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***Ex post* evaluation of the Intelligent Transport Systems Directive 2010/40/EU**

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1 INTRODUCTION

Intelligent transport systems (ITS) apply information and communication technologies (ICT) to transport. Although ITS are used in all modes of transport, the ITS Directive (2010/40/EU)[1] applies to ITS applications and services for road transport, including infrastructure, vehicles, users, traffic and mobility management, and for interfaces with other modes of transport (for example, multimodal journey planners combining road and rail travel).

The ITS Directive was the first EU-wide legislative basis intended to support the coordinated and coherent deployment of ITS in the road sector and its interfaces with other modes of transport, and is therefore an important instrument for deploying such systems. The Directive was a direct response to action 6.1 of the ITS action plan[2]. In particular, it lays down a framework to support the coordinated and coherent deployment and use of interoperable and seamless ITS services, while leaving Member States the freedom to decide which applications and services to invest in.

Since 2010, there has been a significantly greater deployment and technological evolution of ITS, and the digitalisation of transport has become an increasingly important political topic. The continued deployment of ITS can make important contributions to the Commission priorities of the Energy Union and the digital single market[3], and to the EU strategies on low emission mobility[4], cooperative intelligent transport systems[5] and automated mobility[6].

The ITS action plan set out a policy agenda for the years 2010-2014, and a first working programme on the implementation of the ITS Directive was defined for 2011-2015. In 2017, a decision[7] extended the duration of the Commission's empowerment to adopt delegated acts by another 5 years (with tacit extension). This decision also required the Commission to update the working programme for the Directive. In response, the Commission has adopted an updated working programme for 2018-2022[8]. Considering that the first working programme has been completed and given the significant market and technological developments in the sector, it is important to take stock and to verify the adequacy of the current EU legislative framework for ITS.

1.1 Scope & purpose of the evaluation

This *ex post* evaluation concerns the full scope of the Directive, including the delegated acts adopted under the Directive, the Directive's working programme, the guidelines for reporting, and the functioning of the ITS Committee and ITS Advisory Group. The evaluation also takes into consideration relevant aspects of the ITS action plan and of standards and non-binding measures aimed at facilitating the deployment of ITS in road transport.

[1] Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport - OJ L 207 of 6.8.2010, p. 1.
[2] COM(2008) 886 final
[3] https://ec.europa.eu/commission/priorities_en
[4] COM(2016) 501 final
[5] COM(2016) 766 final
[6] COM(2018) 283 final
[7] Decision (EU) 2017/2380 of the European Parliament and of the Council of 12 December 2017 amending Directive 2010/40/EU as regards the period for adopting delegated acts
[8] C(2018)8264 final, Commission Decision of 11.12.2018 updating the Working Programme in relation to the actions under Article 6(3) of Directive 2010/40/EU

The evaluation assesses the implementation of the ITS Directive in all 28 Member States between 2008 and 2017. This covers the period from the adoption of the ITS action plan and the original Commission proposal for the ITS Directive, and includes the 2017 reporting cycle by Member States and the Commission on the deployment of ITS and the implementation of the ITS Directive and its delegated regulations.

Article 17(4) of the Directive requires the Commission to submit a report[9] every 3 years to the European Parliament and to the Council on the progress made in implementing this Directive, and the report must also assess the need to amend the Directive where appropriate. The purpose of this evaluation is to analyse the actual performance of this legislative framework in achieving its key objectives and to assess if it remains fit for purpose.

In particular, this evaluation aims to verify which provisions work well for deploying ITS and its consecutive benefits for transport (increase in road safety, reduction of congestion, pollutant and CO_2 emissions), and why. It also looks into whether there are any inconsistencies or other internal and external factors which hamper the achievement of policy objectives.

The results of this evaluation should serve as a basis for considerations on how to improve the current legislative framework and its implementation.

[9] The latest report, following the 2017 reporting cycle, accompanies the evaluation

2 BACKGROUND TO THE INTELLIGENT TRANSPORT SYSTEMS DIRECTIVE

2.1 Description of the initiative and objectives

The ITS Directive provides for developing specifications for actions within the four priority areas referred to in Article 2, and for developing necessary standards. The Directive's four priority areas can be directly linked to the first four action areas of the ITS action plan[10], namely:

1. Optimal use of road, traffic and travel data: Many ITS applications rely on relevant information to support the safe and efficient management of traffic, including digital maps and real-time traffic information. Where road safety is at stake, it is vital that information is validated and made quickly available to all players on a fair basis.
2. Continuity of traffic and freight management ITS services: This will support the development of measures to improve freight transport, co-modality and road-user charging. Seamless and dynamic traffic management systems are needed to cope with rising congestion and enable optimal use of existing capacity.
3. Road safety and security: This will help to ensure the protection of vulnerable road users and provide services for safe and secure truck parking areas. Another challenge has been to ensure the full-scale roll-out of the interoperable EU-wide eCall[11].
4. Integrating/linking the vehicle with the transport infrastructure: The streamlining and integration of ITS applications and cooperative systems could improve efficiency, enhance usability and reduce costs.

The Directive has been supplemented by a number of Commission delegated regulations, each of which sets the specifications for one of the Directive's priority actions, necessary for the compatibility, interoperability and continuity of the respective services, as follows:

- Commission Delegated Regulation (EU) No 305/2013[12] establishes specifications for the upgrading of public safety answering point infrastructure required for the proper receipt and handling of eCalls in order to ensure the compatibility, interoperability and continuity of the harmonised EU-wide eCall service ('specifications d'). In this context, reference can also be made to Decision No 585/2014/EU on the deployment of the interoperable EU-wide eCall service, which mandates that Member States must deploy no later than 1 October 2017 the eCall PSAP infrastructure required for the proper receipt and handling of all eCalls.
- Commission Delegated Regulation (EU) No 885/2013[13] establishes specifications necessary to ensure compatibility, interoperability and continuity for the provision and operational use of information services for safe and secure parking places for trucks and commercial vehicles ('specifications e').
- Commission Delegated Regulation (EU) No 886/2013[14] establishes the specifications necessary to ensure compatibility, interoperability and continuity for the deployment and

[10] A more detailed mapping can be found in Section 2.1 of the support study.
[11] In case of a crash, an eCall-equipped car automatically calls the nearest emergency centre, see https://ec.europa.eu/digital-single-market/en/ecall-time-saved-lives-saved
[12] Commission Delegated Regulation (EU) No 305/2013 of 26 November 2012 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the harmonised provision for an interoperable EU-wide eCall, OJ L 91, 3.4.2013, p. 1–4.
[13] Commission Delegated Regulation (EU) No 885/2013 of 15 May 2013 supplementing ITS Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of information services for safe and secure parking places for trucks and commercial vehicles, OJ L 247, 18.9.2013, p. 1–5.
[14] Commission Delegated Regulation (EU) No 886/2013 of 15 May 2013 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to data and procedures for the provision, where

operational use of data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users ('specifications c').

- Commission Delegated Regulation (EU) No 2015/962[15] establishes the specifications necessary in order to ensure the accessibility, exchange, re-use and update of road and traffic data by road authorities, road operators and service providers for the provision of EU-wide real-time traffic information services ('specifications b').
- Commission Delegated Regulation (EU) 2017/1926[16] establishes the necessary specifications in order to ensure that EU-wide multimodal travel information services are accurate and available across borders to ITS users ('specifications a').

For the purposes of the adoption of certain acts under its terms, the Directive stipulates that the Commission is assisted by the European ITS Committee (EIC). A European ITS Advisory Group was also set up to advise the Commission on the business and technical aspects of the deployment and use of ITS in the Union.

The **general objective** of the Directive and the action plan is to put in place the necessary mechanisms to increase the deployment and use of continuous ITS services across the EU, to subsequently improve the functioning of the road transport system, including its interfaces with other modes, and in doing so reduce the negative external effects of road transport.

The **specific objectives** are to:

- increase interoperability and continuity of applications, systems and services;
- establish effective coordination and monitoring mechanisms between all ITS stakeholders;
- establish solutions for liability issues and for the sharing of data which supports ITS services in respect of legislation on privacy and data protection.

The **operational objectives** are to:

- establish a clear EU policy agenda by defining priority areas and actions with a timeline;
- establish a legal framework to support coordinated and coherent deployment and use of ITS in the EU;
- adopt specifications and ensure that they are implemented when ITS are deployed;
- establish effective coordination and monitoring mechanisms.

The intervention logic in Annex I describes the links and causal relationships between the problems and needs, broader policy goals, the general, specific and operational objectives that the legislative framework was designed to address, and the specific actions for addressing those problems and needs.

Two key elements to support the coordinated and coherent deployment and use of ITS are the requirements on the Commission to (a) develop a working programme that includes objectives and dates for implementing the various actions, setting a clear policy agenda and timeline and (b) to work

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possible, of road safety-related minimum universal traffic information free of charge to users, OJ L 247, 18.9.2013, p. 6–10.

[15] Commission Delegated Regulation (EU) 2015/962 of 18 December 2014 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic information services, OJ L 157, 23.6.2015, p. 21–31.

[16] Commission Delegated Regulation (EU) 2017/1926 of 31 May 2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services, OJ L 272, 21.10.2017, p. 1–13.

towards adopting specifications in the four priority areas, starting with the six priority actions, as identified in Articles 2 and 3 and Annex I of the Directive. According to Article 7, these should be adopted in the form of legally binding delegated acts where this is considered appropriate, and also be based on standards where appropriate (as set out in Article 8).

2.2 Baseline

2.2.1 Problems at the time of the adoption of the ITS Directive and the ITS action plan

The problems and needs that the ITS Directive and the ITS action plan were expected to address at the time of their adoption, as they were presented in the impact assessment[17] and reflected in the Directive's recitals, are outlined in the intervention logic (Annex I) and further discussed below.

Main problem - ITS will not help fully to improve the functioning of the road transport system and the associated benefits, due to slow and fragmented deployment

At the time of adoption, the uptake of ITS in road transport had been rather slow and fragmented, despite the benefits of ITS being generally recognised. It was considered that this was mainly due to a lack of cooperation among stakeholders, a low level of interoperability and need to clarify privacy, data protection and liability issues. For instance, insufficient access to data led to a low quality of services and in some cases to an inappropriate use of ITS. Proprietary 'all in' silo solutions prohibiting sharing of components kept prices of individual ITS services high, negatively affecting potential customers' willingness to buy.

As a consequence, inefficient use was made of the potential of ITS to support achievement of (transport) policy objectives and to address the increasing challenges posed to road transport, i.e. congestion; emissions, pollution and energy efficiency; accidents and security risks of transport operations.

Problem driver 1: Lack of concertation and effective cooperation among stakeholders

There was **no clear vision on how to make best use of ITS tools** to achieve the various EU policy objectives (in transport, environment, energy, industry, etc.). Nor was there a clear vision of who would lead the deployment in certain areas (private or public sector).

The deployment of continuous and interoperable ITS service across the EU typically requires many stakeholders to work together and to agree on synchronised actions (investments) in order to successfully launch new services and applications. At the time of the Directive's adoption, there was **a lack of effective platforms for cooperation** to support the necessary cooperation between stakeholders, and various organisational barriers were still in place.

In practical terms, absence of a clear cooperation structure also meant that work to develop standards was delayed, and knowledge developed in the context of R&D projects was not taken advantage of. For example, the EC-funded EasyWay project had developed specifications and minimum requirements for deploying a number of ITS services in a harmonised manner. However, there was no EU framework in place to implement these specifications, nor any mechanism to have the specifications incorporated into national deployment schemes.

In addition, there were **no clear business models for a number of ITS applications,** since investment and operation (costs) would fall on specific stakeholders while benefits were often external and hard to allocate (such was, for example, the case for eCall).

[17] SEC(2008) 3083, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008SC3083

In the absence of an overall vision and prioritisation**, public authorities and decision-makers in several Member States were not fully aware of the potential benefits offered by ITS**. As a result, applying ITS was not seriously considered a substitute for more traditional solutions such as expanding or upgrading the infrastructure. Thus, **initial investment in deploying ITS led by the public sector remained limited**.

Problem driver 2: Lack of interoperability of applications, systems and services - Fragmented ITS deployment

Industry and private players active in the development of ITS had been developing 'all in' proprietary solutions based on limited sharing of content or components. This often led to **costly, standalone applications and services requiring high start-up investments. This resulted in services with relatively limited functional and geographic scope** and increasing risks of market failures for the development of services that can be regarded as quasi-public goods (e.g. continuous cross-border services).

It also often led to de facto monopolies through lock-in effects, hindering competition and limiting opportunities for innovation. For example, this was the case when proprietary road charging devices set up for a dedicated part of a road network, which benefited from almost mandatory installation in all vehicles frequently entering the area, are exported to larger networks or are used as an instrument for adding on additional services (e.g. parking payment systems, infotainment). Similarly, national and other public authorities (regional/local) had been deploying tailored solutions to address specific needs at a local level and creating a **fragmented technological landscape**, hampering future harmonisation and standardisation.

Problem driver 3 - Issues of privacy, data protection and liability related to the sharing of data supporting ITS services

Different stakeholders considered that they did not have a common understanding of the application of privacy and data protection legislation to the new technologies that are being developed. They considered this an issue that needed to be addressed to avoid limiting the development of, and demand for, services depending on the use and sharing of data.

In addition, **there was an unclear distribution of responsibilities and an absence of agreements on service ownership.** Since most ITS services rely on integration of data (e.g. in-vehicle systems such as emergency breaking, crash avoidance systems, etc.), having no clear responsibilities for the provision, sharing or re-use of data and components, and no clear liability in case of failure, represented obstacles to the development of ITS.

