.

Disadvantages:-

- The organisation needs to establish and maintain contractual and operational relationships with a large and heterogeneous group of content and service providers. The resulting complexity will stifle development of the centre.
- Because the vast majority of road trips are within the region or country, there is an obvious mismatch of geographic focus between an EU centre and the average road user.
- The development of the centre is likely to be outpaced by developments in the private sector where pan-European content aggregators are being established.
- The approach distorts existing commercial markets for content aggregation already suffering from low margins.
- Establishment of a new European organisation is required.
- The scope is limited to the TERN and international public transport services.

3.3.2. Establishment of a Network of National Traveller Information Centres

Description:-

Establishment of National Traveller Information Centres (TIC) in each Member State which provide a single information portal for the provision of national Road Traffic and Public Transport Traveller information. The centres are operated by national public authorities.

The national TIC's work on the basis of a harmonised national license agreement for the access to, and re-use of traffic and traveller information to both public and private bodies.

Public content owners are obliged to provide all information concerning traffic, and related multimodal information to the centre. Private content owners have the obligation to provide safety-related information to the centre.

Advantages:-
- The arrangement builds on existing Member State initiatives.
- It is coherent with current organisation where location referencing and standardization of messages and codification used by public, local and private initiatives are validated by the Traveller Information Services Association (TISA).
- Because the vast majority of road trips are within one region or country, centralising information on a national level provides the right geographic focus.
- It provides a single national portal for traffic and traveller information; the coverage is not necessarily limited to TERN.
- Decentralised monitoring and benchmarking of content and service quality in the EU leads to better quality.
- Service Providers require a limited number (27) of commercial agreements for access to all EU data.

Disadvantages:
- The development of national centres in many Member States is already outpaced by developments in the private markets.
- The approach may distort existing commercial markets for content providing and aggregation that already suffer from low margins.
- The arrangement does not offer a single source for traffic and travel information in the EU.
- Decentralised monitoring and benchmarking of content and service quality in the EU leads to less harmonisation.
- Risk of divergence between Member States in the development of new policy on content production and sharing, and service providing.
- Conflicts with existing organisational models in established markets (e.g. the German eMarket model), and distorts existing national markets for Service Provision (e.g. UK).
- Differences in semantics on traffic information are likely to persist between Member States.
- Persistent inability to negotiate from a position of strength with global players
- Cooperation between Member States to be agreed to establish cross-border content exchange between national centres.

3.3.3. Network of National Road Traffic Information Centres and registry of Travel Information Sources

Description:-
Establishment of a National Road Traffic Information Centre in each Member State and a national registry of Traffic Traveller information sources. The centres are operated by national public authorities and provide at least safety-related traffic and travel information on the TERN.
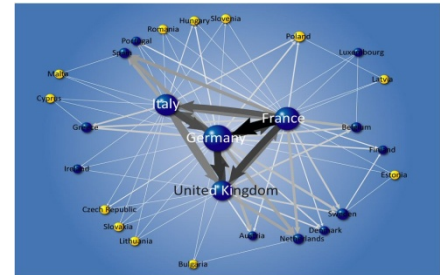
The centres maintain a national registry of public and private content services. It provides a single national legal framework, based on a common EU framework, specifying common minimum requirements for the access to, and re-use of traffic and traveller information to both public and private bodies. The registry also provides a technical and functional framework based on an EU framework, forcing a harmonisation of information coding and semantics.

Public content owners are obliged to provide all information concerning traffic, and related multimodal information to the centre. Private content owners have the obligation to provide access to safety-related information via the registry. The traffic information centre monitors the quality of registration information, and the content and services provided.

Advantages:-
- The arrangement allows for different (new and existing) organisational models to co-exist.
- It allows Member States to select an organisational model which best meets national requirements and existing national markets for service providers.
- The arrangement has a limited organisational complexity.
- It has limited technical complexity; there is no single point of failure.
- It allows for easy access to content of private companies and lower level road authorities, and content collected using innovative collection techniques.
- It allows for private content aggregators to emerge.
- It provides a growth model for the easy incorporation of new types of data (e.g. changes to infrastructure, local road regulations and traffic management directives).
- Because the vast majority of road trips are within one region or

country, centralising information on a national level provides the right geographic focus.
- The coverage does not have to be limited to TERN.
- Service Providers do not need commercial agreements to access public data.

Disadvantages:-
- The arrangement does not provide a single source for traffic and travel information in the Member States and EU.
- Decentralised monitoring and benchmarking of content and service quality in the EU leads to less harmonisation.
- There is a risk of divergence between Member States in the development of new policy on content production and sharing, and service providing.
- Differences in semantics on traffic information are likely to persist between Member States.
- Cooperation between Member States to be agreed to establish cross-border content exchange between national centres.

3.3.4. Regulated Electronic Market Model

Description:-
European framework which establishes the basis for an electronic market model for Traffic and Traveller information in each Member State.

It provides a single EU legal framework specifying common minimum requirements for the access to, and re-use of traffic and traveller information to both public and private bodies.
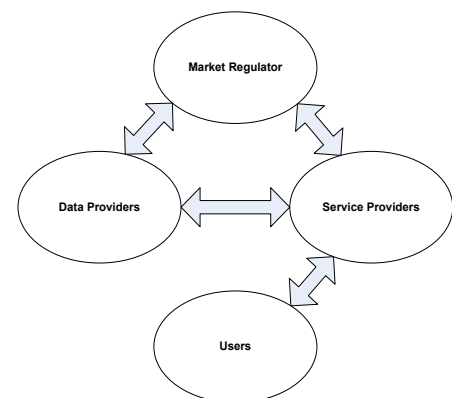
Each Member State is required to maintain an electronically accessible public national register of public and private content/information services.

The EU framework provides a technical and functional framework, forcing a harmonisation of information coding and semantics.

The EU Framework obliges Public Sector Authorities to permit access and reuse of traffic and traveller information data on a transparent and non-discriminatory basis.

The EU Framework obliges Public Sector data to be made available via a common non-exclusive licence agreement.

The EU Framework obliges private sector content owners to provide access to safety-related information on TERN to the Public Sector.

Advantages:-
- The arrangement is based on the existing PSI Directive
- It allows for different (new and existing) organisational models to co-exist.
- It leaves Member States free to organise national traffic and travel information.
- The model has a limited organisational complexity.
- It has a limited technical complexity, with no single point of failure.
- It allows for easy access to content of private companies.
- It provides a growth model for the easy incorporation of new types of data (e.g. changes to infrastructure, local road regulations and traffic management directives).
- Because the vast majority of road trips are within one region or country, centralising information on a national level provides the right geographic focus.
- The coverage does not have to be limited to TERN.
- Service Providers do not need commercial agreements to access public data.

Disadvantages:-
- The arrangement does not provide a single source for traffic and travel information in the Member States and EU.
- Decentralised monitoring and benchmarking of content and service quality in the EU lead to less harmonisation.
- There is a risk of divergence between Member States in the development of new policy on content production and sharing, and service providing.
- Differences in semantics on traffic information are likely to persist between Member States.
- An amendment of the PSI Directive is to be considered regarding industrial and commercial public service and other exceptions
- Effectiveness of access and Re-Use may be still an issue

- Aggregation of data is subject to the *sui generis*[2] right as set forth in the database Directive n°96/9
- Collection of data is also subject to the personal data protection Directive n°95/46

3.3.5. Free European Market Model

Description:-
The role of public EU and Member State authorities is limited to collecting information for traffic management purposes only. This information is made available to private companies under the obligation to diffuse to all customers they have as end users.

Private companies collect additional information, aggregate information from the various services and develop information services.
Private companies have the obligation to share any safety-related information with public authorities who accept not to compete on the same medias.

Advantages:-
- Member States are free to organise national traffic and travel information.
- There is no organisational overhead and no single point of failure.
- It provides maximum opportunity for innovation to private companies.
- Absence of 'false competition' from free or low-cost public services increases the market value of commercial services.

Disadvantages:-
- The deployment becomes dependent on commercial viability
- It could lead to the removal of existing publicly organised traffic information centres.
- It does not provide easy access to content of public or private companies.
- Service Providers will need many commercial agreements to access

[2] The Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases [28] grants a sui generis right to the database maker and the exceptions are limited as they shall not conflict with normal exploitation of the database or unreasonably prejudice the legitimate interests of the maker of the database.

public and other private data.

- It does not apply to "small" Member States where no Return on Investment can be expected from a commercial standpoint and it will aggravate differences between the Member States.
- Access and Re-Use of PSI is still an issue
- Aggregation of data is subject to the *sui generis* right as per the database Directive n°96/9
- Collection of data is also subject to the personal data protection Directive n°95/46

3.3.6. Analysis of Policy Options against the ITS Directive Principles

The advantages and disadvantages for each of these potential organisational models were considered against the ITS Directives (2010/40/EU) Principles. The results from this process are illustrated in Table 2.

	Single Public European Traveller Information Centre	Network of National Traveller Information Centre	Network of National Road Traffic Information Centres and registry of Travel	Regulated European Electronic Market	Free market model
Be Effective	+	++	++	+++	++
Be cost efficient	---	---	++	+++	+++
Be proportionate	--	-	+	+++	++
Support continuity of services	+++	+++	++	++	+
Deliver interoperability	+++	+++	+++	++	+
Support Backward compatibility	--	-	+	+	+
Respect existing national infrastructure	---	--	+	++	++
Promote equality of access	Not Applicable				
Support Maturity	+	++	+	+	+
Deliver quality of timing and positioning	Not applicable				
Facilitate inter-modality	+++	+++	+	+	+
Respect coherence	++	+++	++	++	+
Overall Rating	-	+	++	+++	++

Table 2   Analysis against ITS Directive Principles

Following the assessment of the various organisation models, it was felt that the Regulated European Electronic Market model was the most suitable method of guaranteeing the provision of data for traffic and travel information.

In proposing an organisational framework for the provision of Traffic and Traveller information services it was important to recognise that public and commercial data value chains will need to co-exist. Private companies especially in the road sector are developing markets for the collection, aggregation and dissemination of information. However, the dependency on public data sources will remain as private services may not be commercially viable for all areas of the network, and journalistic and traffic management information can most efficiently be sourced from public authorities.

The proposed approach will allow existing market models to be supported whilst providing the simplest and most cost-effective implementation path for guaranteeing pan-European access to Traffic and Traveller information.

3.4. Recommended Policy Approach

The State-of-the-art Review [6] and the Stakeholder Consultation [8] identified the following issues that would need to be addressed to enable the establishment of guaranteed access to traffic and traveller information throughout Europe:

- Agreement of legal definitions for Traffic data, Travel information, and safety-related information
- Fair and transparent access and reuse of Traffic and Traveller information held by Public authorities. The PSI Directive covers Re-Use but not access.
- Fair and transparent access and reuse of Traffic and Traveller information held by commercial organisations. This is not covered by the PSI Directive.
- IPR and copyright licences
- Personal Data protection
- Exclusivity agreements
- Commercial agreements
    - o A common method for the calculation of access fee to cover data collection or processing costs
    - o Service Levels
- Understanding the Traffic and Traveller Data and Information services that are available
- Access and availability of TMC Tables
- Common Data Exchange standards
- Common Data Quality Definitions
- Service Certification Requirements

The proposed European Framework for Traffic and Traveller information would define the following:
- Organisational Roles within the Traveller Information Environment
- Obligations for the publication of Common Data Service Descriptions
- A common data exchange framework
- The data service certification requirements
- Requirements for access and reuse of publicly held traffic and traveller information
- Requirements for the access and Re-Use of private sector data
- Common requirements for access ad Re-Use of safety-related information
- Common non-exclusive licence agreements

It would be the task of the European Commission to develop the required specifications in accordance with Directive 2010/40/EU.

3.4.1. Definition of the Organisational Roles within the European Traveller Information Environment

The following roles are identified:
- A role relating to the provision of data and information - Content and Information Providers
- A role relating to the provision of traffic and traveller information services – Service Providers
- A role relating to the use of traffic and traveller information services - Users
- A role relating to the management of the Traffic and Traveller Information environment

An overall picture of the main roles and their interactions is providedin Figure 6**Error! Reference source not found.**. The two-way arrows between roles are meant to indicate collections of interactions. Interactions to and from the management role are management information flows, while interactions between the three other roles are operational information flows of the traveller information environment, i.e. information flows that are present during daily operation.
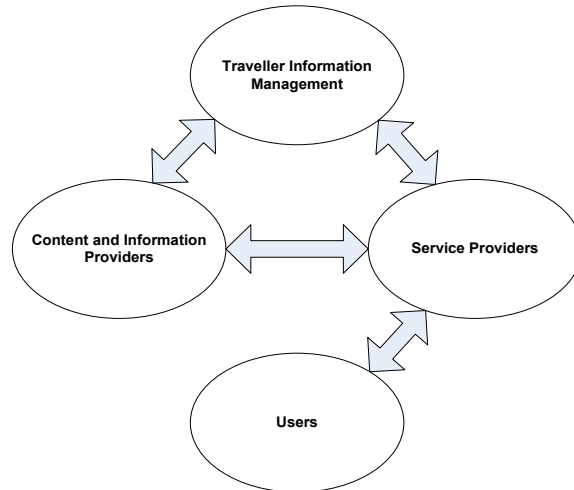
Figure 6   Roles in the European Traveller Information Environment

Role	Description
Traveller Information Management	Organisation responsible for the management of the Traveller Information Market. It is responsible for defining and maintaining a set of rules which define the policy for the traveller information environment. It is responsible for the establishment of a register of Content and Information Providers and operating the associated registration process and for managing the resolution of disputes between parties.
Content Providers	Providers of data used for information services, they collect the data and control the rights to use and distribute the data. The data provided by the Content Provider is in most cases "raw data" without any data refinement (meaning without generation of additional value). The only data processing of the content provider is in most cases a quality check to identify errors and missing data, and replace the missing or incorrect data. Content Providers provide data services using non-exclusive licenses according to published commercial terms.
Information Providers	Organisations that use and process data from one or more Content Providers in order to generate information. The refinement of raw data can be done by applying different methodologies such as data

Role	Description
	fusion with data from other data sources or by the usage of an algorithm and historic data for a prognosis. The Information Provider may generate information services for one or more Service Providers. Information Providers provide information services using non-exclusive licenses according to published commercial terms.
Service Providers	Organisation having the direct interface to the end user providing traveller information services. The Service Provider may be a private company or a public institution such as a traffic information centre. Service Providers use information from Content and Information Providers to deliver an information service to their customers and have to operate all functions related to the customers such as billing, customer administration or marketing
Users	Customer of the Service Provider. The User is interested in getting information to reach better way of travelling or a faster way to get somewhere. Information provided to Users needs to deliver what the consumer wants. Unless the perceived benefits of information access exceeds the perceived costs, Users will not consult or use the information service

3.4.2. Establishment of National and European Registries for Traffic and Traveller information sources

The European Commission would publish an electronic register of National Registries for Traffic and Traveller Information Sources.

Member States would be required to establish National Electronic Registries for Traffic and Traveller Information Sources. In the simplest form this could be a national website which provides links to the published Common Data Service Descriptions from Content and Information Providers.

A more complex implementation could be a national portal providing a single point of access to data sources such as has been implemented in

the UK www.data.gov.uk which at the end of 2010 provided access to over 6000 central and local government datasets.

3.4.3. Obligation for the Publication of Common Data Service Descriptions

Content and Information Providers will be required to publish a Data Service Statement[3] in a common format which as a minimum could set out the following:

- **Data Owner**: identification of the Owner of the data
- **Data Service Description**: a description of the data service offered
- **Data Collection Method**: a description of the method used to collect/process the data
- **Data specification and format**: Technical description of the data specification e.g. xml schema
- **Data Exchange mechanism**: Supported mechanisms for data exchange
- **Data Update Mode**: A data service needs to specify the regime for providing updates to the high level data objects which are published as part of the data service.
- **Physical Coverage**: A definition of the physical coverage of the service.
- **Service Grade**: A quality parameter in which the service is guaranteed.
- **Forecast Horizon**: A definition of the prediction time for the service.
- **Availability Period**: The period during which the availability of the service to the specified standard is defined / guaranteed. This may be by time of day / week / month or other special periods (e.g. 24/7 excluding national holiday periods)
- **Cross Verified**: A verification flag indicating whether the data value has been cross verified from one or more additional sources.
- **Licence Agreement**: details of the conditions for re-use and publishing of information
- **Commercial Terms**: details of the commercial terms and conditions for use of the data source

The Specification for the Data Service Statement should be defined by the European Commission. The existing specifications for metadata which describe data services in the German Mobility Data Marketplace, in combination with the QUANTIS methodology for quality assessment, should be used as a starting point.

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[3] Similar in concept to the EETS Domain Statement

3.4.4. Common Data Exchange Framework

Acceptance of common standards for the encoding of Traffic and Travel information is essential if the proposed distributed organisational model is to be successful. ITS standards allow the exchange of information between senders and receivers regardless of the languages they speak, and their knowledge of geography and location.

The selected standards should provide specifications broad enough to disclose all relevant data without substantial investments, and narrow enough to limit aggregation costs. Fortunately Europe has been at the forefront of the development of ITS standards and several of these standards have been deployed in many member states over the past decade.

The diagram below (Figure 7) presents the proposed data exchange formats to be used between content owners, content aggregators, public authorities and service providers to exchange traffic and traveller information. The requirements are limited to the content that is provided through the e-market. Member States can extend the requirements to the early stages of the value chain, but service providers have the freedom to select the most effective way of distributing the content to travellers.
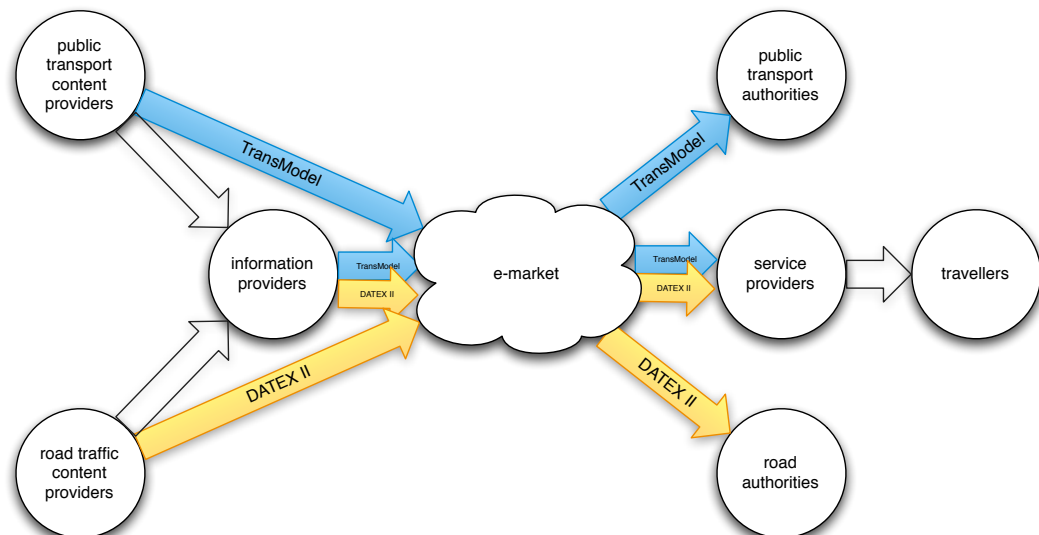

Figure 7   Data exchange formats

For all road traffic information DATEX is defined as the standard for encoding all data. DATEX already is used by many road authorities, traffic management centres and service operators, it provides excellent functionality for the coding of both status data (e.g., traffic speeds),

incident reports (e.g. traffic jams, accidents), as well as warnings (e.g. objects on the road, extreme weather), and traffic management recommendations and directives (e.g. lane closures, diversions).

For encoding information on public transport and multi-modal exchange points, TransModel provides an good standard. TransModel is commonly used by public transport authorities and operators in for example France, Germany and The Netherlands. It provides an abstract model of common public transport concepts and structures that for timetabling, fares, operational management, real time data, etc.

Standards need to provide a clear reference framework for encoding information, but also need to facilitate changes that result from technological innovation, and changes in regulation, legislation and market conditions. CEN Technical Committee 278 maintains both standards.

The organisational setup should include a forum of experts that maintains the standardisation registry and roadmap. The roadmap describes planned changes in the standards used, organisations involved in the value chain to anticipate future changes.

3.4.5. Requirements for Access and Reuse Public Sector Data

The following requirements relating to access and reuse of public sector data for traffic and traveller information services have been identified:
- National registers of Public Sector data sets shall be established
- Public Sector data shall be made available via common non-exclusive licence agreement (e.g. Open Government License (OGL) for Public sector information[4])
- Public Sector Authorities shall permit access and reuse of traffic and traveller information data on a transparent and non-discriminatory basis
- Public Authorities shall distribute safety-related information to all Service Providers
- Traffic Management Authorities shall make traffic management information available to Service Providers – to ensure consistency in information between distribution channels

[4] http://www.nationalarchives.gov.uk/doc/open-government-licence/open-government-licence.htm

3.4.6. Requirements for Access and Reuse of Private Sector Data

The following requirements relating to access and reuse of private sector data for traffic and traveller information services have been identified:

- National registers of commercial Traffic and Traveller information services shall be established
- Commercial Traffic and Traveller information services shall be registered on the National Register
- Commercial service providers determine the access and re-use conditions concerning their data
- Public Authorities have the right to purchase access to safety-related private sector data but are not under an obligation to do so.
- Where no alternative traffic and/or travel data service information exists, Member States can request that commercial safety-related Traffic and Traveller data be made available to Public Authorities under the essential facility theory. Costs for access to data sources costs in that case shall be based on a commonly agreed calculation method
- Commercial Public Transport Operators shall permit access and reuse of timetable information on a transparent and non-discriminatory basis
- Where available, commercial Public Transport Operators shall permit access and reuse of real-time arrival and departure information on a transparent and non-discriminatory basis

3.4.7. Common requirements for Access and Re-Use of Safety-related Information

The following requirements relating to access and reuse of Safety-related Information (SRI) have been identified:

- The public security exception as set forth in the Public Sector Information Directive shall not apply to SRI
- Real-time traffic information, at least for SRI, shall be regarded as news of the day or miscellaneous facts having the character of mere items of press information as per the Berne Convention[5]
- Real-time traffic information, at least for SRI, shall, to the extent justified by the information purpose, be made available to the public, as per the Berne Convention
- The public security exception as set forth in the database Directive n°96/9/EC shall apply to SRI

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[5] Berne Convention for the Protection of Literary and Artistic Works

- SRI shall be regarded as a matter of vital interest of the data subject as per the Directive n°95/46/EC
- Access and Re-Use of real time Safety-related Information shall not be subject to a Licence Agreement.

3.4.8. Common Non-Exclusive Licence Agreements

It is proposed that a common non-exclusive licence agreement is developed to be used to all the re-use of information within the European Traveller Information Environment.

An example of such a licence is provided in Annex A – Example Non Exclusive Licence Agreement, which could be used as the starting point for the Draft Specification.

3.5. Impacts

3.5.1. Direct Impacts

The direct impacts of the introduction of a European Framework for Traffic and Traveller information are expected to be:

- Reduction in the costs of accessing data for pan-European Traffic & Traveller Information Services
- Expansion of the coverage of existing Traffic and Traveller Information Services
- Emergence of multi-modal information services for Travellers
- Increased proliferation of real-time information services for Travellers
- Better informed Travellers and Freight Operators

3.5.2. Indirect Impacts

The indirect impacts of the introduction of a European Framework for Traffic and Traveller information are expected to be:

- The economic impact: reduction of congestion on roads, competitiveness (of industry, cost of ITS applications, innovation), consumers (prices, choices, services and economic growth);
- The social impact: road safety, employment and security;
- The environmental impact: climate change, air quality and noise, energy efficiency and targets related to co-modality (passenger and freight, modal split, interconnections).

3.5.3. Indicators

As indicated in the Impact Assessment conducted for the ITS Directive, the following indicators could be used to monitor the improvements to Traffic and Travel Information Services following the introduction of the European Framework for Traffic and Traveller Information:
- Ratio of average speed to free speed
- Change in journey time and average speed during peak hours
- Number of Content, Information and Service Providers
- Number of multi-modal journey planners
- Availability of multi-modal and/or real-time information
- Total logistics costs to shippers
- Modal split for passenger and freight transport
- Energy savings and emissions avoided
- Greenhouse gas emissions (fuel consumption)
- Indicators on air pollution in accordance with Directive 2004/461/EC
- Harmonised noise indicators in accordance with Directive 2002/49/EC

3.5.4. Proposed Scope of Impact Assessment

In accordance with Article 6 of Directive 2010/40/EU an impact assessment including cost benefit analysis should be conducted for the introduction of a European Framework for Traffic and Traveller information.