2.2.2 How would the situation evolve?

According to the impact assessment, leaving the situation unchanged – i.e. following the no action option - would lead to stagnation or even deterioration of the conditions for deploying ITS. This would likely result in the situation described below[18].

The baseline scenario provides a qualitative description of the expected developments. This is due to the nature of the actions taken, which aim at creating better conditions and facilitating faster take-up

[18] Detailed baseline scenarios in the different priority areas of the ITS Directive are presented in Section 2.2.4 of the support study.

and deployment of ITS. The impacts on the specific and general objectives were expected to be indirect, and it would be difficult to separate them from other influences in the field.

To estimate the quantitative impacts of the baseline and of the implementation of the Directive at EU level, the evaluation support study explored the use of a model. However, it was concluded that the modelling could not currently provide reliable indicators of the expected impacts at EU level. Thus only a qualitative description of the baseline is possible.

Fragmented legal framework and limited cooperation

Synchronised actions, synergies and multiplier effects were less likely to occur if there was no clear vision among key stakeholders. There would be ad hoc voluntary agreements in certain areas (particularly where there was a clear business case and no market failures), isolated deployment initiatives and legislative work in individual Member States leading to an overall fragmented deployment of ITS.

Cooperation among stakeholders would remain relatively underdeveloped, with a lack of knowledge and understanding, in particular among some public sector entities. However, there would likely have been cooperation focusing on specific topics in the context of already existing fora (e.g. eSafety forum, Intelligent Car Initiative) or platforms (e.g. ERTICO[19]). There would also have been technical committees addressing dedicated ITS services or application areas (e.g. road safety, the European electronic toll service (EETS)[20]).

Furthermore, according to the 2008 impact assessment, under the no action scenario, standardisation would also suffer from the absence of public authority representatives in the standardisation working groups. This would strongly limit the technical development and deployment of interoperable services across the EU.

Outstanding legal/judicial implications would likely remain unsolved or addressed in an isolated way, while negative impacts due to an inappropriate use of specific ITS services would not be avoided.

Limited level of investment

In the absence of a clear vision, initial deployment led by the public sector - considered to be a major trigger for private sector initiatives - would remain limited and fragmented. Investment in the development of ITS services would likely remain at the levels prior to the Directive's adoption in most Member States, with the possible exception of a few leading Member States or regions. Thus, the overall level of coverage of the transport network would likely remain limited.

While the action plan and ITS Directive do not provide for specific funding, it is assumed that without the added focus provided by the action plan and ITS Directive, EU-level funding would remain at levels prior to the Directive's adoption, possibly similar to those under the TEN-T 2007-2013 programme[21] and the seventh framework programme for research and development[22]. Support would remain fragmented and be based on responses to calls for proposals. Without a clear framework, these initiatives would primarily build on Member States/local authorities' preferences and provide few

[19] https://ertico.com/
[20] See https://ec.europa.eu/transport/modes/road/road_charging/technical_rules_en
[21] 13 projects for a total share of 4% of the budget; €272 million of EU co-funding for the whole seven-year period https://ec.europa.eu/inea/en/ten-t/ten-t-projects/statistics
[22] 10 identified projects, €45 million of EU co-funding

incentives for an integrated approach. Furthermore, the balance of funding would likely remain focused on R&D and pilot activities and less on deployment.

Low level of market uptake of ITS services

Fragmentation on the public sector side and reliance on voluntary and private sector initiatives would mean that EU cross-border ITS services would not be developed. The private sector would focus on certain market segments and types of ITS services. This would possibly lead to different levels of quality and undermine possible harmonisation even though standardisation activities could help mitigate some of these risks. Consumers would continue to be confronted with discontinuities in services and changing and inconsistent user interfaces, if services were provided at all.

Limited and difficult access to traffic and travel data, absence of harmonised data exchange standards and unresolved cybersecurity questions would likely remain obstacles to the deployment of ITS services that rely on them. Consumers would remain sceptical about the added value of ITS applications and remain reluctant to buy or invest in them. At the same time, relevant solutions would need to be fully compliant with the applicable legislation on privacy and data protection, ensuring trust of consumers in the functioning of different ITS services.

A slow uptake of ITS services would mean that prices would remain higher and R&D investment and innovation by private businesses would grow at a slower pace in the absence of clear market opportunities and due to barriers to competition.

Missed opportunities – ITS not used in its full potential

As a result of the slow uptake of ITS services, only a small share of customers would likely take advantage of ITS and benefit from the increased safety, comfort and cost efficiency resulting from their use. In the case of interurban and urban road transport systems, the possibility to establish multimodality would remain limited given the lack of real door-to-door multimodal planning instruments. Insufficient attention to data security would hinder the uptake of in-vehicle active safety systems.

2.3 Implementation of the Directive

The implementation of the ITS Directive is analysed in two Commission reports to the European Parliament and to the Council, the first published on 21 October 2014[23] [24] and the second published together with this evaluation. Additionally, a dedicated staff working document published together with this evaluation analyses the 2014 and 2017 Member State progress reports. Finally, Section 5 of the support study provides a detailed overview of the state of play of implementation across the EU[25].

The report on the Directive's implementation concludes that the six priority actions for the development and use of specifications and standards defined in Article 3 of the ITS Directive and its Annex I have been fully addressed. New activities under the ITS Directive have been started, the right to adopt delegated acts has been extended and the adoption on 11 December 2018 of the updated working programme of the ITS Directive will guide future work for the coming years.

[23] https://ec.europa.eu/transport/themes/its/road/action_plan/its_reports_en

[24] This report was accompanied by the analyses of the 2011 and 2012 Member State reports, as well as the progress report and review of the ITS action plan.

[25] The support study only had access to 21 out of the 28 Member States progress reports for 2017. Thus the results presented in this evaluation, in the report to the European Parliament and to the Council and the accompanying staff working document are more up-to-date.

According to the analysis of the Member State reports, most Member States have been very active in implementing the first specifications adopted (c, e and b), in particular thanks to EU financial support through the TEN-T and CEF calls. Regarding specifications (b) and (c), 17 Member States plus Norway have reported to have set up their national access point (NAP)[26], while 5 others are taking action to do so shortly. The deployment of NAPs for specifications (e) is more limited (13 Member States have set up a NAP and/or contributed to the European access point), as several Member States consider that the specifications do not apply on their territory in the absence of safe and secure parking information services.

At the same time, new ITS themes and challenges are emerging, as expressed in the Member State reports on the implementation of the Directive, such as cooperative, connected and automated mobility (CCAM)[27], and mobility-as-a-service (MaaS)[28]. Taking these changes into account, the question of the availability of data on the whole road transport network may become more crucial, in particular for important data types relating to the usage of the physical infrastructure.

[26] National Access Points facilitate access, easy exchange and reuse of transport related data, in order to help support the provision of EU-wide interoperable travel and traffic services to end users. See https://ec.europa.eu/transport/themes/its/road/action_plan/nap_en

[27] See https://ec.europa.eu/transport/themes/its/c-its_en

[28] MaaS describes a shift away from personally-owned modes of transportation and towards mobility solutions that are consumed as a service. The key concept behind MaaS is to offer travellers mobility solutions based on their travel needs.

3 EVALUATION QUESTIONS

The evaluation examined the following five evaluation criteria: relevance, effectiveness, efficiency, coherence and EU added value, as described below. The 17 main evaluation questions & sub-questions were designed to cover all the relevant aspects of the evaluation criteria.

- **Relevance**

The evaluation looked at whether the current legislative framework remains suitable to address the lack of cooperation among stakeholders, the low level of interoperability, privacy and data aspects, and liability issues in the field of ITS and whether it still responds to the needs of all relevant stakeholders in view of the technological and market developments (in ITS, but also in related industries such as the automotive industry, electronics and telecommunications).

- **Effectiveness**

The effectiveness refers to the realisation of the expected effects. The evaluation looked at whether the legislation contributed to the deployment and use of continuous ITS services across the EU and whether this helped to improve the functioning of the road transport system. Unintended positive and negative effects were also investigated.

- **Efficiency**

The efficiency questions aimed to estimate the costs of implementing the actions under the Directive for different stakeholders and whether they were proportionate to the benefits. Due to the early stage of deployment of ITS, it was difficult to quantify certain aspects of the costs for operators or for other stakeholders affected. Costs for the Commission and national authorities were easier to quantify at this point.

- **Coherence**

The evaluation looked at the coherence of the ITS Directive, both internally (e.g. consistency of the objectives, gaps or overlaps between the ITS Directive and its delegated acts) and externally in terms of coherence with current ITS deployment and other relevant EU interventions and strategic policies.

- **European added value**

Finally, the analysis of EU added value looked at whether action at the EU level was the most appropriate.

4 METHODOLOGY

As a first step, the Commission made an initial analysis for the preparation of the evaluation work. This analysis included a review of existing legislation, Commission documents and support studies, as well as an analysis of the 2014 Member State progress reports.

Secondly, a support study was carried out by Ricardo Energy and Environment[29] to provide data collection and analysis. The aim of the support study was to provide an independent evidence-based assessment of the implementation of the ITS Directive and action plan between 2008 and 2017. The support study was carried out between November 2017 and July 2018.

4.1 Data collection and analysis

The main research tools included:

- Desk research/review of relevant documents (including legal texts, Member State reports, relevant support studies and deliverables from ITS deployment projects).
- 3 case studies[30] exploring ITS deployment in the United States, Japan and Australia, including desk research and 4 interviews. These case studies looked into market and technology developments, ITS strategies, challenges and lessons learnt in the different regions.
- Analysis of the 2014 and 2017 Member State progress reports. The Member State reports (together with the Member State reports on the implementation of the individual delegated regulations) were a key input to determine the Directive's state of implementation across the EU and an important source of information on the deployment and impacts of ITS services. Only a third of the Member States met the deadline of 27 August 2017 and the reception of the remaining reports continued until November 2018. As a result, the support study could only cover 21 progress reports, and the rest was analysed by the Commission afterwards.
- 12-week public consultation[31] running from 5 May 2017 to 28 July 2017, which gathered 97 responses from 14 EU Member States, plus Israel, Norway and Switzerland. The indicated interests show a diverse coverage of interests with a particularly strong response from vehicle and equipment manufacturers/suppliers/repairs, ITS service providers and road/transport operators.
- Targeted questionnaires to the 1) ITS Committee 2) ITS Advisory Group and 3) ITS Expert Groups, in particular to help assess the role of the coordination mechanisms at EU level and their possible limitations. The questionnaires were open from July to October 2017 and received 37 responses.
- Stakeholder input based on four group discussions[32] involving a total of 19 ITS experts covering each of the four priority areas, along with 13 individual interviews. Regarding overall geographical representation, there was significant interest across Member States but with limited participation from eastern European countries.
- Data requests to national authorities to address any gaps resulting from the analysis of the national reports and desk research. In total, 10 responses (Austria, Czechia, Greece, Finland, Ireland, Latvia, the Netherlands, Sweden, Slovenia and Norway) were received (i.e. response rate of 34%).

[29] Support study for the ex-post evaluation of the ITS Directive 2010/40/EU (2018) available at: https://ec.europa.eu/transport/themes/its/studies/its_en
[30] Details can be found in Annex F of the support study.
[31] Detailed analysis can be found in Annex A of the support study.
[32] Details can be found in Annex E of the support study.

- Two presentations to the ITS Committee with the opportunity for Member States to provide feedback (one to discuss the scoping and approach of the support study and one to present and discuss the draft final results).
- A stakeholder workshop[33] involving over 50 attendees from a diverse range of stakeholder groups (including public and private stakeholders). The workshop was used to present and discuss the draft findings and conclusions of the support study and concluded with an interactive session to reflect on the draft recommendations of the support study[34], to discuss them in more detail and to provide feedback. The feedback was used to validate and revise the findings of the support study.
- The evaluation was supported by an inter-service group consisting of the following Commission Directorates General: MOVE, SG, JRC, ENER, JUST, CLIMA, REGIO, ENV, RTD, CNECT and GROW, which met 5 times between February 2017 and March 2019 and which provided feedback on the most relevant deliverables of the evaluation and its support study.

More details on the stakeholder consultation activities can be found in Annex III and the support study.

4.2 Limitations

There were a few challenges and limitations inherent in the methodology used. The main limitations are described below, together with a summary of the measures taken to mitigate the impacts.

Stakeholder consultation

The stakeholder engagement aimed to involve all affected stakeholders via the most appropriate methods. A variety of tools were used to collect the evidence required for the evaluation, including a public consultation, interviews, a stakeholder workshop, presentations to the ITS Committee and targeted data requests. There were, however, a few limitations in the capacity to obtain relevant input:

- The group interviews were designed to bring together ITS experts from a variety of stakeholder groups and geographical locations across the EU to validate the project findings and gather additional evidence. Despite having contacted a wide range of stakeholders for each of the four priority areas, in some cases it was difficult to find enough experts with detailed knowledge of the topics that were available at the time of the interview or willing to participate. In order to mitigate this, individual interviews were conducted to increase the level of input.
- The response rate for the international case studies was relatively low. This meant that the case studies relied on desk research more than expected.