This impact assessment should include:
- Consultation with affected European Stakeholders on the proposed framework including as a minimum
    - Member States
    - Road Authorities
    - Public Transport Operators
    - Automotive Industry
    - Content Providers
    - Information Providers
    - Service Providers
- Quantitative Cost Benefit analysis
    - Assessment of the costs of the European Framework for Traffic and Traveller Information (both for implementation and operation)
    - Assessment of the Direct Benefits
    - Assessment of the Indirect Benefits
    - Assessment of the key deployment issues

- An assessment of the social-economic benefits of the establishment of the European Framework for Traffic and Traveller Information against a 'do-nothing'-scenario focusing on the accelerated deployment of pan-European Services

4. Part 2 - Free Provision of Minimum Universal Traffic Information

4.1. Understanding the Need

An estimated 34,500 people got killed in accidents on European roads in 2010, nearly 100 people a day. Initiatives from public authorities and innovations by the EU and industry have led to a significant decrease in road fatalities, but transport by road remains far too costly in terms of human lives.

Figure 8   EU road safety targets and achievements

Accidents are often caused when motorists encounter unexpected traffic situations, such as:
- Other accidents
- Tailbacks at unexpected locations

- Wrong-way drivers
- Unexpected objects on the road
- Dangerous local road conditions such as black ice
- Etc.

There is a common understanding that some of these accidents can be avoided by better informing motorists. Timely warning for unexpected traffic situations will allow motorists to better anticipate or even avoid such situations.

Road and enforcement authorities in Member States have long collected traffic information to better inform motorists. Besides information relevant to road safety, they also collected traffic flow information to improve traffic management. In the past decades road authorities in more developed Member States have developed innovative ways of managing traffic; using matrix signs to manage lane speeds and closures, and variable messages signs (VMS) and dynamic route information panels (DRIPs) to issue local warnings and instructions to motorists.

The past decade has also seen a significant increase in activity of private companies in collecting and providing traffic information. These service providers tend to focus on traffic flow as it:
- Allows their customers to avoid congestion
- Can be collected cost-effectively through automated systems

To complement their traffic information services, private service providers in general obtain journalistic information on accidents, closures, road works, and traffic management instructions from road authorities. Through enhanced FVD, private service providers themselves are increasingly becoming important sources of safety-related information. This will however not diminish their reliance on public sources for specific safety-related information.

The involvement of private service providers has contributed to the rapid expansion of in-vehicle delivery platforms for traffic information, such as TMC car radios, and connected navigation devices and smartphones. In the future there might be the danger that public services via radio are no longer operated due to the wide availability of private services via mobile or built-in devices. There is however a public interest to assure that information on incidents that can affect road safety, remains available free of charge to all motorists in the EU – also to those who may opt not to subscribe to any paid service.

In Directive 2010/40/EU the Council of Europe and the European Parliament, therefore endorsed the *provision, where possible, of road safety-related minimum universal traffic information free of charge to users*.

4.2. Issues to be Addressed

The objectives for the 'Universal Traffic Information' are:
- Ensure free minimum safety-related traffic information for all drivers
- Harmonise a Europe-wide free minimum service
- Develop suitable organisational models

To establish the universal traffic information the following issues need to be addressed:
- Definition of 'minimum universal traffic information' and road network coverage
- Selection of technology to describe information and location
- Verification of data availability
- Selection of a delivery method
- Selection of required ITS standards
- Definition of a common minimum quality level
- Selection of the optimum organisational setup
- Identification and remedy of legal impediments
- Careful balancing of stakeholder needs

4.3. Scope

This part provides the proposed specifications for the free minimum universal traffic information service. This service is to be a service that delivers in **real-time**, **safety-related** information on road conditions and the traffic situation, to European motorists while driving on European roads [33].

The proposed solution should further take into account:
- What can be achieved within 3 to 5 years using proven technology.
- The interests of all stakeholders involved.
- The arrangements needed for the minimum universal traffic information shall not be in conflict with European legislation (or include realistic suggestions for adaptation of such legislation).
- Recommendations should not hamper existing commercial and public initiatives to provide traffic information services, but incorporate and stimulate if possible.

- Recommendations shall take into account the EC's resources and wielding power, and are therefore limited to consensus building, stimulation of research and development, and regulatory and legislative action.

4.4. Naming

The proposed service is to provide 'minimum universal traffic information'. Because of the ambiguous meaning of 'minimum' and 'universal' it was decided to further refer to the service as **Traffic Safety Information Service**, or **TSI** Service, or **TSIS** for the TSI-services.

4.5. High-level service requirements

From the Terms of Reference, the following major requirements on the TSIS can be derived:

1. The Traffic Safety Information Services shall be available to all road users
2. The Traffic Safety Information Services shall include safety-related information
3. The Traffic Safety Information Services is offered free of recurring charges to the end user
4. The service should be harmonised and be 'seamlessly' available across Europe.

4.6. First Outline of Specifications

The requirements on the Traffic Safety Information Services are as far as possible 'output-based' and to contain implementation details only as far as needed to achieve a seamless service across the Member States.

4.6.1. Definition of 'safety-related'

For the TSIS, it is important to have a clear distinction between safety-related traffic information and other traffic information. Only in case the information is relevant to traffic safety, a strong public involvement can be justified in terms of policy and legislation.

Competing Requirements
Providing a strict definition of safety-related information is difficult. In general, it should be any information that can keep a traveller from any harm to him/herself or others. Nearly any type of incident can result in a dangerous situation if it is a non-predictable and sudden event. Whereas daily traffic congestion during peak hours experienced by commuters is unlikely to lead to dangerous situations, unexpected stationary traffic on

motorways can be very dangerous especially if the motorist was experiencing free flow conditions before.

A number of factors determine whether an event is relevant to traffic safety or not:
- Incident type, e.g. an accident involving a truck with hazardous goods is more relevant than a closure of a secondary road
- Network proximity, e.g. an accident far away or on a parallel road is less relevant that an accident ahead
- Local situation, e.g. a tailback around a road curve is more dangerous than an incident that can be seen from a long distance
- Geography, e.g. weather conditions in general are more relevant to safety in northern Scandinavia, than in Paris
- Unexpectedness, e.g. a traffic jam at an unexpected location is more relevant than daily congestion at a usual location
- Vehicle type, e.g. specific wind conditions are more relevant to truck than to private car drivers

As non-interference in an existing market is the major reason to be restrictive in the demarcation of 'safety-related' it is important to take into account the position of commercial traffic information providers. From the consultation that was done as part of this task, see [6] and [8], it was observed that according to private traffic information providers:
- The key product differentiator in the market currently is the quality and availability of traffic flow data, which is essential for efficient route-planning. This information is obtained from their own data sources such as floating vehicle data.
- Although private traffic information providers will collect more safety-related information in the near future, they will continue to rely on public sources for journalistic traffic information. This situation is likely to persist as public authorities:
  - will likely stay best informed on safety-related events such as accidents
  - are generally the only sources for traffic management information.

According to private service providers, the TSIS information should not contain traffic flow data, such as reports on stationary or slow moving traffic.

A balance between competing requirements on the definition of 'safety-related' is to be found; a single definition that provides the optimum for

clarity, non-ambiguity and ease of use at the same time does not exist (Figure 9).
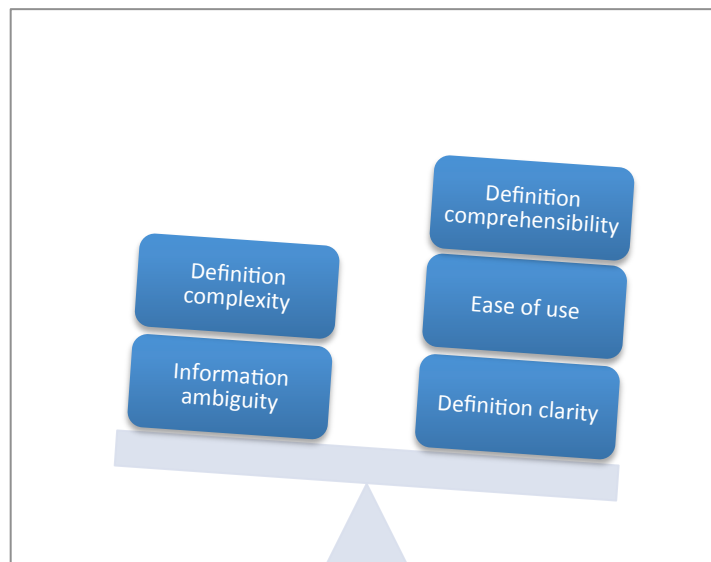

Figure 9   TSIS definition of 'safety-related' - balancing competing requirements

Existing Views on 'Safety-Related Traffic Information'

A number of attempts have been made to establish a practical definition of safety-related information [29, 31, 32].

GST/SACEL provided a clear-cut definition based on the ALERT-C event list, but also included events for traffic flow, such as 'stationary traffic'. TISA has provided a definition that is based on the German Traffic Information Platform [29] definition. This definition lists 8 categories of safety-related incident types. It is proposed to adopt the TISA definition of 'safety-related' as framework definition for TSIS. Though semantically clear, this definition does not yet provide a clear-cut mapping of individual incident types to the categories.

The TSI Definition

A pragmatic elaboration of TISA's definition of 'safety-related' is proposed for TSIS, building on the DATEX II incident classes. The DATEX II classes cover many types of incidents, some of which could be considered informative rather than safety-related. But by basing the definition on this

aggregation level, it has the advantage of being clear-cut and easy to use by traffic information operators, while largely avoiding semantic ambiguity.

The definition of 'safety-related' information for TSIS is as follows:

TISA definition	TSIS-DATEX II Definition	Description
Ghost driver	Included in the definition for category 4	Vehicle on wrong carriageway of a dual-carriageway road
Dangerous road surface	All Traffic Elements of class RoadConditions	All specified road conditions. E.g. black ice, icy patches, oil on road, poor road surface, etc.
Danger due to reduced visibility	All Traffic Elements of class PoorEnvironmentConditions where minimumVisibilityDistance is specified	Any environmental condition reducing visibility. E.g. hail or fog with visibility of less than 50 metres.
Animal / people / debris in the road way	All Traffic Elements of class Obstructions or DisturbanceActivity or AuthorityOperation	All obstructions on the road (e.g. fallen trees, animals, burning vehicle). All public disorder or alerts with the potential to disrupt traffic (e.g. demonstration, assault). All authority-initiated operation or activity that could disrupt traffic (e.g. police investigation, bomb squad in action).
Blockade of road, tunnels …	All OperatorActions of class NetworkManagement	All road operator activities to manage the road network e.g. rerouting, road/lane closures, warnings (e.g. reduce speed) and recommendations (e.g. snow tyres).

TISA definition	TSIS-DATEX II Definition	Description
Unprotected accident area	All Traffic Elements of class Accidents	All accidents
Temporary roadwork	All OperatorActions of class RoadWorks where UrgentRoadworks = true	All urgent repairs on the road network.
End of queue	All Traffic Elements of class AbnormalTraffic where Urgency = (Urgent or ExtremelyUrgent)	Any congestion that is uncommon

The definition excludes non-urgent information i.e.:
- Measured data, e.g. real-time and predicted travel times
- 'Abnormal Traffic', i.e. incidents reporting on traffic flow
- Road works
- Equipment or system failures
- Weather conditions not related to the road surface
- Public events
- Non-road related information, e.g. parking information

The excluded incident reports can be defined as safety-related if labelled 'urgent', e.g. in case of a tailback at a dangerous location, or a blizzard warning.

DATEX II incident codes can be mapped to TMC event codes. As such the above definition can be used for both TSIS-SP and TSIS-TMC.

4.6.2. TSIS Concept

The content scope of TSIS is safety-related traffic information. It has the advantage that such information currently is generally available in the public domain and is strongly related to a traffic management responsibility. Furthermore, safety-related traffic information does generally not conflict with the interests of commercial service providers that compete on the basis of quality, scope and granularity of detailed traffic flow information. Caution is to be taken not to broaden the scope of 'safety-related' to include information on traffic flow that does not imply a direct safety threat.

When pursuing the establishment of a universal traffic information service throughout the Union, it is important to realise that different development levels with respect to collection, processing and distribution will persist between the Member States. The universal service is therefore based on what can be achieved in the less developed markets while allowing for more advanced universal services in more developed Member States.