Member State reporting

The 2014 and 2017 ITS national reports were a key input to this study and made it possible to draw a picture of the state of play of ITS deployment across Europe. The reports were also expected to be a source of data concerning the impacts of the action plan and the Directive. The main limitations were as follows:

- The level of detail provided by Member States varied significantly, from only providing information related to implementing the delegated regulations, to providing comprehensive

[33] Details can be found in Annex G of the support study.
[34] The recommendations can be found in Chapter 8 of the support study.

reports including a detailed description of national ITS activities accompanied with annexes listing ITS projects. This meant that it was difficult to compare progress across the EU.

- Limited reporting of key performance indicators (KPIs). 2017 was the first year in which Member States were asked to provide KPIs (covering deployment, benefits and financial aspects). Eleven Member States reported deployment KPIs, while benefit and financial KPIs were less well covered. This resulted in data gaps and led to difficulties assessing the status of ITS deployment between countries, and no comparison with earlier date could be made.
- The national reports did not include information on all the indicators required for an evaluation, particularly considering the costs of ITS.

To help build a more comprehensive evidence base, data requests were sent to national authorities, European deployment project coordinators and other stakeholders.

Impacts and cost data collection

The literature available did not always contain evidence on the impacts of ITS deployment, while stakeholders generally considered that it was too early to evaluate the Directive's impact. This meant that data on the Directive's impacts was limited to a few evaluation reports from EU deployment projects and a small number of national reports that included benefit KPIs.

Given that many ITS technologies are still in the early stages of deployment, detailed information on actual costs was also not available. As an alternative, stakeholders were asked if they could provide feedback on the estimated preliminary costs in the impact assessments for the delegated regulations and comment on whether these turned out to be in the correct range. Data requests were also sent to national authorities to gather additional cost information.

Establishing the role and additionality of the Directive

Besides the Directive and the action plan, there are multiple other factors that drive the uptake of ITS. For example, deployment is affected by the maturity of the technology, market acceptance, willingness/ability to invest, (co-)funding by the EU or Member State, and evidence of demonstrable benefits.

To try to disentangle these factors, the input of stakeholders was used to get a view on the situation across Europe. The group interviews also helped to establish a consensus on the Directive's relative role in this regard.

5 ANSWERS TO THE EVALUATION QUESTIONS

5.1 Relevance

5.1.1 Question 1: To what extent have the objectives of the Directive and action plan proved relevant to the needs identified at the outset?

The 2008 impact assessment found that the slow and fragmented uptake of ITS services was driven by a number of underlying problems. To address these problems, the objectives of the ITS Directive and action plan were to support the coordinated and coherent deployment and use of interoperable ITS within the Union, in particular across borders.

As presented in Table 1 below, we can observe that all problem areas are covered by one or more specific objectives:

1. Establishing a clear EU policy agenda and priority areas is relevant to create a clear vision and help to increase awareness among national authorities. This is also expected to help address fragmentation and contribute to strengthening the business case for certain ITS applications.
2. Establishing a specific EU legal framework for the deployment of ITS may help address issues around compliance of different services with the applicable legislation on privacy and data protection, as well as issues related to liability. It would also help address the lack of interoperability and continuity of applications, and the issues arising from a fragmented approach.
3. Establishing coordination and monitoring mechanisms was clearly relevant to the problem of the absence of a strong platform for cooperation and, at least in principle, the need for increasing awareness among a broader range of stakeholders. Less directly, these mechanisms would also help in ensuring a more consistent approach and increase the interoperability of ITS systems.

In the public consultation, a large majority of stakeholders (74-90%) considered that the actions of providing strategic, legal and coordination frameworks and facilitating communication and cooperation between stakeholders were very important or absolutely essential. Specific expert input from stakeholders on the relevance of the specific objectives was limited but largely positive, with stakeholders stating that the Directive did identify the right set of objectives.

5.1.1.1 Conclusions

It can be concluded that the objectives of the ITS Directive and action plan were relevant to the set of issues and problems characterising the uptake of ITS services identified at the time of the Directive's adoption, as a clear link can be identified between them. This is particularly the case in relation to the limited concertation and cooperation between stakeholders, the absence of a liability framework and the need of ITS services to respect legislation on privacy and data protection. Indirectly, and in combination, the operational objectives were also relevant to the need to ensure greater interoperability of ITS services.

Table 1: Analysis of relevance of objectives of the ITS Directive and action plan[35]

++	direct/strong relevance
+	indirect relevance
o	No relevance

Problems identified	Specific objectives		
	Establish a clear EU policy agenda by defining priority areas/actions and a timeline	Establish a legal framework for coordination on the deployment of ITS	Establish an effective coordination and monitoring mechanisms
1. Lack of interoperability of applications, systems and services			
• Standalone solutions developed by the private sector with limited sharing of content or components and requiring high start-up costs	+	+	+
• Public sector initiatives at local level that create a fragmented technological landscape	+	++	+
• Inconsistent market development with monopolies limiting competition	o	++	+
2. Lack of concertation and effective cooperation among stakeholders			
• Absence of a clear vision on how to make the best use of ITS tools	++		
• Lack of a strong platform for concertation and cooperation		+	++
• Limited awareness of the potential benefits of ITS among public authorities and decision makers	++		++
• Lack of robust business models for several ITS applications	+	+	
3. Issues related to privacy, data protection and liability issues			
• Lack of common understanding of the application of the legislation on privacy and data protection in view of the novelty of technologies that are being developed	o	+	o
• Unclear distribution of responsibilities, absence of agreements on service ownership	o	+	o

5.1.2 Question 2: To what extent are the original objectives and instruments of, A) the Directive and B) the action plan, still adequate in the current context and how do they relate to the current problems and needs?

The **general objective 'to put in place the necessary mechanisms to increase the deployment and use of continuous ITS services across the EU, to subsequently improve the functioning of the road transport system including its interfaces with other modes, and in doing so reduce the negative external effects of road transport'** remains relevant. As many of the actions set out in the action plan, as well as the priority actions that were identified in the Directive, have been completed, it can be concluded that the first part of the general objective, i.e. putting in place mechanisms to foster the uptake of ITS services, has been met. The issue is that these mechanisms have not yet been sufficient for ITS to contribute 'at its full potential', and thus further action remains necessary. The deployment of continuous EU-wide ITS is still not that widespread, and many of the NAPs are only just becoming operational.

[35] Adapted from the analysis in the evaluation support study

It can be concluded that the **first specific objective to 'increase interoperability and continuity of applications, systems and services'** is also still relevant. While action has been taken to increase the interoperability through various initiatives, in particular for five of the six priority actions set out in the ITS Directive, this has not yet been sufficient to ensure continuity of services. In response to the public consultation, a large majority of stakeholders (74-88%) felt that more action was either 'absolutely essential' or 'very important' in all of the Directive's priority areas. In the group discussions, some stakeholders noted that the actions that have been undertaken have helped to address some difficulties relating to interoperability, while others noted that deployment was still at an early stage.

The **second specific objective to 'establish effective coordination and monitoring mechanisms between all ITS stakeholders'** also remains relevant, as the various coordination mechanisms have been important for developing a clear vision on ITS and support its implementation, but it needs to be ensured that the combination of groups remains effective, efficient and relevant, in particular with new ITS-related topics like CCAM emerging. The European ITS Committee (EIC) and the Member State Expert Group supporting the preparation and implementation of delegated acts have worked reasonably well, while the European ITS Advisory Group has had less of a clear role.

It can be concluded that the **third specific objective to 'establish solutions for liability issues and for the sharing of data which supports ITS services in respect of legislation on privacy and data protection'** is still relevant. Action has been taken to address data protection, privacy and liability aspects, both with reference to other EU legislation of relevance, but also through specific actions in the context of ITS. Indeed, the mid-term evaluation of the ITS action plan[36] concluded that relevant actions with respect to those aspects had been more or less completed. However, the same evaluation noted that stakeholders did not have a clear view on what action was needed next in these areas. In their responses to the public consultation, stakeholders did not feel that the objectives of the actions relating to privacy, data protection or liability had been fully met in an effective manner. At the same time, privacy, data protection and liability remain very relevant, as new developments such as C-ITS and CCAM have strong implications in this field, and the legislative framework has strongly developed since the ITS Directive's adoption, in particular following the entry into application of the General Data Protection Regulation.

5.1.2.1 Conclusions

The original objectives of the ITS Directive and action plan were effectively set as multipart objectives, with the first part being feasible to deliver in the short term, while the second part resembled a long-term objective. Thus, while the short-term objectives have been met (e.g. putting in place mechanisms to foster the uptake of ITS and to increase interoperability), the respective longer-term objectives (e.g. that ITS contributes to its full potential and that seamless access based on continuity of services is ensured) have been achieved to a lesser extent.

It is clear that while progress has been achieved, the needs that these objectives aim to address (i.e. increased interoperability and continuity of applications, systems and services, effective concertation and cooperation among stakeholders, and establishing solutions for liability issues and for the sharing of data which supports ITS services in respect of legislation on privacy and data protection) are still valid, and further action is still needed to deliver the full benefits of ITS, which is also clearly indicated in stakeholder responses.

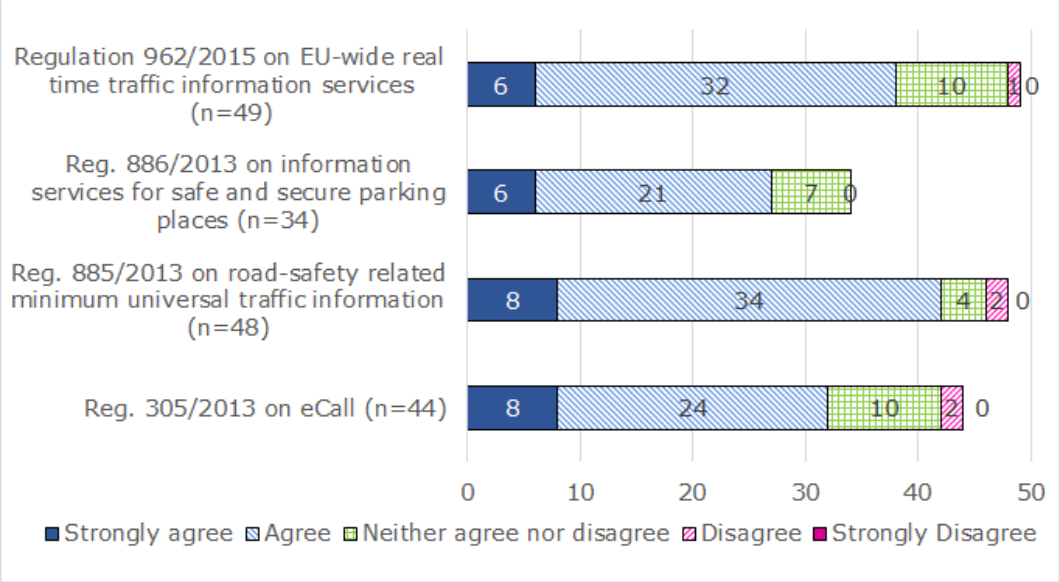
[36] https://ec.europa.eu/transport/themes/its/studies/its_en

5.1.3 *Question 3: Are the specifications adopted through delegated acts still up-to-date and relevant, considering technological and market developments (in ITS, but also in related industries such as automotive, electronics and telecommunications)?*

In the public consultation, the response on the relevance of the delegated act was strongly positive (see figure below). However, a few stakeholders noted a number of aspects where the relevance of the delegated acts could be further increased:

- On Regulation EU 2015/962, it was noted that current requirements focus on the provision of the data from the public sector, but that there was no consideration and relevant provisions to ensure that services provided from the private sector on the basis of this data will be interoperable.
- On Regulation EU 2013/886, it was noted that the scope of the Regulation is linked to the TEN-T network, where there is also a need for safe and secure parking in other areas, notably in urban areas and ports.
- On Regulation EU 2013/885, it was noted that the list of events and conditions covered by the legislation is limited, and the limitation to the TEN-T network limits the continuity of the services.
- On Regulation EU 2013/305, stakeholders noted that the legislation only covers new light-duty vehicles, and not existing vehicles or other vehicle categories. It has to be noted, however, that these comments relate to Regulation EU 2015/758[37], which mandates the fitting of eCall on light-duty vehicles, rather than the delegated act.

Figure 1: Public consultation response that the stated delegated regulation is still relevant



5.1.3.1 *Conclusions*

On the basis of the input from stakeholders, **all delegated acts so far are considered relevant and there were no identified market or technology developments that would challenge their ongoing relevance.** Nonetheless, it has to be taken into consideration that the limited specific comments on the relevance of the delegated acts could indicate that it is still early to assess the continued relevance of delegated acts that were only recently adopted.

[37] Regulation (EU) 2015/758 of the European Parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46/EC, OJ L 123, 19.5.2015, p. 77–89

5.2 Effectiveness

5.2.1 Question 4: To what extent have A) the Directive and B) the action plan, been successful in speeding up the deployment and investment in ITS and lowering its costs?

As reflected in the intervention logic (see Annex I), the ITS Directive provides a framework to support the deployment of ITS, which was intended to increase the pace and coordination of deployment for specific priority areas/actions. The establishment of a clear EU policy agenda and a timeline to achieve various actions was intended to lead to a faster, more coordinated approach by Member States to deploy ITS across the EU, therefore lowering its costs and reducing the differences between Member States.

5.2.1.1 Sub-question 4.1: What is the level of deployment of ITS applications and services (under each priority/action area)?

Priority area I – Optimal use of road, traffic and travel data

In general, priority area I is the area in which the most progress has taken place and most countries have been assessed to have made significant progress. Member States are generally carrying out many activities in this area and continue to progress well since the previous assessment in 2014.