The Traffic Safety Information Services are defined in such a way that no investments in automated traffic monitoring systems are required. The Traffic Safety Information content can be compiled by structuring and centralising content already available at Road Authorities, 112-operators and Enforcement Agencies. However, the smaller and less developed Member States might still lack the funds for the implementation of the Traffic Safety Information Services.
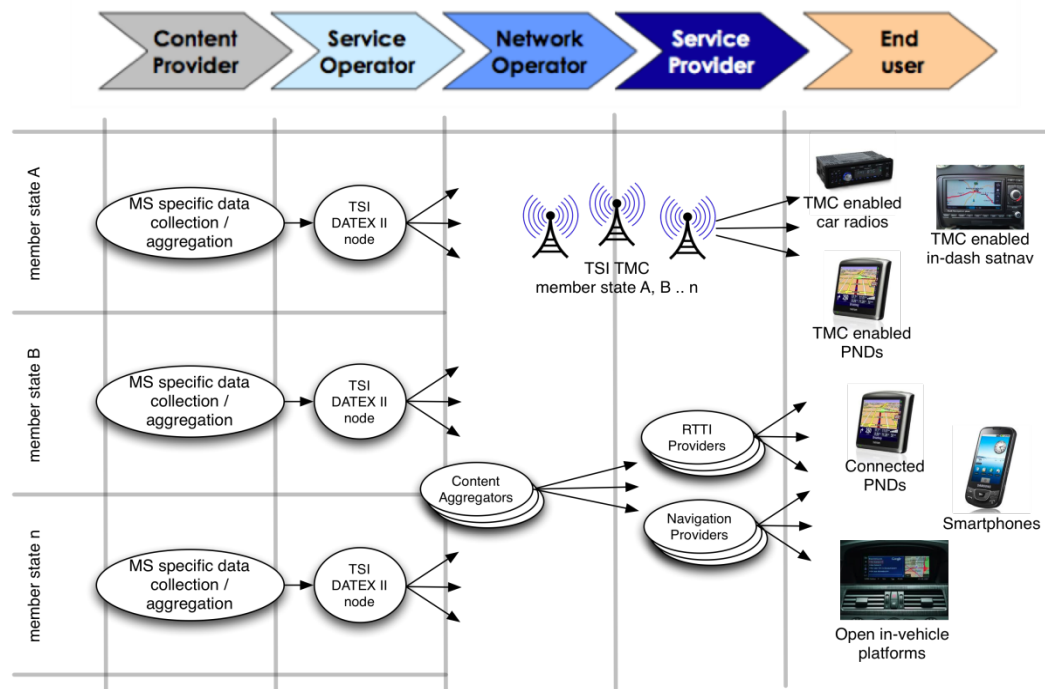
Figure 10 Overview of organisational setup of the Traffic Safety Information Services.

The suggested Traffic Safety Information Service has two components:
1. TSIS-TMC: A free service to the end user via RDS-TMC. The requirement for RDS-TMC should be re-assessed after a period of 5 years, as other technologies may become widely adopted on such a time scale.
2. TSIS-SP: A free publication of traffic information to commercial service providers, enabling distribution to end users through various

channels. TSIS-SP can also be used by road authorities to feed variable message signs (VMS).

The TMC-component will allow citizens to receive safety-related info in all Member States in their own language using a single device.

The TSIS-SP service will encourage further dissemination of safety-related information by commercial service providers to devices supporting other communication methods than RDS-TMC. The availability and free access to the TSIS-SP is guaranteed by the individual Member States. Service providers can develop new (integrated) services using the TSIS-SP. They may either offer their services for free, or charge a fee to the end user.

This approach will maximise the dissemination level for traffic safety information, as presented in Figure 10.

Rationale for RDS-TMC
RDS-TMC is selected for its wide availability and relatively low operational cost. It is supported by large volumes of car radios, in-car navigation systems and personal navigation devices (PNDs). Obviously, technically superior alternatives exist (DAB, DVB-H, DVB-SH, cellular). DAB and DVB however have a market penetration that is still marginal compared to RDS-TMC. Cellular communication does not suffer from low penetration but is basically inefficient for a broadcasting application. Cellular communication is also impractical as it requires a previous arrangement with a telecom operator, and costs for international data roaming over cellular networks are still considerable.

On the contrary, RDS-TMC broadcasting has low operational costs, as the required infrastructure is limited and centralised. The required investments are also low given the fact that the infrastructure for FM radio transmissions is already available in almost all countries. In fact, RDS-TMC services are already operational in many Member States.

It is noted that RDS-TMC can be regarded as 'old' technology and that it has its impracticalities, e.g. concerning the very limited bandwidth, and the need to switch to a different channel/frequency when travelling from one service area to another, or even from one beacon to the next of the same service. Other technologies are expected to gradually take over the role of RDS-TMC.

The second component of the recommended strategy should ensure that the choice for RDS-TMC at this stage will not obstruct the further

development of traffic information services. At this stage it is impossible to select one most suitable technology for the future. It is therefore recommended to leave choices for enhanced distribution channels and services to the market but to offer all service providers a free, uniform, and easiest possible access to safety-related traffic information. This guarantees optimum exposure of this information and may stimulate the further development of traffic information services.

4.6.3. Organisation and legal requirements

It is not likely that a completely non-committal arrangement will lead to the desired seamless service in the foreseeable future. In order to implement the TSIS and to ensure it keeps running and meeting its objectives, a suitable legal and organisation framework is required.

The legal framework should:
- Stipulate the obligation of Member States to implement the Traffic Safety Information Services
  - Define the functional and technical requirements of the TSIS
  - Establish the implementation schedule of the TSIS. Differences between Member States shall be taken into account.
  - Stipulate the obligation to notify Traffic Safety Information Services to the central registry and define the associated procedures
- Define quality monitoring procedures
- Define procedures for change management and further development of TSIS.

At the European level the European Commission will act as TSI Coordinator. Tasks of the TSI Coordinator would logically include:

- Maintaining and publishing a registry of TSIS-TMC and TSIS-SP services. Monitoring of content quality and service coverage of the TSI, also in view of new Member States and extension of the European road network.
- Co-ordination of the promotion of services.

The following tasks are carried out by TISA but are essential for the successful operation of TSIS:
- Quality monitoring and assessment of TMC location tables
- Maintenance of standards in co-operation with standardization bodies.

The Member States shall be responsible for the availability of one or more TSIS-TMC services that offer the required minimum quality and coverage, as well as for the availability of the TSIS-SP. In view of great differences with respect to already existing organisations, services and infrastructure for traffic information, the Member States shall be free to choose any national arrangement they deem appropriate for this purpose. It may involve public organisations, private sector or a combination of those. Member States shall also have the freedom to define additional content beyond the defined minimum. It is however recommended to take a conservative approach here, in order to avoid unnecessary intervention in an existing and open market for traffic information services.

Table 3 summarises the division of key roles in the implementation and operation of the TSI services.

	TSI Registry	TSIS-SP	TSIS-TMC
Implement	TSI-Coordinator	Member States	Member States
Operate	TSI-Coordinator	Member States	Member States
Use	Member States	Service provider	Motorists

Table 3   Key roles TSIS

4.6.4. Central Registry and Meta-Data

In order to enable a seamless service, a central registry shall be kept of national / regional TSIS-TMC and TSIS-SP services. The central registry shall be managed on a European level, i.e. by the TSI Coordinator.

4.6.5. Roles of Public and Private Actors

The envisaged approach provides Member States with the flexibility to implement the Traffic Safety Information Services service in the most efficient way. Different approaches are conceivable:
- New Traffic Safety Information Services can be set up and operated by public authorities in parallel to existing services.
- The implementation and operation of new Traffic Safety Information services can be outsourced to private companies, as long as continuity and adherence to the service definition is guaranteed by the Member State. Traffic Safety Information Services need to comply with the Traffic Safety Information definition, but the Traffic Safety Information may be integrated in a broader information service.

- Existing services operated by private organizations can be proposed as Traffic Safety Information Services. The Member State then needs to guarantee continuity and adherence to the service definition through a contractual agreement with the service provider.
- When services exist that are compliant with Traffic Safety Information, a Member State may still decide to set up a parallel Traffic Safety Information Service, e.g. to guarantee fast delivery of safety-related information in congested areas.
- Development and operation of one service shared by multiple Member States is allowed as long as full TERN coverage is guaranteed as minimum by every Member State. Similarly, it is also allowed that multiple services in a Member State together provide the required coverage.

4.6.6. Business Cases

For commercial service providers the business case for stand-alone TSI-service is unlikely to exist. In-car delivery of information requires some kind of device and a wireless communication service. Both incur non-negligible costs on service provisioning.

However, the service can be included in extended traffic information, integrated with route guidance / navigation services, or be part of even broader multi-modal mobility information services. The marginal costs to include the TSI in new or existing in-car services are generally low as bandwidth, processing and presentation requirements of TSI will not be dominant.

4.6.7. *Coverage*

The service will at least cover the complete Trans-European Road Network (TERN) in the Member States (Figure 11). Member States need to assure availability of the service concerning the TERN. They are free to extend the service with information on road sections that are not part of the TERN. Other European States should be invited and encouraged to implement the Traffic Safety Information as well.

The TERN is defined by [11]. On-ramps, crossroads and distributors, and parking areas and service/petrol stations that can be accessed directly from the TERN, are also considered part of the TSI geographic coverage.

Figure 11 Overview of TERN

4.6.8. Data Gathering and Processing

The organisation, effort and technologies to collect and process the data is decided by the individual Member States. However, the end-product of the value chain will need to comply with the quality standards defined for the TSI, e.g. in terms of the maximum time allowed between the occurrence of an incidence and the presentation of the incidence to the Traffic Safety Information user.

Member states can obtain traffic information from different sources, depending on the level of development of their markets:

- Public sources: aggregated information at traffic management and information centres, or their subsources:
  - Enforcement / emergency services; information on accidents, major calamities affecting road traffic, public events, etc.
  - Road authorities; closed circuit television (CCTV) images, traffic measurements, road work information, lane and road closures, etc.
  - Meteorological services; road conditions, extreme weather conditions
- Private sources: traffic information providers or their subsources:
  - Floating vehicle data providers
  - Traffic reporters
  - Traffic monitoring equipment
  - Meteorological services; road conditions, extreme weather conditions

The availability of sources, and the amount and quality of data available will vary between Member States. However, even in Member States where no traffic information is currently available, a basic value chain can be set up with limited investment to aggregate safety-related information from enforcement services, road authorities and meteorological services.

In more developed markets, Member States can opt to implement a publicly operated value chain that collects information for the TSIS services, or outsource the TSIS data collection to private service providers.

The first option is most suited for Member States where public authorities are the key traffic information providers, e.g. Denmark. The latter is more suited for Member States where traffic information services are mainly operated by private service providers, e.g. UK and Poland.

4.6.9. Presentation

The presentation of information on the device interfacing with the end user should take into account the capabilities and limitations of the platform, as well as user preferences. It is up to the supplier of the in-vehicle equipment to determine the best way to present TSI.

To aid intuitive recognition and understanding, it is desirable to make use of harmonised icons to present types of events graphically. Given the fact that in-car presentation of traffic information is part of the competitive edge

of service providers and equipment suppliers, it is unrealistic that the EC or the Member State would strictly impose presentation details for traffic warnings. The optimum achievable seems to agree on a recommended presentation for common TSI events and categories.

It is required that the content of Traffic Safety Information is not changed, but content may be filtered to improve presentation (e.g. icon on map), user relevance (e.g. only show incidents on planned route), etc.

4.6.10. Quality Level

Quality Approach

Successful Traffic Safety Information Services need to provide a level of service that meets the average expectation of the European motorists. However, the proposed organisational model allows for different TSI service levels in the Member States.

It therefore is essential that a uniform method is established to:
- Clearly indicate the level of service for each TSI service
- Guarantee a minimum level of service for all TSI services.

The Member States will be responsible for guaranteeing the minimum quality level of the TSI services in their country. Before a Traffic Safety Information Service is admitted to the central TSIS registry, the service needs to pass an objective quality assessment. After initial admission, periodic audits should ensure that the service level is maintained on the longer term.