Although several Member States are still late or did not provide information regarding the deployment of their National Access Points (NAPs), overall Member States have made good progress setting up their NAPs, which were intended to facilitate access, easy exchange and reuse of transport-related data for the priority actions under this priority area and referred to in points (a), (b) and (c) of Article 3 of the Directive[38]. The table below summarises the picture across the EU and shows the total number of countries with NAPs that are operational or in development.

Table 2: Progress in NAP implementation across the EU[39]

NAP status	Multi-modal travel info	Real-time traffic info	Safety-related info
Operational	8	18	19
In development	10	5	4
No action	0	0	0
No information	10	5	5

Notes: Table shows the total number of countries for each status and priority action.

The results from the public consultation showed that stakeholders generally agreed that progress has been achieved for activities within priority area I. A significant percentage (44%-80% depending on the action – including responses of 'yes, but not always completing the full scope') considered that the objective of defining requirements for actions has been met in an effective manner. This was especially the case for priority actions where delegated regulations have been adopted.

[38] Priority actions as referred to in the various points of Article 3 of the Directive will be referred to in shorthand hereafter as "priority action (a)", "priority action (b)"etc.

[39] Source: https://ec.europa.eu/transport/sites/transport/files/its-national-access-points.pdf, accessed 26-2-2019

Table 3: Responses from the public consultation to 'Have the objectives of the following actions been met in an effective manner?'

Action	Yes*	Yes, but not completing the full scope	No	No opinion
Definition of requirements for EU-wide MMTIs[40]	28 (37%)	24 (32%)	5 (7%)	18 (24%)
Definition of requirements for EU-wide RTTIs[41]	36 (49%)	23 (31%)	2 (5%)	11 (15%)
Definition of requirements for collection and provision of road and traffic data	27 (36%)	20 (27%)	7 (9%)	20 (27%)
Definition of requirements for data used for digital maps	17 (24%)	22 (31%)	7 (10%)	24 (34%)
Definition of requirements for SRTI[42]	29 (41%)	23 (33%)	2 (3%)	16 (23%)
Development of national multimodal journey planners	14 (20%)	15 (22%)	16 (23%)	24 (35%)

*Notes: * Responses for 'yes' include 'yes but slower than expected' – see Annex A of the support study for more detailed analysis.*

While good progress has been made on the ITS data infrastructure side (i.e. the establishment of NAPs and the definition of requirements for various sets of data), several stakeholders commented during the group discussion for priority area I that this is different to the development of ITS services. There was a consensus that the NAPs only show the capacity to make road data accessible but that most ITS services that use this data are still at an early stage of deployment, and it is thus too early to assess the Directive's effectiveness in this regard. Statistics on the use of the data provided by NAPs or a KPI to measure the deployment of ITS services would be required to better assess the coverage and use of ITS services across Europe. However, it is currently difficult to use KPIs to gain an accurate picture of deployment across the EU, as only a limited selection of Member States provided KPIs.

Feedback collected after the stakeholder workshop suggested that the current use of data from the NAPs is limited, but that the level of use depends on the type of service. It was noted that the NAPs are used in the context of CEF funded deployment projects but that in other cases usage may be limited since there is not yet a clear business case.

Details for priority action (a)

Out of 28 Member States, 18 have established or are in the process of developing their NAP for priority action (a), which gives access to data required for multimodal traffic information services (MMTIs). However, only 6 countries currently provide some data related to MMTIs, while the rest are at various stages of development of their NAP. It should be recalled that the delegated regulation for this priority action was only adopted in 2017. The fact that by 2017 there were NAPs in other priority areas may accelerate this process. For example, many countries have stated that their NAP for priority action (a) will be the same as for priority actions (b) and (c).

Compared to the baseline scenario – which indicates that the development of access points would have only taken place in a few advanced Member States and that deployment of MMTIs would probably have been limited to specific Member States – this represents good progress. Data is

[40] Multi-modal traffic information services
[41] Real-time traffic information services
[42] Road safety-related information

provided in standardised formats (notably DATEX II) in many countries' NAPs, which also shows better progress than was expected in the baseline case (which anticipated no framework for the access/use of data and no adoption of standards).

Consequently, this suggests that the Directive has had a reasonable impact on both the pace of deployment and the quality of data interoperability for this priority action.

Details for priority action (b)

Out of 28 Member States, 23 have established or are in the process of developing their NAP for priority action (b), which gives access to data for EU-wide real-time traffic information services. The delegated regulation for this priority action was adopted in 2015 and applied from July 2017, so this represents a good pace of deployment.

The baseline scenario indicated that while the uptake of real-time traffic information services was expected to increase, it would have been mainly based on static and often unreliable data. The extent of the data currently provided varies by Member State (in terms of the types of data available and the geographic coverage). However, most countries provide access to all three types of information referred to in the delegated regulation (static road data, dynamic road status data, and traffic data). Furthermore, countries that provided KPIs for real-time traffic information generally showed very high levels of network coverage. It can therefore be said that the Directive has had a positive impact in ensuring the availability of data and services across the EU.

The baseline description also notes that cooperation between relevant stakeholders would have been suboptimal and that there would not have been a common approach across the EU, thus limiting the development of these ITS services. The development of an NAP for this priority action has helped to ensure that Member States followed similar approaches. Although national authorities are responsible for establishing the NAP, the data may be provided by other stakeholders (such as road authorities and road operators), while users of the NAP can include a range of stakeholders. Therefore, in this respect, better cooperation across stakeholder groups has been seen compared to what was expected in the baseline.

Details for priority action (c)

Out of 28 Member States, 23 have established or are in the process of developing their NAP for priority action (c), which provides road safety-related information (SRTI). The delegated regulation for this priority action was adopted in 2013, so this shows a good level of progress.

The baseline scenario indicated that while the relevant technical standards were already in place before the specifications were adopted, investment in collecting the relevant information would likely be limited to a few (but not all) Member States. In this respect, the Delegated Regulation has helped to improve the situation across the EU and has helped to accelerate this process, as a significant number of countries have established an NAP, which is an improvement compared to the baseline.

Cooperation at an EU level is also likely to have been greater than what was expected in the baseline. Many Member States have participated in projects such as CROCODILE (and follow-on projects), which have led to knowledge sharing during the setting up of NAPs, and quality guidelines have also been developed via the European ITS Platform.

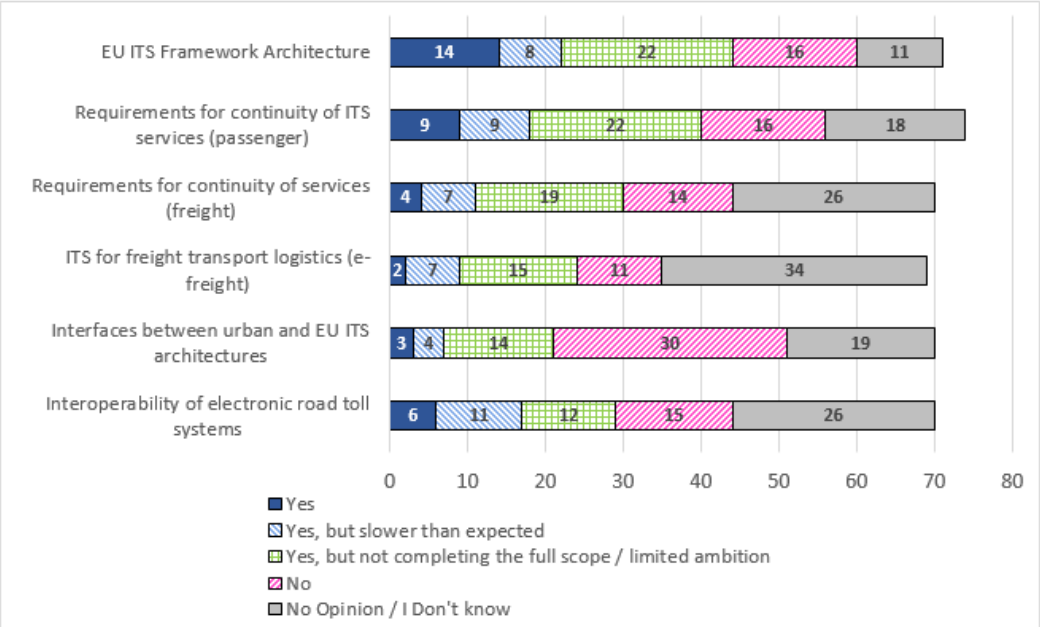
Priority area II - Continuity of traffic and freight management ITS services

In general, significant activities have taken place in priority area II since the Directive's adoption. Member States are generally carrying out many activities in this area and continue to progress well since the previous assessment in 2014.

The participants in the group discussion for priority area II considered that overall, development has evolved positively within this area. However, several stakeholders considered that the pace of deployment needs to improve and that more cooperation is required between countries to accelerate deployment.

The responses of national authorities to the data requests also suggested that some developments have been made within priority area II. 6 out of 10 respondents considered that intermodal traffic management systems are moderately developed in their country and 5 out of 10 respondents considered that e-freight services are moderately developed, while the others indicate that there has been limited or no development.

Figure 2: Public consultation responses to 'Have the objectives of the following actions been met in an effective manner?' (Priority area II)



Source: Public consultation responses – see Annex A of the support study for more detailed analysis

Compared to the group discussions and Member State responses, the results of the public consultation were more mixed concerning whether actions within priority area II have been met in an effective manner. It was suggested that some progress has been made towards the development of an EU ITS framework architecture and the definition of minimum necessary requirements for continuity of passenger ITS services (44 (62%) and 40 (54%) respectively – including responses of 'yes, but not always completing the full scope'). However, the assessment was more negative for the development of interfaces between urban and EU ITS architectures (where only 21 (30%) responses considered the action had been addressed effectively).

In the baseline, it was expected that continuity and interoperability across Member States and across different modes would remain problematic due to limited cooperation and awareness of cross-border issues, while limited adoption of e-freight solutions was also anticipated. Overall, the evidence

suggests that the definition of this priority area has had a positive impact in terms of the interoperability across different modes but that less of an impact has been observed regarding cross-border issues. The analysis of the national reports indicated also that a significant amount of work has been carried out in the digitalisation of freight transport, which represents a positive impact compared to the baseline.

Priority area III – ITS road safety and security applications

Overall, fewer activities have been carried out in this priority area compared to priority areas I and II. Some Member States are active, while others are less active in this area. However, most Member States continue to progress well since the previous assessment in 2014.

Although the overall scope of activities carried out within this priority area was relatively limited, most countries focused on eCall and the NAP for safe and secure truck parking information, two of the priority actions (d and e) within this priority area. Significant progress was made across Europe, particularly in the case of eCall, where 23 countries have prepared their national PSAP infrastructure. As shown by Table 4, countries have also made progress in setting up their NAPs for safe and secure truck parking information. These conclusions are also supported by the responses received in the public consultation.

Table 4: Progress in eCall PSAP readiness and safe and secure truck parking NAP implementation across the EU-28 and Norway

NAP status	eCall PSAP status	Safe and secure truck parking info
Operational	23	12
In development	4	8
No action	0	6
No information	2	3

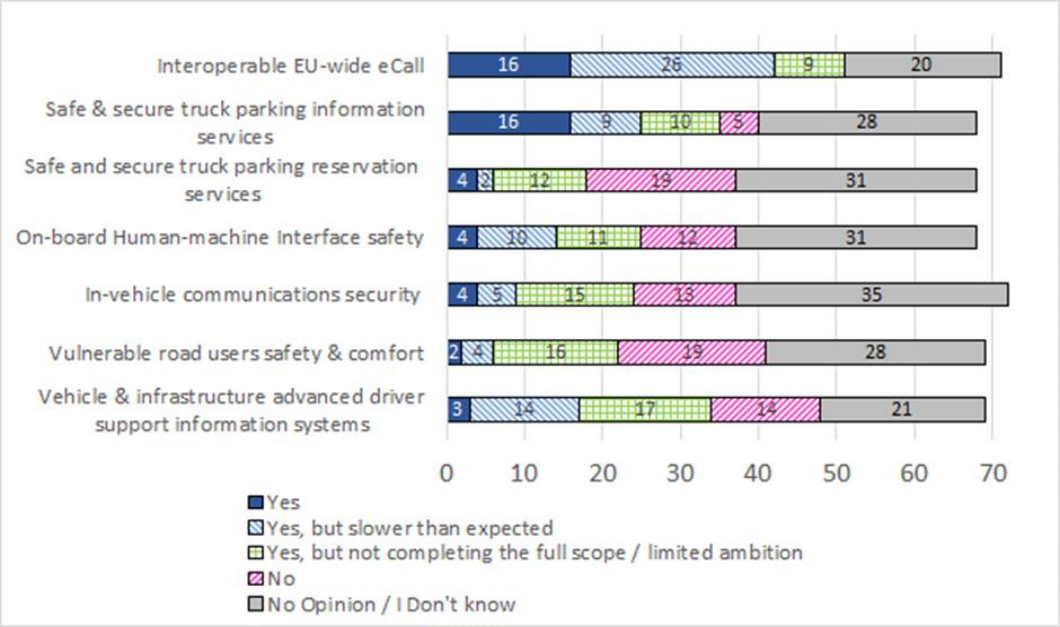
Notes: Table shows the total number of countries for each status and priority action.

However, the analysis of the national reports, the input received during the group discussions and the responses from the public consultation suggest that relatively slow progress has been made in other areas such as security of in-vehicle communications and the safety of vulnerable road users.