Quality Assessment Methodology

Quality assessments are commissioned by the Member States to the appropriate certification bodies of the Member States, and controlled by the National Accreditation Bodies of the Member States [28]. The assessment methodology is based on the methodology recently developed by the QUANTIS project [27], which in turn is based on ISO 21707 of the International Organisation for Standardization (ISO) [20]. The QUANTIS methodology provides a structured way of assessing the quality of a traffic information service. The result is a 0-4 score (Standard Quality Level) on a number of key quality parameters (Quality Objects), as well as a rating for the Total Service Quality (TSQ) of the service. A QUANTIS quality assessment can be represented in a spider diagram, see Figure 12.
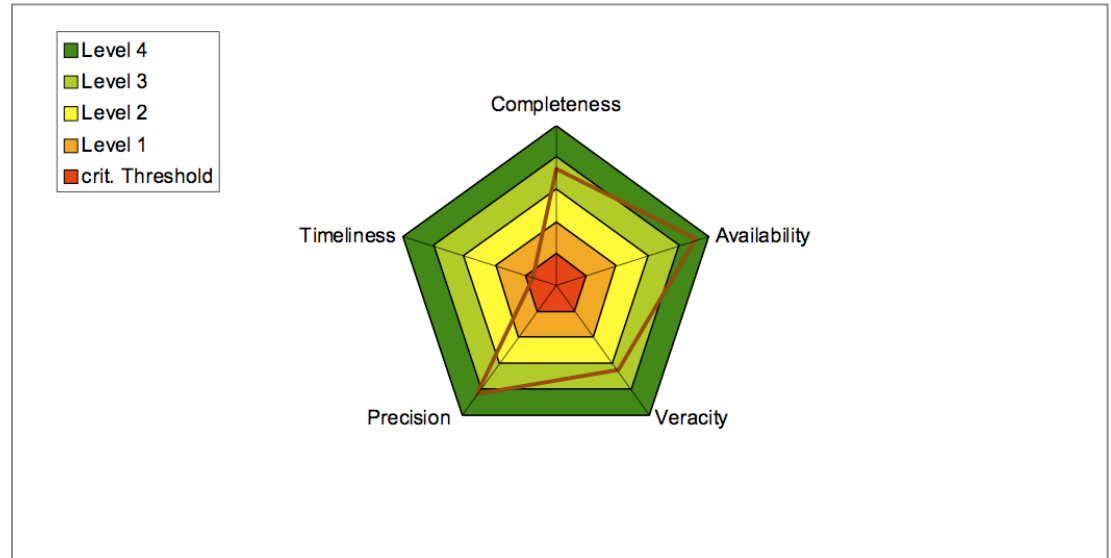
Figure 12   QUANTIS spider diagram

The QUANTIS Quality Objects are composed of a number underlying Quality Parameters, see Table 4.

Quality Object	Quality Parameters
Completeness	Geographic coverage Physical coverage Percentage of physical coverage Percentage event coverage Data types coverage Depth of coverage (density)
Availability	Availability Period Up time
Veracity	Error probability Cross verified
Precision	Duration accuracy Location accuracy Content accuracy Forecast horizon
Timeliness	Data latency Data update mode Data update interval
Consistency (from different media)	
Relevance	

Table 4   QUANTIS Quality Objects and associated Quality Parameters

QUANTIS provides a generic method for testing the Quality Parameters against specific criteria. The method allows for the definition of new parameters and criteria while providing standard sets for a number of predefined service types (the Core Services). To determine the Total Service Quality rating, the Standard Quality Level ratings are multiplied with a weight factor based on relevance. The weight factors have been assigned through an expert consultation.

TSI Quality Definition

Based on the QUANTIS methodology, a TSI quality definition has been established, applicable to both TSIS-TMC and TSIS-SP, it is included in Annex B – TSIS Quality Definition. The TSI quality definition is based on the values for the QUANTIS Core Service 'Accidents and Warnings'. It uses the same weight factors and most of the quality parameters. Some criteria have been extended with, or replaced by criteria specific to TSI. A service is accepted as TSI service when all the minimum requirements (Critical Values) are met, and the Total Service Quality is 3 or higher.
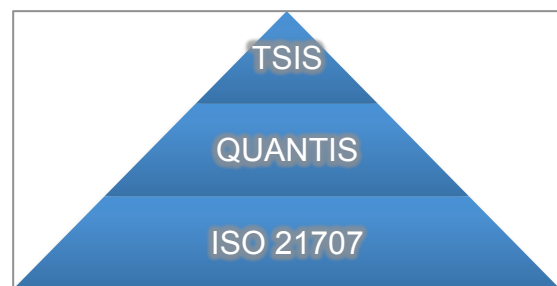

Figure 13 TSIS quality methodology stack

QUANTIS contains some ambiguity in its definitions. It is for example not completely clear how the location accuracy for linear and area locations is determined. Standardisation bodies should be encouraged to adopt the QUANTIS methodology, and elaborate it further to a universal Traffic and Traveller Information quality standard.

The minimum content to be provided by TSIS consists of safety-related incident information. The occurrence of such incidents is too limited to cost-effectively assess the quality based on ground truth collected during field surveys. The quality assessment will therefore be carried out through internal audits by the appropriate certification body of the Member State. Auditors will assess the individual quality parameters based on information provided by the TSI service operator on the applied methods for collecting, processing and distributing of the safety-related information (Figure 14).

The quality of the TSIS-SP services is assessed from the perspective of the service providers. Of the TSIS-TMC services, the air-interface will be

assessed, i.e. the auditors assess the service as it is offered to RDS-TMC receivers, and need to take into account differences in FM-coverage.

Because the assessment cannot be based on ground truth testing, it is essential that the auditor is independent. This is achieved by outsourcing the audits to an organisation independent of European institutions, the TSI-Coordinator and service providers involved, i.e. the appropriate certification bodies, monitored by the National Accreditation Bodies of Member States.
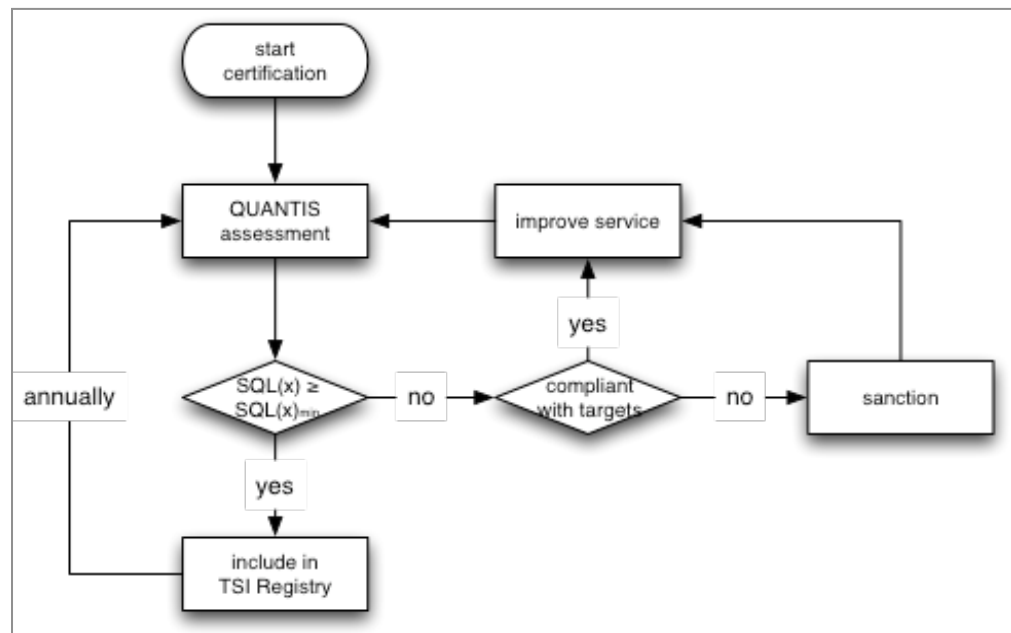
Figure 14 Assessment procedure for TSI services

4.6.11. TSIS-TMC specific requirements

4.6.11.1. Format and Coding

Coding
For the exchange of information to end-user devices the TSIS-TMC shall make use of:
- RDS-TMC [21]
- ALERT-C [22]
- TMC Location referencing [35]

Location Referencing

TMC tables are used for translation of the TMC location codes into text messages or graphical presentation by equipment of the end user in case of the Traffic Safety Information TMC service. For a seamless service, it is essential that TMC tables shall be publicly available, free of charge.

Creation, publication and management of TMC tables to be used by the Traffic Safety Information is a responsibility of the Member States, which may or may not delegate implementation to the private sector. The TMC table(s) have to be publicly available, the access details have to be present in the central registry.

Currently some countries only have private TMC services that use proprietary TMC location tables for location referencing. Such services do not conflict with the Traffic Safety Information Services, but do not qualify as such as long as their TMC location tables are not made available through the central registry free of charge.

4.6.11.2. Distribution

The following standards shall be used:

• RDS-TMC: Radio Data System – Traffic Message Channel as mechanism to distribute the Traffic Safety Information to devices of end-users.

4.6.11.3. Coordination of services

The coverage of the TERN (as a minimum) in a Member State is preferably achieved through a single TMC service using a single radio frequency. For Member States with a large surface area and densely populated Member States, setting up multiple services can result in faster content delivery to travellers. Coverage may therefore also be achieved through the implementation of multiple TMC services or using multiple radio frequencies. The number of services should however be limited so as to guarantee maximum continuity for long distance travellers.

Member States can also agree to set up and/or operate a single service covering the TERN (as a minimum) in two or more Member States. In particular for the smaller landlocked countries this should be encouraged in order to provide seamless service for long distance travellers.

A registry of TSIS-TMC services is to be kept by the TSI-Coordinator. This registry shall also contain links to the associated TMC tables, and the FM-channel (or channels) used for distribution of the TMC service.

4.6.12. TSIS-SP specific requirements

4.6.12.1. Format and Coding

The location referencing method used in the TSIS-DATEX II service can be any method approved by the DATEX II standard.

4.6.12.2. Distribution

The following standard shall be used for the provisioning of the traffic information feed to service providers over an IP network:

- DATEX-II XML [10].

For the distribution of traffic information to end users, service providers are free to use standards or proprietary coding methodologies of their choice.

4.6.12.3. Coordination of services

Coverage of the TERN (as a minimum) in a Member State is achieved through a single TSIS-SP service.

Member States can also agree to set up and/or operate a single service covering the TERN (as a minimum) in two or more Member States. In particular for the smaller landlocked countries this should be encouraged in order to limit overhead for service providers.

4.7. Policy Options Implementation

4.7.1. Background

This section presents the policy options of the European Commission for the establishment of the TSIS-SP and TSIS-TMC services. Subsequently the policy requirements and policy options are described, followed by a description of the recommended policy mix, and an assessment of effectiveness of the proposed policy mix.

4.7.2. Policy Requirements

The policy will need to adhere to the Principles for Specifications and Deployment of ITS as defined in Annex 2 of the ITS Directive [14]:

1. Be effective.
2. Be cost-efficient
3. Be proportionate – provide, where appropriate, for different levels of achievable service quality and deployment
4. Support continuity of services & deliver interoperability
5. Support backward compatibility, ensure capability to work with existing systems that share a common purpose, without hindering the development of new technologies
6. Respect existing national infrastructure and network characteristics – take into account the inherent differences in the transport network characteristics, in particular in the sizes of the traffic volumes and in road weather conditions.
7. Promote equality of access – do not impede or discriminate against access to ITS applications and services by vulnerable road users.
8. Support maturity – demonstrate, after appropriate risk assessment, the robustness of innovative ITS systems, through a sufficient level of technical development and operational exploitation.
9. Deliver quality of timing and positioning – use of satellite-based infrastructures, or any technology providing equivalent levels of precision for the purposes of ITS applications and services that require global, continuous, accurate and guaranteed timing and positioning services.
10. Facilitate inter-modality – take into account the coordination of various modes of transport, where appropriate, when deploying ITS.
11. Respect coherence – take into account existing Union rules, policies and activities which are relevant in the field of ITS, in particular in the field of standardisation.

Further to the general requirements from the ITS Directive, the policy will also need to:
12. Assure the timely implementation, successful operation, and future development of the TSI services in all member states.
13. Assure organisational setup as described in D6 [9]
14. Contribute to the main policy objectives of the ITS Action Plan [1] for transport and travel: cleaner, more efficient, safer and more secure transport.
15. Contribute to the objectives for the 'Free Universal Minimum Service' as defined in the Task Description [33]:
    o Ensure free minimum traffic services for all travellers
    o Harmonise a Europe-wide free minimum service
    o Develop suitable organisational models

16. Establish and foster support from citizens, road authorities, and public and private service operators and providers for the deployment and continued operation of the TSI services.
17. Allow for different deployment speeds in the member states, enabling less developed markets to catch-up.
18. Take the already established public and private value chains into account, including the different organisational setups of the different member states.
19. Avoid market interference, stimulate the development of the private traffic and travel services markets where possible.
20. Assure level of quality of the TSI services as defined in Annex B – TSIS Quality Definition
21. Set clear objectives and market requirements for the TSI services, as well as define the exit strategy should the TSI services no longer comply with said objectives and requirements.
22. Provide financial support where member states cannot comply with the policy for economical reasons.

4.7.3. Policy Instruments

The European Commission can propose legislation, publish recommendations and opinions, and has the obligation to enforce EU legislation and policy by member states and EU Institutions. To do so it disposes over the following policy instruments:

Legislative
The EC alone has legislative initiative in the European Union. It can propose regulations, directives and decisions that take precedence over national law and are binding to EU Member States..

Non-binding instruments
The EU can issue recommendations and opinions to influence the common opinion on specific topics in Member State authorities, associations and interest groups, and other stakeholders. The EC can further issue rules governing how EU institutions and programmes work.