The responses to the data requests provided by national authorities suggest that progress has been made within certain actions for this priority area. The most positive response was for eCall where 9 out of 10 respondents stated that it has been broadly or moderately developed in their country. The responses were less positive for the integration of advanced driver support information systems and information services for safe and secure truck parking but overall suggested that some progress has been made. 6 out of 10 of respondents considered that reservation services for truck parking have not been developed at all, while 3 out of 10 of participants consider that limited or moderate progress has been made.

The responses to the public consultation (see Figure 3) also suggested that progress has been made for certain actions within this priority area. This was the case for the provision of an interoperable EU-wide eCall (51 (72%) respondents agreed to some extent) and for information services for safe and secure truck parking (35 (51%) respondents agreed). Less positive responses were seen for reservation services for safe and secure truck parking and for vulnerable road users' safety and comfort, where a greater proportion of respondents did not agree that the objectives had been met in an effective manner.

Figure 3: Public consultation responses to 'Have the objectives of the following actions been met in an effective manner?' (Priority area III)



Source: Public consultation responses – see Annex A of the support study for more detailed analysis

Details for priority action (d)

Significant progress has been achieved in preparing the necessary infrastructure required to deliver the eCall service, with almost all countries (28 out of 29) having their public safety answering points (PSAPs) operational or in development. Compared to the baseline scenario, which assumed that the pace of adoption of eCall would remain slow, a clear impact on the level of deployment has therefore been observed.

The baseline also describes the likely situation that the interoperability of the eCall system in the absence of the Directive would have been a clear issue. One of the findings from the group discussion was the consensus that the development of the common eCall system should lead to better interoperability within the EU. However, stakeholders commented that further efforts should be made to ensure interoperability with neighbouring non-EU countries; it has to be noted that action on this is already being taken at UNECE.

Participants in the group discussions also agreed that it is not possible to properly assess the level of effectiveness in terms of road safety, because the deployment of eCall in vehicles only just started on 31 March 2018.

Details for priority action (e)

The analysis of the national reports showed that progress has been made overall, but the extent of information available in countries' NAPs was highly variable. Stakeholders in the group discussion provided similar comments and indicated that progress has been made (especially regarding static data) but that the pace of deployment varies across the EU. However, the level of cross-border cooperation within this priority action is also thought to be limited, besides the European access point developed by the Commission.

However, when compared against the baseline scenario, the activities performed represent good progress. In the baseline, the development of safe and secure truck parking information services was expected to remain very limited, with limited sharing of information. Therefore, progress towards implementing NAPs in this area is a step in the right direction.

Details for priority action (f)

Work on the delegated regulation for priority action (f) - reservation services for truck parking was stopped in 2012 after the impact assessment study found that only 2% of truck parking places could offer reservations. This led to the conclusion that there was no need for specifications and standards on the reservation of parking areas. There is no indication that this situation has significantly changed since.

Overall, progress in this priority action is likely to be slightly more advanced (due to the investigation into the need for further action), or similar to the baseline situation (in terms of the deployment of ITS services).

Priority area IV – Linking the vehicle with the road transport infrastructure

In general, activities within priority area IV have gradually gathered pace and involved more Member States since the Directive's adoption. In the first years following this adoption, many of the projects were research-focused and involved only a few countries, whereas by 2017, large-scale pilot projects involving significant cross-border cooperation were being carried out.

The analysis of Member State reports shows that the level of activity across the EU is relatively high. However, there is an uneven status across the EU: some countries are very active, some are less active but are beginning to ramp up their activities, while other countries have not yet started work in this area. However, the number of activities within this priority area has clearly been rising since 2014 and reaching a more advanced stage.

The responses by national authorities to the data requests suggested that deployment has been limited for the actions within priority area IV. 7 out of 10 respondents considered that only limited or moderate development of the open in-vehicle platform and of C-ITS infrastructure and services has taken place. This reflects the fact that many activities are generally still at the pilot stage. However, this still is considered substantial progress, given the status of development in this priority area at the time of the Directive's adoption.

The public consultation responses showed a similar picture – 51 (70%) agreed that the objectives relating to cooperative systems have been met in an effective manner, although some of these considered that it was slower, or not to have reached as high an ambition level as expected. Only 20 (27%) agreed that the objectives relating to the open in-vehicle platform had been met in any way.

Stakeholders participating in the group discussion for priority area IV also agreed with the results of the public consultation and considered that there has been progress in the development of C-ITS but only limited progress has been achieved for the open in-vehicle platform. Stakeholders felt that data security, data protection and privacy issues may be hindering the open in-vehicle platform concept. They also agreed that a clear business case for deploying C-ITS is not yet visible, as many of the benefits are societal and the companies that would need to invest will not necessarily benefit directly.

The group discussion participants agreed that many different projects have been carried out to deploy C-ITS across Europe, but there were mixed views concerning whether these had happened because of

the Directive and whether they would have happened without the Directive. For example, stakeholders pointed to developments in C-ITS in other parts of the world, such as the US, where many projects have benefited from funding and oversight from the ITS Joint Program Office of the US Department of Transport. A consensus was also reached that the CEF funding has led to the more rapid deployment of C-ITS in recent years. Nevertheless, stakeholders agreed that deployment has been supported by the Directive overall.

In the baseline scenario, only limited uptake of C-ITS services was expected due to factors such as a low level of investment and limited cooperation and coordination at EU level. The Member State report analysis showed that by 2017, 23 countries had carried out C-ITS activities but that a few Member States had advanced significantly more than others. Many platforms have been created to enhance stakeholder dialogue and large-scale cross-border projects have started (often co-funded by the EU), indicating that progress has been both faster and more widespread than what was expected in the baseline.

Other activities within priority area IV, such as the open in-vehicle platform, have not progressed to the same extent as C-ITS and are comparable to the baseline case.

Overall, the analysis suggests that the Directive has created supportive conditions for deploying C-ITS but that other factors such as CEF funding, investment from industry and national-level strategies were also very important for accelerating deployment. It is difficult to disentangle the Directive's impact from these factors, particularly the extent to which the Directive has influenced decisions for allocating CEF funding.

Conclusions on deploying ITS across the EU

The evidence collected for this sub-question points to the Directive's positive role in speeding up the deployment of ITS across the EU. The best progress (and consequently the highest impacts compared to the baseline) has been observed in the priority areas where specific priority actions were defined. For example, the development of NAPs for each of the priority actions has resulted in the availability of a range of important road, traffic and travel data in a significant percentage of Member States.

National authorities were also asked how the Directive has contributed to the pace and level of deployment of ITS services in their country. 1 out of 10 respondents considered that the Directive had a significant role in the pace of deployment, while 7 of respondents considered it had some or a limited contribution, and 1 felt it had a very limited contribution. The responses were slightly more positive for the level of development, with 4 respondents indicating that the Directive had a significant contribution, 4 that it has had some or a limited contribution and 1 that it had a very limited contribution. Overall, these responses indicate that the Directive has indeed played a role but that the extent may vary depending on the situation.

Table 5 shows the overall assessment of the level of progress considered to have been achieved in each priority area compared to the baseline.

Table 5: Success of the Directive/action plan in speeding up deployment in each priority area

++	clear positive impact on deployment
+	Slight positive impact on deployment
0	No impact on deployment
-	Slight negative impact on deployment
--	Clear negative impact on deployment

Priority area	Deployment status compared to the baseline scenario	Comments / justification
I	++	Significant progress in developing NAPs for each of the priority actions, leading to significantly higher deployment than was expected in the baseline. Progress has also taken place in areas outside of the priority actions (e.g. digital maps).
II	+	Good progress within some actions such as the development of interfaces to support intermodal passenger transport and the digitalisation of freight. However, less evidence of cross-border interoperability and continuity of traffic management systems.
III	+	Deployment accelerated in some areas (e.g. eCall) but there could have been better coordination between countries. Few activities have taken place in areas not covered by the priority actions.
IV	+	Significant progress in C-ITS deployment, particularly since 2014 but most activities are still at the pilot project stage. CEF funding has played a key role. There is evidence of cross-border cooperation, but issues such as data protection, privacy and interoperability have not yet been fully addressed. There has been limited progress towards the open in-vehicle platform.

5.2.1.2 Sub-question 4.2: What is the level of investment in ITS applications and services?

The amount of investment/cost data available is limited, therefore the analysis for this sub-question has mainly been carried out at the level of the Directive, rather than by priority area/action.

The analysis of EU funding for the deployment of ITS services showed that €262m was allocated under the TEN-T programme (2007-2013, although all projects started in 2009 or later) and that €468m was allocated under CEF (2014-2020). Of the funding allocated under CEF, €15.5m was for programme support actions, which are strongly linked to the ITS Directive's implementation. The remaining €452m is less strongly linked but nevertheless has had a positive impact. The total investment in ITS (i.e. including both EU investment and other funding sources) was €1.3b for TEN-T projects and close to €1.2b for CEF projects. Under both programmes, each priority area received a reasonable share of funding. However, a slight shift in funding allocation from mainly priority areas I and II in TEN-T to more horizontal activities and priority area IV was observed under CEF.

The analysis of funding for ITS research and innovation projects showed that €45m was allocated under the seventh framework programme for research (FP7), while €101m was allocated under the Horizon 2020 programme (H2020). Under FP7, funding was evenly allocated among priority areas I, II and IV, while under H2020 most of the funding was allocated to projects covering priority areas I and IV. The total amount of funding allocated to ITS-related projects also more than doubled under H2020, compared to FP7. Although the funding is not directly linked to the Directive, many projects investigate topics that are closely aligned to the priority areas (for example, several projects are focused on developing C-ITS).

Significant funding for ITS was also available via the EU Structural Funds, with €510m allocated from 2007-2013 and €2.1bn planned for between 2014-2020. As only limited information was available concerning these projects, it was not possible to determine whether the Directive played a role in the allocation of funds to specific projects.

Feedback from stakeholders also indicated that the availability of EU funding has been supportive in meeting their objectives. For example, the participants in the priority area III group discussion indicated that EU funding under CEF has been useful for developing ITS services within this area, particularly under the CROCODILE and eCall-related projects. The Member State authorities responding to the data request also agreed that the Directive had made some level of contribution to increased public sector funds, although there were a range of views as to the extent of its impact (with 4 respondents indicating the contribution was limited, 4 that there was some contribution, and 2 that the contribution was significant).

Five of the national reports also provided financial KPIs, which show the annual investment in the development, operation and maintenance of ITS at a national level. These showed that the annual investment in ITS (as a % of total spending on transport infrastructure) was between 2% to 12% and that the annual operating and maintenance costs of road ITS were around €4,000/km. However, as only a small percentage of Member States reported on financial KPIs and because these were only reported for 2017, it is difficult to draw clear conclusions about the present picture across the EU and how it has changed since the Directive's adoption.

In conclusion, the evidence for this sub-question indicates that some of the investment in ITS services is likely due to the framework and goals set out by the Directive and the action plan. Funding sources such as the CEF PSAs can be directly linked to the Directive, but the remaining sources (which represent a much greater share of overall investment) are less closely linked. However, the projects funded under these programmes are often closely aligned to the priority areas identified by the Directive, and the Directive's goals are referred to within funding calls, which suggests the Directive has helped to direct project funding.

5.2.1.3 Sub-question 4.3: How have the costs for ITS technology developed over time?

Overall, only limited information is available on how the costs of ITS technology and the costs for delivering ITS services have evolved since the Directive's adoption. For example, cost data for providing ITS services over time could not be identified. The analysis for this sub-question has therefore been carried out for the Directive as a whole, rather than by priority area/action.

Input from stakeholders during the group discussions suggested the following.

Priority area I group discussion:

- Some participants considered that the costs of ITS have gone down since the Directive's adoption and that the Directive provided a supportive context for developing ITS. However, other stakeholders considered that the Directive may not have directly led to a decrease in costs and that national authorities may have faced significant costs for developing the required ITS infrastructure.

Priority area II group discussion:

- Overall, stakeholders agreed that the legal framework has helped to create a level playing field, which is important when bringing innovations to market. However, only a limited number of companies are currently operating in these areas, so it is difficult to assess whether costs have been reduced.
- Stakeholders also agreed that interoperability and harmonisation of ITS services can lower costs and considered that this will become more important as more ITS services are developed across the EU.

Priority area III group discussion:

- One stakeholder commented that standardisation of the data format has had a clear effect on lowering the cost of developing ITS services for safe and secure truck parking information.

Based on this input, the Directive may have led to a slight reduction in the costs of providing ITS services as a result of the specifications developed under the priority actions. The development of the DATEX II standard is also likely to have helped to reduced costs. It is considered likely that most of these cost savings might be achieved in the future, when deployment is more widespread and more ITS services have been developed.

5.2.1.4 Sub-question 4.4: To what extent has the definition of priority areas and actions under Articles 2 and 3 of the Directive helped (1) establish a clear time-plan and priorities in the development of ITS (2) helped increase the pace in the deployment of ITS across the EU?

Defining the four priority areas and the six priority actions (Articles 2 and 3 of the Directive) was expected to be a key factor in how Member States approached implementation. As part of this approach, specifications and standards have been developed under these priority areas and actions and adopted via delegated regulations. A more detailed analysis of the effectiveness of this mechanism is provided in evaluation question 6.

Analysis of the national reports indicated that setting priority actions has been an effective way of directing Member States' attention to specific deployment activities. For example, under priority area III, most activities were carried out through eCall and information on safe and secure truck parking, whereas relatively few activities were carried out for other topics within this priority area.

It is likely that defining specific priority areas and actions provided a clear signal on the themes of ITS services that countries should focus on deploying and that in turn, this may have helped to more easily structure/attract funding programmes. For example, the priority areas and actions were frequently mentioned in calls for European funding programmes. Also, the 2017 CEF transport multiannual work programme states that 'actions must comply with legislation, in particular to the ITS Directive 2010/40/EU and its Delegated regulations'. The PSAs for the CEF funding also refer to specific actions within the priority areas.

Member States responding to the data request shared the opinion that the Directive has helped to set priorities in their national ITS strategies. 6 out of 10 considered that it had a very significant or significant contribution, while 4 considered that it had some, or a limited contribution. The responses were somewhat less positive concerning whether the Directive has helped to establish a clear time-plan for the deployment of ITS but overall, 7 out of 10 still considered it has made either some, a significant or a very significant contribution.

Stakeholders participating in the group interviews provided a few opinions on whether the Directive has helped to increase the pace of deployment. Overall, many considered that it is too early to assess the Directive's effectiveness in this respect because widespread implementation is still in its early stages.

5.2.1.5 Sub-question 4.5: To what extent has the Directive effectively addressed the following root causes: (1) ITS deployment is incoherent and unfocused; (2) ITS deployment is fragmented and not coordinated; (3) ITS deployment and development is limited in geographical scope

A key problem identified at the time of the Directive's adoption was the incoherent and fragmented deployment of ITS and its limited geographical scope. The analysis above shows that since the Directive's adoption, most Member States have commenced activities in at least one of the priority areas and achieved a good degree of progress. CEF-funded cross-border projects helping the implementation of the IT Directive have become more widespread, and the ITS Committee, Member State expert groups and CEF PSAs have provided opportunities for cooperation between Member States.

The data requests sent to national authorities generally agree that the Directive has made a significant contribution towards cooperation in deploying ITS across borders (8 out of 10 respondents) but that there has been a less significant impact on the extension of the geographical scope of ITS (5 out of 10 respondents considered there has been some impact, while 3 considered there has been a limited impact).

The participants in the group discussion had more mixed opinions on whether ITS deployment is coherent, interoperable and has extended in geographical scope. Overall, participants considered that the main benefits have been in terms of interoperability (particularly for eCall and the sharing of data) but that in some cases deployment is still fragmented and more work could be done to better connect initiatives across borders. Concerning the geographic scope, feedback was received that the Directive does not specifically address ITS services that are thriving and evolving very fast in urban areas (e.g. ITS services for parking in general).

Based on the available evidence, the Directive appears to have addressed interoperability for specific services (e.g. eCall), but it would appear that further work is required in other areas, such as C-ITS. The Directive has established a more supportive framework for deploying ITS, but in some cases deployment is still fragmented, e.g. in the case of truck parking information services. Compared to the baseline scenario, it is considered that a fair amount of progress has been achieved. These aspects are discussed in further detail in evaluation question 5.

5.2.1.6 Sub-question 4.5: What has been the progress made in priority areas covered only by the action plan, and not by the ITS Directive?

For many of the actions only covered by the action plan, early activities were carried out but little evidence has been identified that further progress has been made with these actions. An overview of the activities carried out within each action is provided below.

Electronic road tolling

Activities conducted for this action mainly involved supporting the implementation of the European electronic toll service (EETS). These included a combination of dialogue, coordination and use of supporting tools. For example, the Association for Electronic Tolling and Interoperable Services (AETIS) was established to represent EETS providers as a group of stakeholders to promote the EETS.

The mid-term evaluation of the action plan identified several difficulties that were encountered. For example, stakeholders considered that the precise outputs of the action were unclear, and given the open-ended nature of the objective, conclusive support for the European-wide implementation of the

EETS was not achieved by the target date. Nevertheless, the rights and obligations of Member States were defined, and this action provided a platform for further collaboration on the deployment of the EETS, including support for promoting regional deployment under the REETS project and the EETS Facilitation Platform[43].

The recast Directive 2004/52/EC on the interoperability of electronic road toll systems in the Community[44] lays down the conditions necessary to ensure such interoperability. As from 20 October 2021, it will be replaced by Directive (EU) 2019/520[45], whose terms are to be transposed by Member States at the latest at around the same date. The latter Directive clarifies the rights and obligations of market players and extends the scope of the Directive's application to electronic toll collection systems which use automatic number plate recognition (ANPR) as the main technology. Moreover, the recast Directive makes it easier to identify toll offenders who are established in another Member State, thus enabling better enforcement of electronic toll systems.

Promoting safety and security-related ITS

Several dialogue and cooperation activities were carried out for this action. Consequently, the action stimulated the deployment of various road safety systems, including advanced emergency braking systems (AEBS), lane departure warning systems (LDWS), advanced driver assistance systems (ADAS) and other safety-related ITS through the funding of research and deployment projects and the raising of public awareness. A European Commission staff working group was set up for ADAS, although this was not fully deployed. Overall, this action was very successfully implemented. This was demonstrated by the commitment for AEBS and LDWS to become mandatory by 01 November 2013[46].

Decision support toolkit for investment decision

This action aimed to provide policy makers with evidence of the success and impact of the deployment of ITS solutions in road transport. The mid-term evaluation of the action plan showed that relatively few stakeholders participated in work in this area. Although this action's implementation was initially delayed, the toolkit was developed.

The mid-term evaluation of the action plan identified that the toolkit was not extensively disseminated or promoted. Nevertheless, some awareness was raised on the lack of an evaluation culture in the EU with respect to implementing ITS solutions. The toolkit had many registered users, but due to a lack of data and no maintenance plan, the cost-effectiveness and therefore the use of this toolkit for actual decision-making in Europe was limited[47].

[43] European Commission, EETS - Information Sharing Resource Platform, available from: http://eetsinfoplatform.eu/ , accessed on 10/5/2018.
[44] Directive 2004/52/EC of the European Parliament and of the Council of 29 April 2004 on the interoperability of electronic road toll systems in the Community (Text with EEA relevance), OJ L 166, 30.4.2004, p. 124–143
[45] Directive (EU) 2019/520 of the European Parliament and of the Council of 19 March 2019 on the interoperability of electronic road toll systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union (Text with EEA relevance.), PE/69/2018/REV/1, OJ L 91, 29.3.2019, p. 45–76
[46] Ramboll, 2013. Final Report: Mid-term evaluation of the implementation of the ITS Action Plan. [Online] Available at: https://ec.europa.eu/transport/sites/transport/files/themes/its/studies/doc/2013-03-06-mid-term-evaluation-of-the-implementation-of-the-its-action-plan.pdf
[47] idem

Funding guidelines

This action aimed to provide decision-makers with tools to support evidence-based policy making and funding. The mid-term evaluation of the action plan revealed that only a limited number of stakeholders had participated in this action. Moreover, the effectiveness of this action was limited by the implementation plan, which did not include a follow-up of recommendations with practical or long-term solutions. Nevertheless, phase one of this action successfully provided new baseline information on ITS funding in Member States[48].

Urban ITS platform

The approach taken for this action encouraged cooperation and dialogue from a broad base of stakeholders. However, the mid-term evaluation of the ITS action plan reported that overall, relatively few stakeholders took part in activities within this action. Activities for this action included setting up expert groups, including at the ITS World Congress, and organising a workshop with ERTICO and EUROCITIES.

The action benefited from dedicated support and management by the European Commission. Outputs of the Urban ITS Expert Group (established by the Commission) included guidelines for three applications: travel information, traffic management (including urban logistics) and smart ticketing. Additionally, information on best practices for ITS deployment was collected and a report on standardisation needs was issued.

However, due to the complexity of the issues covered in this action, stakeholders criticised the guidelines as being too lengthy[49]. Since the guidelines were produced, we have identified little evidence to show that stakeholders have used these.

Conclusions

Overall, compared to the actions that were taken forward by the ITS Directive, there has been relatively little progress for the actions only covered by the ITS action plan (with the exception of safety-related ITS and EETS). The higher level of progress made in areas included in both the Directive and the action plan implies that the Directive is likely to have played a positive role in the deployment of ITS services.

5.2.1.7 Sub-question 4.6: How has the adoption of the Directive contributed to/facilitated the development of new innovative ITS services?

Several methods could potentially be used to assess the level of innovation in ITS services, such as the number of new products developed or the number of patents published. However, given that many ITS services are in the early stages of deployment, it is difficult to develop a robust analysis in many areas. The evidence for this sub-question is therefore mainly derived from stakeholder inputs, namely from the national authority data requests and the group discussions with experts in each of the priority areas.

Responses to the data request sent to national authorities on the level of innovation in ITS services were mixed. 4 out of 10 respondents indicated some or a significant contribution, 4 indicated a very limited contribution or a limited contribution, and 2 indicated that they did not know.

[48] idem
[49] idem

Meanwhile, inputs from the group discussions indicated that:

- Some solutions are available within priority area I, but overall, relatively few new ITS services have been developed since the Directive's adoption. It was also considered that innovation in priority area I is mostly driven by the private sector, and because some US companies are dominant in this sector, there is therefore relatively limited capacity for the Directive to influence their decision-making. Overall, participants considered that the Directive has been positive in encouraging innovation but that the resulting products are not yet commercially available.
- Responses were mixed in the priority area II group discussion. One stakeholder considered that the actions in priority area II have helped to create a more supportive context for the development of new ITS solutions, especially for multimodality in passenger transport. However, one stakeholder noted that it is possible that providing direction limits innovation but that in practice this has not restricted players such as start-up companies. The innovative ITS solutions developed can then be adapted to EU protocols at a later stage.

The limited evidence available for this question (combined with the early stage of deployment for most ITS services and the contradictory views expressed by stakeholders) does not point to a clear conclusion on the Directive's impact on innovation. Further work is required in the future to reassess this question.

5.2.1.8 Conclusion

Overall, based on the conclusions to the sub-questions (see Table 6 for more details), the Directive and action plan have had a positive impact compared to what was expected in the baseline scenario. The most significant impacts have been in promoting the deployment of ITS and in allocating funding. In other areas, the impacts are less clear but may have had a slight impact. It may be the case that the impacts in some of these areas are clearer in the future, once the overall level of deployment has increased.

Table 6: Summary table of the impact of the ITS Directive/action plan

+++	Clear positive impact
++	Some positive impact
+	Limited positive impact
o	No impact
-	Limited negative impact
--	Slight negative impact
---	Clear negative impact
/	Insufficient evidence to draw a conclusion

Sub-question	Impact	Comments / justification
Level of deployment of ITS	++	Levels of ITS deployment have significantly increased and deployment has been more rapid than expected in the baseline. This suggests the Directive has played a significant role.
Level of investment in ITS	++	Significant funding has been made available for ITS at an EU-level, national level and through investments made by the private sector. It is difficult to disentangle the Directive's impact from other actions, but it is likely to have played a significant role.
Change in costs of ITS over time	+	Some evidence to suggest that costs have decreased over time – these are likely to have been achieved through standardisation activities.

Sub-question	Impact	Comments / justification
Definition of priority areas and actions supported a clear time-plan and helped increase pace of deployment	++	Definition of priority areas has helped to direct countries' activities. Time-plan established but deadlines not met in several cases and progress delayed compared to what was originally envisaged. Pace of deployment increased overall.
Provided for more coherent, coordinated deployment over a greater geographical scope	++	Deployment has increased in terms of its geographical scope. Significant success in ensuring interoperability for specific applications (e.g. eCall) but further work is required in other areas. Better coordination of activities cross-border is required.
Supported progress in actions covered by the action plan but not by the Directive	+	Progress in electronic tolling and safety-related ITS has been achieved but in other areas progress has been limited, or has stalled in recent years.
Facilitated the development of innovative ITS services	o	The Directive has established a supportive context for the deployment of new ITS services, but stakeholders' views were mixed concerning the level of impact.

5.2.2 Question 5: To what extent has the Directive been successful in improving the compatibility, interoperability and continuity of ITS across Europe?

5.2.2.1 Role of inputs/actions

Annex II of the Directive sets out the principles for specifications and deployment of ITS. For reference, the definitions of compatibility, interoperability and continuity are summarised below:

- Compatibility – ensure, where appropriate, the capability for ITS systems to work with existing systems that share a common purpose, without hindering the development of new technologies.
- Interoperability – ensure that systems and the underlying business processes have the capacity to exchange data and to share information and knowledge to enable effective ITS service delivery.
- Continuity– ensure seamless services across the Union, in particular on the trans-European network and where possible at its external borders. Linking countries with countries, regions with regions and cities with rural areas is also considered.

The delegated regulations adopted for each of the priority actions have ensured that if Member States deploy ITS, they meet certain necessary specifications. Setting up national access points has facilitated the sharing of important data and provided the building blocks for ITS to be developed in relevant areas. Feedback received during the group discussions indicated that there is more interoperability as a result of the adoption of these specifications.

The delegated regulations also require Member States to report on compliance assessments – i.e. whether transport authorities, operators, service providers and other relevant stakeholders are following the requirements that have been set out. According to the 2017 EU ITS Platform (EU EIP) NAP status report, the EU EIP project has developed, in cooperation with TISA, a uniform declaration of compliance for priority actions b and c to help harmonise assessments between countries. To provide technical guidance to all stakeholders, the European Commission supported the development of such templates for use on a voluntary basis, and it has also created a webpage with technical guidance for implementing the delegated regulations[50]. Nevertheless, the reports of

[50] https://ec.europa.eu/transport/themes/its/road/action_plan/traffic-information_en

compliance assessments were only provided in some cases and varied considerably by priority action[51].