Enforcement
The Commission's role is to ensure EU law is properly applied - by individuals, national authorities and other EU institutions. To do this the Commission can impose sanctions on individuals or companies who break EU law. If required, the EC can also take formal action against national authorities.

A more detailed description of the policy instruments has been enclosed in
Annex C - Policy Instruments European Commission.

4.7.4. Policy Mix

This section describes the proposed mix of policy actions. These are:
1. Issuing the TSI Specifications
2. Establishment of a TSI Coordinator (TSIC)
3. Establishment of TSI Funding
4. Establishment of a TSI Council

The TSI Specifications are to be regarded as Specifications as defined in the ITS Directive [14] and will:
1. Define the principles of the TSI service platform.
2. Include the TSIS-SP and TSIS-TMC Specifications
3. Include the TSI License Agreement (e.g. based on Annex A – Example Non Exclusive Licence Agreement)
4. Oblige Member States to attune national laws and regulations to the meet the requirements of the TSI Specifications and License Agreement.
5. Oblige the Member States to implement the TSIS-SP and TSIS-TMC services.
6. Specify the implementation planning per Member State.

Figure 15 TSIS legal and organisational framework

7. Clarify the responsibilities, goals and policy instruments of the TSI Coordinator (TSIC) to monitor the proper deployment and operation of the TSI services in each Member State.
8. Specify the obligation of Member States to provide full co-operation to the TSI Coordinator.
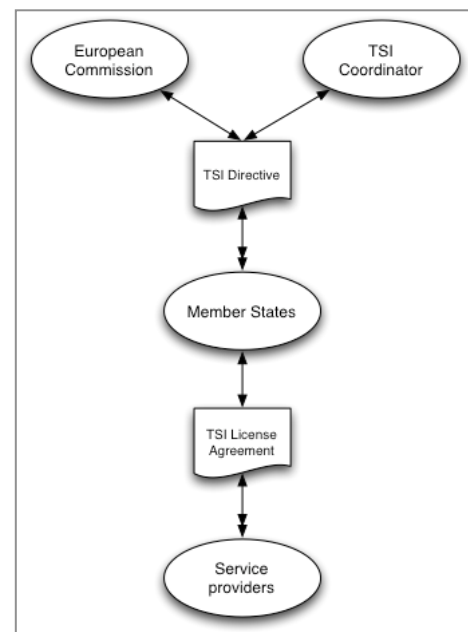
The TSI Coordinator Work Programme should detail:
1. Objectives
2. Responsibilities, such as:
   a. Maintaining and publishing the registry of TSIS-TMC and TSIS-SP services

       b. Monitoring of content quality and service coverage of the TSI

       c. Co-ordination of the promotion of the TSI services by the Member States.

       d. Assessment of the TSIS (dis)continuation criteria

3. Methodology, including procedures for:

       a. TSI service quality assessment

       b. Admission to the central registry

       c. Removal from the central registry

       d. Non-compliance

       e. Reporting to Member States and stakeholders

       f. TSIS (dis)continuation

4. Task specification and planning for the start-up and operational phase

5. Resource requirements for the start-up and operational phase

TSI Funding will provide financial support to less developed Member States in the deployment, i.e. not operation, of the TSI services. The TSI Funding is to be drawn from existing ITS funds such as the Structural Funds, TEN-T, etc. A work programme should be drafted for TSI Funding that will define:

1. Funding scheme

2. Planning, including application deadlines and funding programme end

3. Eligibility criteria

4. Methodology, including procedures for:

       a. Applications

       b. Assessment of applications

       c. Financial audits

A TSI Council is to be defined to safeguard the stakeholders' interest in the TSI project. The Council can make recommendations to the TSI Coordinator on the deployment, operation, and development of the TSI services.

4.7.5. Funding

The implementation and operation of the TSI Services will require funding. Costs should be divided between stakeholders based on their specific interest in TSI, and should be proportionate to their funding capacity and willingness to contribute. Financial contributions will also assure the continued contribution of key stakeholders.

The table below provides an overview of these considerations and the resulting funding recommendations.

Stakeholder	Specific interest in TSI	Contribution area
Motorist	Use of services	• Purchase of TMC device, or • Purchase of other device to receive TSIS-SP data
Private service provider	Availability TSIS-SP	• Funding implementation and operation of TSIS-SP-based services
Member State	Availability and use of TSIS at desired service level	• Funding implementation and operation of TSIS-TMC and TSIS-SP
European Commission	Availability and use of uniform minimumTSIS in all MS	• Implementation and operational costs of TSI-Coordinator • Financial support for implementation of TSIS in less developed Member States

Table 5   Funding overview

The budget for implementation and operation of the Traffic Safety Information Services is to be provided or organised by the Member States. It is up to Member States to decide what bodies are responsible for funding the implementation and operation of the DATEX II and TMC Traffic Safety Information Services within their country.

The Traffic Safety Information Services are defined in such a way that no investments in automated traffic monitoring systems are required. The Traffic Safety Information content can be compiled by structuring and centralising content already available at Road Authorities, 112-Operators and Enforcement Agencies. However, the smaller and less developed Member States might still lack the funds for the implementation of the Traffic Safety Information Services and should be supported by allocating

funds for implementation. Member States that desire so can implement and operate more advanced TSI Services.

The reception and presentation of the Traffic Safety Information service content requires some form of device. This can be a TMC enabled car radio or navigation device, but also devices that retrieve information from dedicated back office systems using mobile Internet or other data communication networks. In general the consumer will need to cover the costs for these devices, although these costs might also be hidden, e.g. in a mobile phone subscription, or when the Traffic Safety Information is considered an add-on to a navigation device or services bundle.

Service providers can develop new services based on the DATEX II Traffic Safety Information. Free access to the DATEX II Traffic Safety Information is guaranteed by the individual Member States. Service providers can provide the Traffic Safety Information based services for free, or charge a fee. They can also generate income through sponsoring and advertisement contracts based on the Traffic Safety Information services. Citizens always have the option to receive the free Traffic Safety Information TMC service.

4.7.6. Policy reassessment

It is expected that the suggested policy mix is realistic and effective to boost the dissemination of TSI. It should be noted that the actual usage of the TSIS-TMC is not fully predictable, e.g. due to:
- Strong developments in technology or market conditions that render part of the TSIS obsolete
- Insufficient use by motorists
- Quality of the content failing to meet objectives or user expectations.

As to the TSIS-SP, take-up might also fail to meet expectations, e.g. if business cases appear not to be significantly improved by the easy and low-cost availability of safety-related traffic information.

Under such circumstances it might not be cost-effective and/or efficient to maintain the TSIS in its original form. In view of that, it is recommended to implement a mechanism of annual policy reassessment that provides an objective indication to what extent the objectives of the policy are being met.

The following parameters are expected to be relevant for the policy reassessment:

1. Implementation status of TSIS, per member state
   a. Coverage of TERN as a minimum. Does it suffice or should minimum coverage be expanded to include other roads
   b. Quality achieved, in terms of QUANTIS metrics
   c. Promotion of services
2. Number of TSIS-TMC enabled devices sold/in use
3. Number of service providers subscribing to the TSIS-SP, per member state, and number of connected end users receiving TSIS
4. Statistics of traffic accident counts on the TERN, with analyses on the relative impact of TSIS as far as possible.

The exact scope of the reassessment should be further elaborated in cooperation with the TSI Coordinator and Council. The assessment approach should be supplemented with criteria for failure/success.

4.7.7. Assessment against Policy Requirements

This section provides an assessment of the proposed mix of policy instruments by assessing the fulfilment of the policy requirements described in section 4.7.2.

1. Be effective.

The TSI Specifications will assure the establishment of the TSI services in all Member States. Putting the primary responsibility for TSI deployment at the Member State level will allow for a quick rollout in advanced markets. Limiting the content to information collected by road and enforcement authorities will allow for rapid TSI development in less advanced markets.

The TSI Coordinator and sanctioning scheme will assure rapid implementation adhering to common technical, organisational and legal requirements. The TSI Coordinator will also assure the development of next generation Traffic and Traveller Information (TTI) standards and TSI services.

The allocation of TSI Funding will assure financial impediments are removed beforehand. The TSI Council will assure support from key stakeholders during implementation and operation of the TSI services.

2. Be cost-efficient

By choosing proven technology and established ITS standards as the technical framework for the TSI services, no investment in R&D, demonstrators or pilots is required. The TSI services can be implemented using off-the-shelf technical components available from multiple established ITS suppliers.

The level of centralisation is limited to a minimum, limiting overhead for attuning and co-ordination.

3. Be proportionate – provide, where appropriate, for different levels of achievable service quality and deployment

The TSI specifications allow for a rapid deployment based on existing ITS infrastructure in advanced TTI markets, and the establishment of a basic ITS infrastructure in less advanced markets. Building on proven technology and established ITS standards the TSI services will provide harmonised TTI services in all Member States.

The central role will be limited to compliance monitoring and reporting, and assuring continuity of the applied ITS standards.

4. Support continuity of services & deliver interoperability

The TSI Coordinator will monitor, and assure, deployment and operation of the TSI services compliant with the TSI specifications. The TSI Coordinator in co-operation with the TSI Council will assure continued stakeholder support.

5. Support backward compatibility, ensure capability to work with existing systems that share a common purpose, without hindering the development of new technologies

The TSI services are based on technology and ITS standard in use in advanced TTI markets. The TSI services can be therefore be based on the ITS infrastructure available in the advanced markets.

It will be the TSI Coordinator's and TSI Council's task to assure continuity of the ITS standards used it the TSI framework.

6. Respect existing national infrastructure and network characteristics – take into account the inherent differences in the transport network

characteristics, in particular in the sizes of the traffic volumes and in road weather conditions.

The proposed policy allows for a deployment at different speeds. Member states with an established ITS infrastructure will be able to quickly deploy the TSI services. Member States with less advanced TTI markets will be able to quickly set up the TSI services with limited support from the TSI Coordinator and TSI funding arrangements.

Putting responsibility of TSI implementation at the Member State level, allows for regional variation in TSI functionality. i.e. Member States can attune the content of the TSI services to meet the needs of the motorists on their road network, taking into account specific regional circumstances such as road conditions, traffic density, mountain pass weather, and pass, tunnel and bridge closures.

7. Promote equality of access – do not impede or discriminate against access to ITS applications and services by vulnerable road users.

All TSI information is provided in coded form, allowing for any audiovisual presentation method, and any language. Though less relevant to pedestrians and cyclists, the TSI services can be accessed by any road user.

8. Support maturity – demonstrate, after appropriate risk assessment, the robustness of innovative ITS systems, through a sufficient level of technical development and operational exploitation.

The TSI services are based on proven technology and ITS standards, and can be implemented using off-the-shelf ITS components from various established suppliers. The real innovation lies in the technical, functional and legal harmonisation the proposed policy mix will achieve in all Member States.

9. Deliver quality of timing and positioning – use of satellite-based infrastructures, or any technology providing equivalent levels of precision for the purposes of ITS applications and services that require global, continuous, accurate and guaranteed timing and positioning services.

The information from TSI services will allow both in-dash and nomadic navigation devices to contribute to the road safety of their customers. The

advent of uniform TSI services throughout Europe is likely to increase the use of satellite based positioning services.

10. Facilitate inter-modality – take into account the coordination of various modes of transport, where appropriate, when deploying ITS.

The TSI services are limited to information related to road safety and therefore by definition will not facilitate inter-modality.

11. Respect coherence – take into account existing Union rules, policies and activities which are relevant in the field of ITS, in particular in the field of standardisation.

The TSI Services will be founded on the
- Directive 2010/40/EU of the European Parliament and of the Council on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.
- Commission Recommendation on the development of a legal and business framework for participation of the private sector in deploying telematics-based Traffic and Travel Information (TTI) services in Europe (2001/551/EC).
- Directives 98/34/EC and 98/48/EC of the European Parliament and of the Council laying down a procedure for the provision of information in the field of technical standards and regulations.
- Directive 2003/98/EC of the European Parliament and of the Council on the re-use of public sector information.

12. Assure the timely implementation, successful operation, and future development of the TSI services in all Member States.

The TSI Specifications in combination with the ITS Directive, and the monitoring by the TSI Coordinator will assure timely implementation and continuous operation of the services. The TSI Specifications will specify different deployment speeds for advanced and less developed markets.

13. Assure organisational setup as described in D6 [9]

The TSI Specifications will provide the organisational framework and specify roles, rights and responsibilities for all stakeholders.

14. Contribute to the main policy objectives of the ITS Action Plan for transport and travel: cleaner, more efficient, safer and more secure transport.

The TSI services will contribute to improved road safety. Fewer accidents will result in fewer traffic jams, fewer traffic jams will result in less air pollution and a reduction in greenhouse gases emissions.