The development of the DATEX II standard also represents progress in this area, as it allows for the data required for ITS services to be shared in a consistent format across the EU. One Member State authority considered that the Directive made a significant contribution to the use of standards in ITS projects, a sentiment echoed by several stakeholders, with one stakeholder stating that DATEX II would not have been possible without the Directive.

The baseline scenario suggested that although relevant standards were expected to have been developed in some priority areas, significant gaps would remain and there would not be a coherent framework for the access of data. The provisions of the delegated regulations and the establishment of NAPs have clearly helped in this regard and led to an improved situation in comparison to the baseline situation.

5.2.2.2 Level of impact

Analysis of the implementation showed that cross-border projects and initiatives have been carried out more frequently since the Directive's adoption. Many EU-funded projects have involved a wide selection of Member States, and cooperation has been a key activity during these projects, which has led to a more coordinated approach across the EU. The European ITS Platform has also played a key role in knowledge sharing across the EU.

At this stage it is difficult to estimate the share of ITS services that are compatible/interoperable, as many ITS services are still in the early stages of deployment. The analysis of the national reports and EU-funded projects indicates that interoperable systems are being developed, particularly through corridor projects such as Arc Atlantique, but more activities could be carried out in other areas. For example, the 2017 EU EIP NAP status report highlighted that no NAPs are shared with other Member States (besides the EU access point for truck parking information, no international/common access points providing data for several Member States have been established at this point). Creating a network of NAPs may facilitate better sharing of data across the EU and allow greater continuity of services.

Similar feedback was received from stakeholders participating in the group discussions. In the group discussion for priority area II, stakeholders considered that although many standards are already in place, there is still a need for further cooperation with industry to develop interoperable ITS. It was also noted that although ITS architectures have been developed at a national level, there are rarely checks to see whether the systems are compatible with other countries.

Participants in the priority area III group discussion had mixed opinions on whether ITS deployment is coherent, interoperable and the extent to which ITS services are seamless across borders. The findings were that the Directive has achieved its goals within certain areas (such as eCall) but that further work is required in other areas. For example, the seamless provision of information services

[51] European ITS Platform, 2018. EU EIP SA46 Annual NAP report - 2017: Monitoring and Harmonisation of National Access Points in Europe. [Online], available at: https://www.its-platform.eu/filedepot_download/1971/6320. For example, 10 countries have nominated a national body for assessing compliance for SRTI and 5 countries (Finland, the Netherlands, Norway, Sweden and the UK) have a procedure in place for assessing compliance. For RTTI, most countries have not yet decided whether to nominate a national body for assessing compliance. For SSTP, 5 countries have nominated a national body for assessing compliance.

for safe and secure truck parking across borders was identified as an area where significant further improvements could be made.

The baseline scenario indicated that few pan-European ITS services would have been developed in the absence of the Directive and that there would be limitations in terms of interoperability. It also suggested that some services (e.g. multimodal information and safety-related traffic information) would remain limited in terms of geographical coverage. Compared to the baseline, the evidence suggests that the Directive has helped to accelerate progress in specific areas (mainly the priority actions). Continuity of services has improved at a national level (many countries have reported the development of national multimodal ITS), but there is still some work to do to provide better cross-border continuity of services.

The most significant achievement has been for eCall. The baseline indicates that eCall would have been deployed in the absence of the Directive, but that significant interoperability issues would have been encountered. In contrast, the legislation put in place will ensure the interoperable roll-out of eCall across the EU.

Stakeholders see interoperability as a key remaining issue for priority area IV, especially regarding the development and deployment of C-ITS. This is because various technical solutions are available and are being/have been standardised, but it is not clear whether the technologies will be compatible. One stakeholder considered that C-ITS pilots have up until recently been quite fragmented and that interoperability issues may have slowed more widespread deployment. On the other hand, stakeholders considered that the C-ITS platform and C-ROADS have been instrumental for creating a more harmonised approach at EU-level.

5.2.2.3 Conclusions

Overall (see Table 7), progress has been made in the more coordinated deployment of ITS compared to what was expected in the baseline scenario, particularly in the areas where the delegated regulations have been adopted. In these cases, relevant standards have been developed, adopted and followed by Member States. In areas where there has been less clear direction, progress has been slower (e.g. cross-border truck parking reservation services), while interoperability issues may be limiting the rate of deployment in other areas (e.g. within priority area IV).

Table 7: Summary table of the impact of the ITS Directive on compatibility, interoperability and continuity of ITS across Europe

+++	Clear positive impact
++	Some positive impact
+	Limited positive impact
o	No impact
-	Limited negative impact
--	Slight negative impact
---	Clear negative impact
/	Insufficient evidence to draw a conclusion

Aspect	Impact	Comments/justification
Compatibility	+	EU-funded corridor projects have ensured compatibility during pilot projects but there is limited evidence concerning the wider compatibility of systems as this has not been tested extensively. Overall, the Directive has had some impact but there is still work to be done to ensure future compatibility, especially within priority area IV.

Aspect	Impact	Comments/justification
Interoperability	++	The evidence suggests that interoperable ITS services are more extensive since the introduction of the Directive and are more developed than what was expected in the baseline scenario. It is likely that standardisation, improved collaboration and involvement of a range of stakeholder groups has contributed to this success.
Continuity	+	Continuity of ITS services has been demonstrated in some instances (such as eCall and some corridor projects). In other cases (such as truck parking information services) further work needs to be done to better connect pilot projects and ensure that services can be provided across borders.

5.2.3 Question 6: To what extent has the adoption of specifications through delegated acts been an effective mechanism?

The adoption of delegated acts was expected to have an important role in determining the Directive's effectiveness. According to the recitals of the Directive, adopting specifications in a binding/mandatory manner was intended to ensure the compatibility, interoperability and continuity of ITS services. The impact assessment supporting the Directive's adoption noted that legislative action provided the best chance for progressing rapidly and reducing the risks of not delivering the expected results. It would also be able to make a difference by putting all players under pressure to work together and to agree on common approaches, synchronised actions and issues to be standardised in the short term.

So far, delegated acts have been developed and adopted in relation to five priority actions falling under both priority areas I (a, b, c) and III (d and e). One more delegated act, related to C-ITS in priority area IV, was under preparation in parallel to this evaluation. No delegated acts have been developed in relation to priority area II.

Furthermore, in terms of follow-up initiatives on deployment, as provided for in Article 6(2), there has only been one case where this has been used, namely for deploying eCall (Decision 585/2014/EU).

5.2.3.1 Contribution of the delegated acts in speeding up the implementation of the Directive and improving interoperability

A review of the implementation of the delegated acts suggests that they have supported progress in the development of necessary infrastructure at EU level. By March 2018, a large number of Member States (more than 15) had developed the relevant infrastructure required to facilitate the access to data (NAPs) in relation to priority actions b and c and had upgraded the public safety answering points (PSAP) to support the operation of the interoperable eCall (priority action d). More were in various stages of the development process. The development of NAPs in the case of priority action e was more limited, with some Member States indicating that no action has been taken (Cyprus, Finland, Malta, Luxembourg, Ireland and Norway). In these countries, the need to provide information services on safe and secure parking places for trucks and commercial vehicles has been limited. Overall, this suggests that significant progress has been made within a relatively short period, since only a very small number of national access points were in place when the delegated acts were adopted.

Furthermore, these developments have taken place while ensuring a level of consistency in the handling and exchange of data. According to the 2017 EU EIP NAP status report, all operational NAPs use DATEX II to exchange the information that can be encoded for safety-related information, real time/dynamic traffic information and truck parking information. Furthermore, for the exchange of information on changes in static road attributes, access points have been developed which provide

data to be used for developing and updating digital maps. Such activities took place in the EU-funded TN-ITS GO project[52] and are expected to become part of the NAPs soon.

Past experience from the eCall system supports the view that a voluntary approach would not have brought the same results. In that case, reliance on a voluntary approach since 2003 – along with adoption of the necessary technical standards – did not lead to the expected level of deployment[53]. Although a memorandum of understanding was signed by 20 Member States and 100 other organisations (including vehicle manufacturers), only a small number of Member States developed / upgraded the appropriate PSAP infrastructure due to the limited share of vehicles equipped, while, from their side, manufacturers were unwilling to invest in large-scale equipping of vehicles with eCall if there were no PSAPs able to receive and handle eCalls. The impact assessment study concluded that a mandatory approach would ensure fast implementation and reduce cost for industry. Similar conclusions were reached by the other studies that informed the development of other delegated acts (e.g. Regulation (EU) 2015/962 on RTTI), which also concluded that the binding measures would ensure a higher degree of harmonisation and quicker deployment[54].

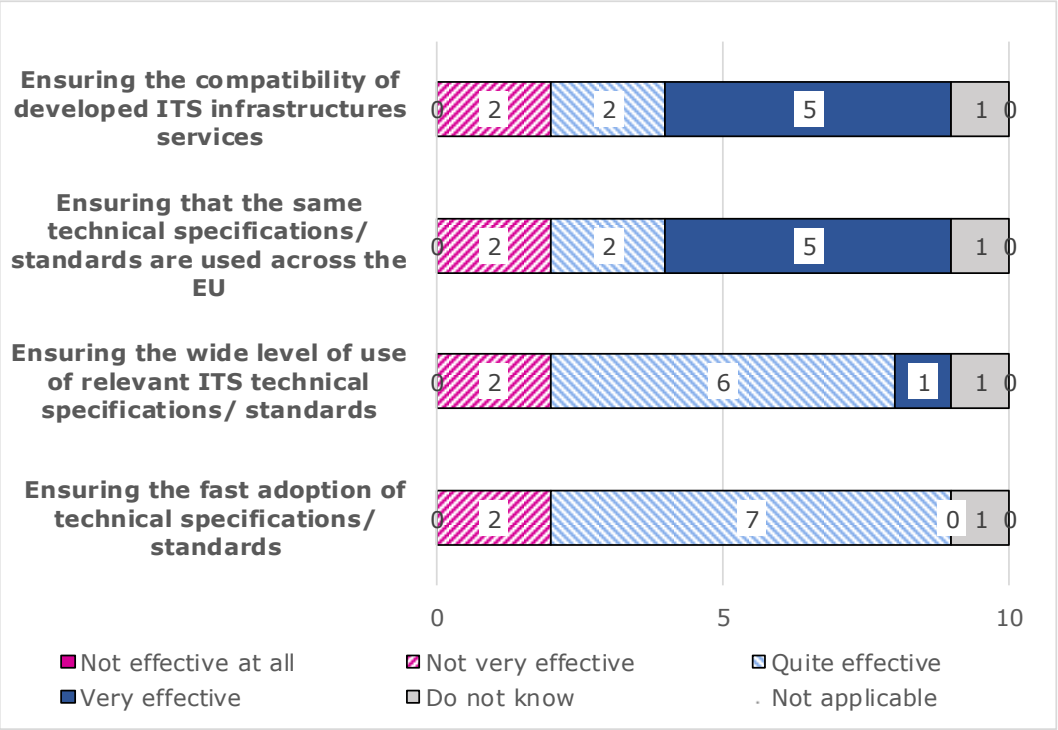
The feedback from stakeholders also support the view that the delegated acts have been helpful to ensure compatibility, with 7 out of 9 Member State authorities indicating that they have at least been quite effective (see Figure 4). An authority indicated that the technical specifications included in the delegated acts have been adopted and integrated in the public procurement process. This is seen as an effective way to ensure interoperability.

[52] TN-ITS GO Project webpage, https://tn-its.eu/tn-its-go

[53] European Commission, 2011a. COMMISSION STAFF WORKING PAPER - Impact assessment accompanying the Commission recommendation on support for an EU-wide eCall service in electronic communication networks for the transmission of in-vehicle emergency calls based on 112 ('eCalls'). [Online] Available at: http://ec.europa.eu/smart-regulation/impact/ia_carried_out/docs/ia_2011/sec_2011_1019_en.pdf

[54] European Commission, 2014d. COMMISSION STAFF WORKING DOCUMENT - The provision of EU-wide real-time traffic information services SWD(2014) 356 final. [Online]
Available at: https://ec.europa.eu/transport/sites/transport/files/themes/its/news/doc/2014-12-18-rtti/swd%282014%29356.pdf

Figure 4: In your view, has the adoption of specifications in the form of mandatory regulation (delegated acts) been an effective mechanism in terms of the following aspects?



Source: Data requests from national authorities

The responses to the public consultation also provide a picture supporting the perception that the delegated acts were both sufficiently specific and detailed to ensure compatibility, interoperability and continuity for deployment and operational use of ITS. 23 out of 39 respondents supported this statement in the case of Regulation No 305/2013 on eCall, 23 out of 46 in the case of Regulation 886/2013 on road-safety related minimum universal traffic information and 23 out of 37 for Regulation 885/2013 on information services for safe and secure parking places. In the case of Regulation (EU) 2015/962 on EU-wide real-time traffic information services, 28 out of 50 respondents agreed that the delegated acts ensured compatibility, interoperability and continuity for deployment and operational use of ITS. When analysing the responses by stakeholder type, public authorities were generally more supportive than private sector representatives.

Input provided in the group discussions and interviews with stakeholders also provided a positive assessment of the role of the delegated acts. The feedback on the role of the delegated acts supported the view that their adoption has helped speed up activity at national level and has been positive in terms of ensuring interoperability. They are also seen as having led to increased awareness among authorities and helped in ensuring available resources are allocated, particularly in countries where there was less progress in the initial period. There was particular support regarding the positive role of the use of delegated acts among participants in the group discussion covering priority areas I and III, where delegated acts are already in place.