15. Contribute to the objectives for the 'Free Universal Minimum Service':
    o Ensure free minimum traffic services for all travellers
    o Harmonise a Europe-wide free minimum service
    o Develop suitable organisational models

The policy mix will assure that TSI content will be available on TMC-enabled devices. Because the harmonisation of TSI information throughout the EU will reduce the data collection costs, it is expected that private companies will develop and operate TSI services as free-of-charge add-on services to nomadic devices and in-dash systems.

16. Establish and foster support from citizens, road authorities, and public and private service operators and providers for the deployment and continued operation of the TSI services.

The TSI Council will assure the involvement and support from the key stakeholders in the implementation, operation and innovation of the TSI services.

17. Allow for different deployment speeds in the Member States, enabling less developed markets to catch-up.

The TSI Specifications feature a tailoreddeployment planning for both advanced and less developed TTI markets.

18. Take the already established public and private value chains into account, including the different organisational setups of the different member states.

The proposed TSI services build on technology and ITS standards commonly in use in the more developed TTI markets of Europe. The TSI policy only specifies requirements to the provisioning of the TSI services, not how the data collection and processing is organised per Member State. This means existing value chains in Member States need not be affected

by the implementation of the TSI services. Member States can themselves decide on the roles of public and private stakeholders in the value chain in the establishment and operation of the TSI services.

19. Avoid market interference, stimulate the development of the private traffic and travel services markets where possible.

The proposed free TSI services will not compete with existing TTI services because:
- The TSI Services will provide safety-related information as a minimum. This type of information in general is already provided for free through radio broadcasts. Advanced TTI services providing real-time and predicted travel times are the key source of turnover for private TTI operators.
- The TSI services will cover the TERN as a minimum, commercial services provide much wider road coverage.

20. Assure level of quality of the TSI services as defined in Annex B – TSIS Quality Definition.

The TSI Coordinator will define the quality requirements, the National Accreditation Bodies monitor quality of the TSI services to assure compliance.

21. Set clear objectives and market requirements for the TSI services, as well as define the exit strategy should the TSI services no longer comply with said objectives and requirements.

The objectives and market requirements of the TSI services as well as the exit strategy are defined in the TSI Specifications. Compliance and will be monitored by the TSI Coordinator.

22. Provide financial support where Member States cannot comply with the policy for economical reasons.

Member States with insufficient funding capacity can call on TSI funding for financial support for the implementation of TSIS.

5. Conclusions

5.1. Guaranteed Access to Traffic and Travel Data

1. Concerning traffic and travel information (TTI), substantial differences exist between Member States
2. Different development levels will likely persist between the TTI value chains of Member States
3. Private service providers rapidly expand traffic information services coverage, which will likely result in full coverage of all except the smaller EU Member States in 1 to 3 years
4. Currently, private companies mainly collect traffic flow data using automated data collection systems.
5. Private companies will become important sources of safety-related information in the near future.
6. Private companies will continue to depend on public authorities for journalistic information on incidents and traffic management measures.
7. The development of pan-European TTI services can be stimulated by harmonising access to public and private sector traffic and travel data:
    a. Reducing the barriers in terms of access and cost of data
    b. Introduction of sustainable commercial arrangements
8. Privately held data is protected by intellectual property rights and other commercial considerations, but private operators in general are keen to co-operate with public authorities to gain access to their TTI.
9. To guarantee access to traffic and traveller information, certain legal issues need to be addressed:
    a. Agreement of legal definitions for Traffic data, Travel information, and safety-related information
    b. Fair and transparent access and reuse of Traffic and Traveller information held by Public authorities. The PSI Directive covers Re-Use but not access
    c. Fair and transparent access and reuse of Traffic and Traveller information held by commercial organisations. This is not covered by the PSI Directive.
    d. IPR and copyright licences
    e. Personal Data protection
10. Main contractual issues that need to be solved are:
    a. Fair and transparent access and reuse of Traffic and Traveller information held by Public authorities. The PSI Directive covers Re-Use but not access
    b. Fair and transparent access and reuse of Traffic and Traveller information held by commercial organisations – this not covered by the PSI Directive.

  c. IPR and copyright licences

  d. Exclusivity agreements

  e. Commercial agreements

    i. Common method for the calculation of access fee to cover data collection or processing costs

    ii. Service Levels

11. Main technical issues that need to be addressed are:

  a. Understanding the Traffic and Traveller Data and Information services that are available

  b. Access and availability of TMC Tables

  c. Common Data Exchange standards

  d. Common Data Quality Definitions

  e. Service Certification Requirements

12. The Regulated European Electronic Market model is the most suitable method of guaranteeing the provision of data for traffic and travel information.

5.2. Free Provision of Minimum Universal Traffic Information

1. There is a public interest to assure that safety-related traffic information, remains available free of charge to motorists in the EU.

2. The proposed service should deliver real-time, safety-related traffic information to European motorists seamlessly across the Trans-European Road Network

3. The service should reach as many motorists as possible, and the service can be used free of recurring charges

4. The proposed solution should further take into account:

  a. What can be achieved within 3 to 5 years using proven technology

  b. The interests of all stakeholders involved.

  c. European legislation.

  d. Existing commercial and public initiatives to provide traffic information services.

  e. The EC's resources and wielding power

5. It should be possible to set up Traffic Safety Information Services (TSIS) without automated traffic monitoring systems.

6. The requirements can be met by setting up two types of services in each Member State:

  a. TSIS-TMC - a public RDS-TMC service that broadcasts safety-related information free of charge

  b. TSIS-SP – a service that provides free public access to safety-related information through a DATEX II feed, enabling service

provides to develop safety-related information services for any desired distribution channel.

7. TMC table for all TSIS-TMC services should be publicly available.
8. A uniform method based on QUANTIS should be established to:
   a. Indicate the level of service for each TSI service
   b. Guarantee a minimum level of service for all TSI services.

5.3. Assessment Study Objectives

This section provides the achievements per research objective as defined in the Task Description [33].

Guaranteed Access to Data

Objective 1 - make private, especially safety-related, traffic information available to public authorities

Sections 3.4.6 and 3.4.7 describe common requirements for guaranteeing access to private traffic and travel information.

Objective 2 - ensure a fair and transparent access to public traffic and travel related data

Section 3.4 proposes an extensive set of measures that together will ensure fair and transparent access to public traffic and travel related data. In particular the establishment of central registries, and the harmonisation of access and use rights concerning traffic and travel related data, are instrumental to achieving the objective.

Objective 3 - promote public-private co-operation to improve traffic and travel information

The proposed organisational setup will promote the exchange of publicly and privately held traffic and travel related data. It does this by defining a limited set of measures that can be implemented almost completely independent by private and public bodies.

Objective 4 - increase data quality and improve multi-modal co-operation encourage (cross-border) data exchange

The establishment of a common quality standard for the description of traffic and travel data will increase data quality and quality awareness throughout the traffic information value chain. The establishment of central

registries will make all traffic and travel related information more easily accessible to service providers, road authorities and other stakeholders.

Free Universal Minimum Service

Objective 1 - ensure free minimum traffic services for all travellers

The establishment of the TSIS-TMC service as described in section 4.6.11 will assure European motorists access to safety-related information, on any section of the Trans-European Road Network, free of recurring charges.

Objective 2 - harmonise a Europe-wide free minimum service

The specifications assure that TSIS-TMC is implemented using commonly accepted and proven standards for the dissemination of traffic and travel information.

Objective 3 - develop suitable organisational models

The proposed organisational model for TSIS assure the implementation on the most suited level of public authority, carefully balancing the interests of public and private stakeholders.

5.4. Answers to the Key Research Questions

This sections provides answers to the study's key questions, as defined in the Task Description [33]

Question 1 - What is the state-of-the-art concerning traffic and travel data availability and access, co-operation and data exchange between the public and private sector across the EU?

The state-of-the-art has been described in detail in deliverable D2 of the study [6].

Question 2 - What is the state-of-the-art concerning the definition of safety-related traffic information across the EU?

The stakeholder consultation has shown that only a few Member States use a formal definition of safety-related traffic and travel information, although most agree that a common definition would be beneficial. The definitions in use have been described in deliverable D2 of the study [6].

Question 3 - What is the current status of free universal traffic information across the EU?

The state-of-the-art has shown that there are no Member States that operate a traffic information service that provides safety-related information only. Significant differences exist between Member States in terms of the business and organisational models in use, ranging from markets dominated by private traffic service providers, to markets where free public information services are available to all motorists. This has been described in detail in deliverable D2 of the study [33].

Question 4 - How can public traffic and travel related data (including road and public transport) be made available in a fair, transparent and harmonised way across the EU?

Section 3.4 proposes an extensive set of measures that together will ensure fair and transparent access to public traffic and travel related data. In particular the establishment of central registries, and the harmonisation of access and use rights concerning traffic and travel related data, are instrumental to achieving the objective.

Question 5 - How can privately held safety-related traffic information be made available to public authorities?

Sections 3.4.6 and 3.4.7 describe common requirements for guaranteeing access to private traffic and travel information.

Question 6 - What are the most appropriate instruments for Community action for the two issues above? Are new and/or revised legal instruments necessary?

The various policy options have been accessed and based on the assessment results the recommendations of chapter 6 have been drafted. A description of the assessments can be found in sections 3.3 and 4.7.7.

Question 7 - How can the integration of road traffic and travel information and public transport information be improved?

Sections 3.4.6 and 3.4.7 describe common requirements for guaranteeing access to private traffic and travel information.

6. Recommendations

6.1. Guaranteed Access to Traffic and Travel Data

1. The following requirements relating to access and reuse of private sector data for traffic and traveller information services have been identified:
    a. National registers of commercial Traffic and Traveller information services shall be established
    b. Commercial Traffic and Traveller information services shall be registered on the National Register
    c. Commercial service providers determine the access and re-use conditions concerning their data
    d. Public Authorities have the right to purchase access to safety-related private sector data but are not under an obligation to do so.
    e. Where no alternative traffic and/or travel data service information exists, Member States can request that commercial safety-related Traffic and Traveller data sources be made available to Public Authorities under the essential facility theory. Costs for access to data sources costs in that case shall be based on a commonly agreed calculation method
    f. Commercial Public Transport Operators shall permit access and reuse of timetable information in a transparent and non-discriminatory basis
    g. Where available commercial Public Transport Operators shall permit access and reuse of real-time arrival and departure information in a transparent and non-discriminatory basis

2. The following requirements relating to access and reuse of Safety-related Information (SRI) have been identified:
    a. The public security exception as set forth in the Public Sector Information Directive shall not apply to SRI
    b. Real-time traffic information, at least for SRI, shall be regarded as news of the day or miscellaneous facts having the character of mere items of press information as per the Bern Convention
    c. Real-time traffic information, at least for SRI, shall, to the extent justified by the informatory purpose, be made available to the public, as per the Bern Convention
    d. The public security exception as set forth in the database Directive n°96/9/EC shall apply to SRI
    e. SRI shall be regarded as a matter of vital interest of the data subject as per the Directive n°95/46/EC

f. Access and Re-Use of real time Safety-related Information shall not be subject to Licence Agreement.

3. It is proposed that
   a. A common non-exclusive licence agreement is developed to be used to all the re-use of information within the European Traveller Information Environment.
   b. A common European framework for the certification of data and information services based on the QUANTIS methodology is established.

6.2. Free Provision of Minimum Universal Traffic Information

1. The suggested Traffic Safety Information Service has two components:
   a. TSIS-TMC: A free service to the end user via RDS-TMC. The requirement for RDS-TMC should be re-assessed after a period of 5 years, as other technologies may become widely adopted on such a time scale.
   b. TSIS-SP: A free publication of traffic information to commercial service providers, enabling distribution to end users through various channels.

2. Relevant metadata (including the TMC tables) of all TSI services are to be published in a central registry, administered by the TSI-Coordinator.

3. The proposed mix of policy actions:
   a. Issuing TSI Specifications within the framework of the ITS Directive
   b. TSI Coordinator Work Programme
   c. Establishment of TSI funding
   d. Appointment of a TSI Council

4. Development of TSI Specifications that will:
   a. Define the principles of the TSI services.
   b. Include TSIS-SP and TSIS-TMC Specifications
   c. Include a TSI License Agreement
   d. Oblige Member States to attune national laws and regulations to meet the requirements of the TSI Specifications and License Agreement.
   e. Oblige the Member States to implement the TSIS-SP and TSIS-TMC services.
   f. Specify the implementation planning per member state.

g. Clarify the responsibilities, goals and policy instruments of the new TSI Coordinator (TSIC) to monitor the proper deployment and operation of the TSI services in each Member State.

h. Specify the obligation of Member States to provide full co-operation to the TSI Coordinator.

5. The rights, responsibilities and procedures of the TSI Coordinator should be documented in a TSI Coordinator Work Programme.

6. Funds from existing structural and TEN-T budget is to be committed for TSI funding to support less developed member states in the deployment of the TSI services.

7. A work programme is to be drafted for the TSI funding that will define funding scheme, eligibility criteria, and methodology

8. The budget for implementation and operation of the TSI Services is to be provided or organised by the Member States.

9. Motorists that wish to use the TSI services are responsible to purchase or otherwise obtain a device for receiving TSI.

10. Service providers can use any business model for their services based on content from TSIS-SP.

11. Free unconditional access to TSIS-SP is guaranteed by the Member States.

12. The European Commission acts as TSI-Coordinator

13. Tasks of the TSI Coordinator should include:
    a. Maintaining and publishing a registry of TSIS-TMC and TSIS-SP services.
    b. Monitoring of content quality and service coverage of the TSI, also in view of new Member States and extension of the TERN
    c. Co-ordination of the promotion of services.

14. Member States should be free to choose any national arrangement they deem appropriate to establish the TSIS.

15. The following definition of 'safety-related' information is proposed for TSIS:

TISA definition	TSIS-DATEX II Definition
Ghost driver	Included in the definition for category 4
Dangerous road surface	All Traffic Elements of class RoadConditions
Danger due to reduced visibility	All Traffic Elements of class PoorEnvironmentConditions where minimumVisibilityDistance is specified
Animal / people / debris in the road way	All Traffic Elements of class Obstructions or DisturbanceActivity or AuthorityOperation
Blockade of road, tunnels …	All OperatorActions of class NetworkManagement
Unprotected accident area	All Traffic Elements of class Accidents
Temporary roadwork	All OperatorActions of class RoadWorks where UrgentRoadworks = true
End of queue	All Traffic Elements of class AbnormalTraffic where Urgency = (Urgent or ExtremelyUrgent)
Any other incident deemed Urgent by the traffic management organisation	

16. TSIS should at least cover the complete TERN in each Member State, Member States can increase coverage if they desire so.

17. It should be up to the supplier of the in-vehicle equipment to determine the best way to present TSI, but a harmonised set of icons should be adopted and recommended to present types of events graphically.

END OF MAIN DOCUMENT

Glossary of Acronyms

ABS	Anti-lock braking system
Alert-C	Communication protocol used for communication within TMC, which is a simplification of DATEX
CCTV	Closed Circuit Television
DAB	Digital Audio Broadcasting
DATEX II	Transport data exchange standard primarily for communication between TMCs as successor to DATEX
DRIP	Dynamic Route Information Panel
DSRC	Dedicated Short Range Communication
DVB	Digital video broadcasting
EC	European Commission
EETS	European Electronic Toll Service
EIC	European ITS Committee
EU	European Union
FM	Frequency Modulation
FPD	Floating Phone Data
FVD	Floating Vehicle Data
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
IAG	ITS Advisory Group
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IPR	Intellectual Property Rights
ISO	International Organisation for Standardization
ITS	Intelligent Transportation Systems
IVE	In-vehicle Equipment
DG MOVE	Directorate-General Mobility and Transport
MS	European Member State
OBE	On-Board Equipment
OGL	Open Government License
PND	Personal navigation device
PPP	Public private partnership
PSI	Public Sector Information
PT	Public transport
RDS	Radio Data System
RTTI	Real-time Traffic and Travel Information
SMS	Short Message Service
SP	Service Provider
SRI	Safety-related information
SWOT	Strengths, Weaknesses, Opportunities, Threats
T3P	Trusted 3rd party

TEN-T EA	Trans-European Transport Network Executive Agency
TERN	Trans-European Road Network
TISA	Traveller Information Services Association
TMC	Traffic Message Channel
TPEG	Transport Protocol Expert Group
TSI	Traffic Safety Information
TSIS-SP	DATEX II service providing free TSI to service providers
TSIS-TMC	TMC service providing free TSI to motorists
TSIC	Traffic Safety Information Co-ordinator
TSIS	Traffic Safety Information Services
TSQ	Total Service Quality
TTI	Traffic and Traveller Information
UK	United Kingdom
UMTS	Universal Mobile Telecommunications System
VMS	Variable Message Sign

Annex A – Example Non Exclusive Licence Agreement

NON EXCLUSIVE LICENCE FOR THE RE-USE OF
TRAFFIC AND TRAVELLER INFORMATION

This Licence is dated …………………………………*[date of final signature]*

and is between [*name and address of organisation*]

and   [*insert name and address of licensee*]

1 Definitions

In this Licence, the terms below have the following meanings:

Accounting period:	as set out in Schedule A. *Royalty licences*
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End-users:	users and subscribers who access electronic or digital versions of the Product. *Electronic licences*
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Material:	the Material listed at Schedule B.
Official source:	any publication, product or information service which has been made available to the public by us or on our behalf. This includes our official website.
Our, us and we:	[*name of organisation*]
Product:	your product or products as set out in Schedule B
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Start date:	as specified at Schedule A.
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- not use the Material in ways which are knowingly or potentially libellous or slanderous of individuals, companies or organisations.

6. Our obligations

We aim to:
- confirm receipt of the Application promptly;
- quickly put right any difficulties or answer any queries which you may have;
- handle all Licences in a way that is fair and consistent;
- give you details of any changes to this Licence;
- if you are dissatisfied with the standard of service you receive from us, you can make a formal complaint. We will deal with it by following our complaints procedure. You can find this on our website at *[insert]* or please e-mail us at *[insert]* or telephone *[insert]* and we will send you details.

7. List of Licence holders

7.1 We may list the names and addresses of all Licence holders on our website because we want:
- to be open and transparent about who has a Licence; and
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We will not use this information for marketing or publicity purposes. If you are a private individual please let us know whether you are willing to have your details listed.

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These are given in Schedule A.

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All payments will be subject to VAT at the appropriate rate.

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We will send you an invoice for the amount that you are due to pay to us.

You must pay all invoices within 28 days of the invoice date. Make your cheques payable to *[insert details]* and send them to:

[insert details]

We have the right to charge interest on any amounts that are not paid within the 28 days at a rate of 2% a month above the minimum-lending rate.

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You must send us a Statement within 90 days of the end of each Accounting period so that we can calculate the payment due.

13. Inspection of accounts *Royalty licences*

We, or our representative, may inspect your records for Sales income and royalties payable to us.

These inspections will take place at your premises during your normal business hours. We shall give you reasonable notice of our wish to inspect your accounts, either in writing or by e-mail.

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This Licence may be ended:

By you

You have the right to end this Licence at any time by giving notice to us in writing or by e-mail.

By us

We have the right to end this Licence:
- after the end of the initial term by giving you six calendar months' notice in writing or by e-mail;
- at any time if you are wound up, declared bankrupt, placed in the hands of receivers or creditors or otherwise stop operating;
- at any time if there is a significant breach of the terms of this Licence and you do not put this right within 60 days of our telling you in writing or by e-mail.

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Ending this Licence shall not affect:
- the rights of any End-user who has been granted an End-user licence;
- our right to payments under this Licence;
- our right to Statements under this Licence.

16. Changes to the terms of this Licence

The terms of this Licence may only be changed if you and we agree in writing or by e-mail. We will confirm any changes to the Licence, sending you an amended schedule.

17. Assignment

This Licence may not be assigned.

18. Disclaimer

Your use of the Material under this Licence is entirely at your own risk. We make no warranty, representation or guarantee that the Material is error free.

19. Governing law

This Licence is made under the laws of *[insert country]* and comes under the exclusive jurisdiction of the courts of *[insert country]*.

Signed by …………………….. Date …………………………………

Name in block capitals ………………………………..
for the *[insert name of organisation issuing the Licence]*

Signed by ………………………Date …………………………………

Name in block capitals ………………………………..

Job title ...……………………………………………………
for *[insert name of Licensee]*

SCHEDULE A

Licence number: ……………………………………………………………

Start date
……………………………………….. *[date of final signature]*

Licensee's name, address

[insert details]

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The first Accounting period will run from the start date until
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Annex B – TSIS Quality Definition

Quality Object	Parameter	Definition	TSIS criteria
Completeness	Geographic coverage	Geographic area covered by the service	Critical value: member state
	Physical coverage	Physical coverage of the service. For instance this might be a list of infrastructure items which are monitored by the service such as lists of roads covered	Critical value: TERN Type 1: TERN Type 2: + other motorways Type 3: + secondary roads Type 4: + main city arteries Type 5: + other urban roads Type 6: + other rural roads
	Percentage of physical coverage	% of km covered according to physical coverage	Critical value: 75 % Level 1: >75% Level 2: >90% Level 3: >95% Level 4: >99%

Quality Object	Parameter	Definition	TSIS criteria
	Percentage event coverage	Number of reported true events by number of total events	Critical value: 75 % Level 1: >75% Level 2: >90% Level 3: >95% Level 4: >99%
	Data types covered	Included relevant data types	Critical value: level 1 Level 1: location + type of safety-related information Level 2: + effects on traffic Level 3: + lanes affected Level 4: + on trip: related information, e. g. warnings, re-routing, speed limit
	Depth of coverage	Density of measuring sites	Not relevant

Quality Object	Parameter	Definition	TSIS criteria
Availability	Availability period	Specify period during which the availability is defined	Critical value: 24/7
	Up-time	Percentage uptime per year which can be expected during the availability period	Critical value: Level 3 Level 1: >95% Level 2: >97% Level 3: >99% Level 4: >99,5%
Veracity	Error probability	Percentage of content provided outside stated quality boundaries: false events per total reported events	Critical value: < 10% Level 1: 10 -25% Level 2: 5 - 10% Level 3: 2 - 5% Level 4: < 2%
	Cross verified	Indicates whether data has been cross verified with one or more additional sources	Not relevant

Quality Object	Parameter	Definition	TSIS criteria
Precision	Location accuracy	Accuracy in terms of location	Critical value: Level 4 Level 1: 5-10 km Level 2: 2-5 km Level 3: 100m - 2 km Level 4: exact location according to GPS or mileage - <100m
	Forecast horizon	Specify time difference between forecast calculation and forecast date	Not relevant
	Duration accuracy	Deviations between reported start and end of event and actual start and end	Not relevant
	Content accuracy	Accuracy /weakness of information provided	See data types covered

Quality Object	Parameter	Definition	TSIS criteria
Timeliness	Data latency	Time period between end of event and cancellation	Critical value: < 15 min Level 1: 30 - 60 min Level 2: 15 - 30 min Level 3: 5 - 15 min Level 4: <5 min
	Data update mode	Event driven or periodic	Critical value: event driven
	Data update interval	Event driven: delay between event and service provision	Not relevant

Annex C - Policy Instruments European Commission

Legislative

The EC alone has legislative initiative in the European Union. It can propose regulations, directives and decisions that take precedence over national law and are binding on national authorities.

Regulations   Adopted by the Council in conjunction with the European Parliament or by the Commission alone, a regulation is a general measure that is binding in all its parts. Unlike directives, which are addressed to the Member States, and decisions, which are for specified recipients, regulations are addressed to everyone.

A regulation is directly applicable, which means that it creates law which takes immediate effect in all the Member States in the same way as a national instrument, without any further action on the part of the national authorities.

Directives   Directives are addressed to national authorities, who must then take action to make them part of national law. EU directives lay down certain end results that must be achieved in every Member State. National authorities have to adapt their laws to meet these goals, but are free to decide how to do so. Directives may concern one or more Member States, or all of them.

Each directive specifies the date by which the national laws must be adapted - giving national authorities the room for manoeuvre within the deadlines necessary to take account of differing national situations.

Directives are used to bring different national laws into line with each other, and are particularly common in matters affecting the operation of the single market.

Decisions   Decisions are EU laws relating to specific cases, involving particular authorities or individuals. They are fully binding and can come from the EU Council (sometimes jointly with the European Parliament) or the Commission.

They can require authorities and individuals in Member

States either do something or stop doing something, and can also confer rights on them.

Non-binding instruments

Recommen-dations   A recommendation allows the institutions to make their views known and to suggest a line of action without imposing any legal obligation on those to whom it is addressed (the Member States, other institutions, or in certain cases the citizens of the Union).

Opinions   An opinion is an instrument that allows the institutions to make a statement in a non-binding fashion, in other words without imposing any legal obligation on those to whom it is addressed. The aim is to set out an institution's point of view on a question.

Enforcement

Sanctioning   The Commission's role is to ensure EU law is properly applied - by individuals, national authorities and other EU institutions. The Commission can impose sanctions on individuals or companies who break EU law.

Legal action   If required the EC can take formal action against national authorities, asking them to remedy the situation by a certain date. This may involve taking them to the European Court of Justice.

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