5.2.3.2 Role of support measures

While noting the general view among stakeholders that the delegated acts have played a positive role in improving interoperability, they cannot be considered as the sole driver. Support in the form of pre-existing and follow-up actions have also contributed. The implementation of projects like HeERO and HeERO II already supported the development of the PSAPs even before the adoption of the eCall

delegated act and Decision 585/2014. Subsequent projects under the CEF (I_HeERO and eCall.at) supported the development of the infrastructure and the subsequent trials to ensure interoperability. These projects have been particularly important in ensuring that action has been taken within the set timetable by some Member States, particularly those with more limited financial resources. In other areas, the implementation of the EU-funded projects, such as CROCODILE 2 and 3, have also contributed to a greater level of cooperation and the adoption of common standards for the provision and exchange of data in a harmonised manner.

Most of the activities of these projects have been defined in direct linkage with the provisions and requirements of the delegated acts, as can be seen in the respective calls under the CEF programme[55]. Furthermore, in the EIP+ project, standard declarations of compliance forms were developed – led by TISA and in cooperation with other stakeholders – to harmonise the approach for submitting data related to delegated acts b and c.

Considering the strong interaction between the requirements of the delegated acts and the objectives of the voluntary support measures, it is not always possible to clearly separate the impacts of both. However, it can be argued that the adoption of the delegated acts has operated as a catalyst to increase interoperability by setting specific timetables and helping identifying priorities for following supporting measures.

5.2.3.3 Role of mandatory follow-up measures

After the adoption of the necessary specifications for a priority action (i.e. a delegated act), Article 6(2) of Directive 2010/40/EU requires the Commission to present, where appropriate and based on an impact assessment, a proposal on the deployment.

So far, there has been only one case where this has been used, namely for deploying eCall (Decision 585/2014/EU). The key reason for adopting a mandatory measure was that manufacturers were unwilling to invest in equipping all vehicles with eCall if the authorities did not take similar action to ensure that PSAPs would be able to receive and handle eCalls. This was a clear conclusion after a long period during which a voluntary approach had not brought the desired results. The impact assessment concluded that a mandatory approach would ensure fast implementation and reduce cost for industry with the greatest possible benefits in terms of safety. Thus, in this specific case the use of follow-up action under Article 6(2) was necessary, and it came together with action requiring that manufacturers install the eCall in all new vehicles from a set date (Regulation (EU) 2015/758). The responses to the public consultation confirmed the added value of this mandatory action (31 out of 36 respondents agreed or strongly agreed).

However, a similar approach has not been adopted so far in relation to other priority actions. Mandatory measures would by their nature ensure deployment, which cannot be achieved through specifications alone. However, it is important to note that Member States could find it difficult to meet such provisions, unless these were introduced with long transition periods, which in turn would reduce the added value when compared to voluntary deployment in line with specifications. For example, in relation to the development of infrastructure for providing real time traffic and travel information, Member States have pointed to the fact that certain concession agreements are very difficult – and possibly costly - to change to ensure that the operators invest in the necessary

[55] For instance: INEA, 2014. CEF Transport - 2014 Call for project proposals. [Online]
Available at: https://ec.europa.eu/inea/sites/inea/files/download/calls2014/cef_transport/map_333_its_road.pdf
[Accessed 20 05 2018].

infrastructure. Furthermore, the impact assessment that supported the adoption of the delegated act (Regulation (EU) 2015/962 on RTTI) concluded that there are multiple different ways that road traffic information is provided among Member States and that significant flexibility with respect to the provision of such services would be needed. More generally, the need for flexibility is a consistent message that arises from the review of the expert group meetings and the meetings of the ITS Committee discussing the adoption and implementation of the relevant delegated acts.

In the recent preparation for a delegated act under priority area IV (C-ITS), the impact assessment suggests stronger benefits from making it mandatory to equip vehicles with C-ITS stations, as this would strongly stimulate the deployment of C-ITS services. At the same time, considering that several vehicle manufacturers and road operators are already planning to deploy C-ITS services, it also clearly identifies that the two-step approach (starting with specifications) would make it possible to assess the need for a mandate in more detail based on initial deployment.

5.2.3.4 Comparison with other regions

The analysis of the policy in three other regions outside Europe (US, Japan and Australia) helps provide some insight into the role of binding measures and the balance with other approaches. The three countries represent quite different approaches:

- In Australia, there has been less use of mandatory tools at national level, and the level of ITS development remains rather limited. Where action has been taken, it has been at state or local level with limited consideration for ensuring interoperability.
- In Japan, the national authorities have taken the initiative through specific investment programmes (such as the ITS Spot programme for deploying roadside stations throughout the country providing real-time traffic information to vehicles[56]). There has been limited need to use legislation as a tool to promote ITS deployment and there have not been concerns for ensuring interoperability, given that all necessary decision power is concentrated at the national government level. Significant progress has already been achieved in those areas which the authorities have identified as priorities. However, a possible parallel can be drawn in the case of the eCall system where a voluntary approach has not led to a significant level of uptake. This supports the view that binding measures may be needed in this area.
- Finally, in the US, legislative action has been used only in a few areas, with a stronger focus on other instruments (funding, standards, guidance). For C-ITS, deployment has been promoted by funding large-scale pilot projects that can make a business case for deployment, letting the states opt independently for deployment, with federal aid and guidance. Nonetheless, in certain areas (e.g. real-time travel information), action at federal level did include the adoption of legislative measures setting minimum requirements under the SAFETEA-LU Act for the provision of information intended to ensure that a minimum set of data is provided from all authorities across the country.

Overall, the three case studies provide supporting evidence that using legislative measures in the form of delegated acts has a positive role on deployment, in particular where ensuring a consistent approach among Member States with different priorities has been an important consideration.

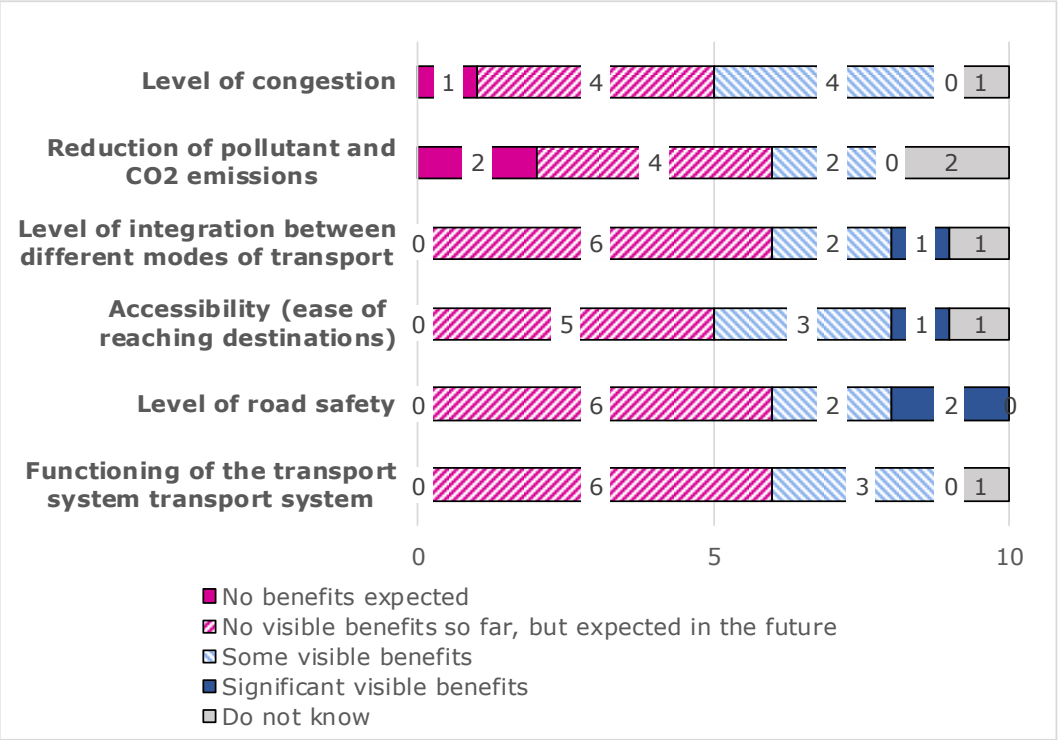
[56] Japanese Ministry of Land, Infrastructure, Transport and Tourism, 2012. ITS (Intelligent Transport System) Spot Services. [Online] Available at: http://www.mlit.go.jp/kokusai/itf/kokusai_itf_000006.html [Accessed 31 May 2018].

5.2.3.5 Impacts associated with the delegated acts

Feedback from the great majority of stakeholders, including group discussions and interviews, was that it is too early to assess the impacts of the adoption of the delegated acts.

In the case of eCall this was largely expected, since the obligation under Regulation (EU) 2015/758 to equip all new types of M1 and N1 vehicles with 112-based eCall in-vehicle systems on only became applicable on 31 March 2018. Also, in the case of the NAPs for RTTI and SRTI, it has been reported that the use and provision of data among data providers has so far been limited. In a recent workshop with the participation of NAPs from 10 Member States, it was concluded that providers have shown little interest to date in making use of the NAPs for providing information about their data and services[57]. Exchange of data is reportedly greater in the case of the static data to be used for updating digital maps under the TN-ITS project.

Figure 5: Have there been benefits that can be associated with the implementation of the ITS Directive and the delegated acts in the expected impact areas in your country? How important have they been?



The review of the 2014 and 2017 national reports provided examples where there was use of the data developed by NAPs, albeit in those Member States where access points were already in place early on (e.g. Data Market Place in Germany or the National Data Warehouse in the Netherlands). Nonetheless, it is quite clear that the level of use of the NAP infrastructure as a result of the delegated acts is currently limited, and benefits from implementing the delegated acts have yet to materialise. This is also reflected in the responses from national authorities who responded to the data requests (see Figure 5).

[57] CROCODILE 2, 2017. National Access Points converging at the CROCODILE 2 Technical Workshop in Budapest. [Online] Available at: https://crocodile.its-platform.eu/highlights/national-access-points-converging-crocodile-2-technical-workshop-budapest [Accessed 17 May 2018].

5.2.3.6 Conclusions

The analysis suggests that the adoption of delegated acts with common requirements pertaining to interoperability has helped to speed up deployment (see Table 8). Taking the form of binding measures – rather than voluntary non-binding measures – has had an added value by setting specific timelines at national level. Particularly in the case of Member States that have been slow in developing ITS, the presence of delegated acts has helped increase awareness and ensure a minimum level of investment. It has also ensured that actions related to the handling and exchange of data were based on the common standards set by the delegated acts (for example, by making use of the Datex II standard). Overall, compared against an approach based only on non-binding measures, delegated acts have had a positive role.

The delegated acts have been supported by additional actions – primarily in the form of EU-funded ITS projects through the CEF. The objectives and priorities of these activities have been closely linked with the delegated acts. These measures have made a clear contribution by ensuring a high level of implementation of the delegated acts, promoting cooperation across Member States and increasing interoperability of ITS services on the basis of minimum common standards. In their absence, it is safe to conclude that the level of progress would have been slower and less consistent across the EU. In conclusion, it is the combination of delegated acts and support measures that has ensured a successful approach in the EU.

Overall, with the exception of eCall, it is not clear whether the adoption of follow-up mandatory deployment actions under Article 6(2) would, in fact, have accelerated deployment, compared to the existing situation, in which only the known delegated acts apply, also considering that the other delegated act focused primarily on the accessibility of data for ITS services and contained relatively few provisions related to the provision of ITS services themselves. The mandatory deployment of eCall across the EU broke the impasse between public sector unwillingness to invest in the upgrade of PSAPs in the absence of a significant share of vehicles fitted with the eCall system and the decision by original equipment manufacturers (OEMs) not to extend the scope of the use of the eCall system in the absence of the relevant PSAP infrastructure. There is no indication of a similar situation in other areas – at least so far – while there is already action to develop relevant infrastructure (in the form of NAPs) and gradually services.

Table 8: Summary table of the effectiveness of the delegated acts in promoting deployment of interoperable ITS

+++	Clear positive impact
++	Some positive impact
+	Limited positive impact
o	No impact
-	Limited negative impact
--	Slight negative impact
---	Clear negative impact
/	Insufficient evidence to draw a conclusion

Sub-question	Impact	Comments / justification
Speeding up implementation / deployment of ITS	++	Positive impact through setting clear timetables and ensuring that all Member States make a minimum level of investment. Effectiveness ensured through the EU-wide implementation project through TEN-T/CEF and, in the case of the eCall, through follow-up action under Article 6(2).
Ensuring interoperability	++	Positive impact through the establishment of minimum common levels of services and common standards. Effectiveness increased by implementing projects through TEN-T/CEF across the entire EU.

Sub-question	Impact	Comments / justification
Achieving specific impacts	/	No evidence of impacts available due to the very limited period since the operation of NAPs & deployment of eCall. Input so far suggests the level of provision/use of data is still limited.

5.2.4 Question 7: To what extent has the deployment of ITS contributed to improving the functioning of the road transport system, including its interfaces with other modes? How has this consecutively contributed to reducing the negative effects concerning road safety, congestion and pollutant and CO2 emissions?

5.2.4.1 Sub-question 7.1: Have ITS systems been introduced that improve the interfaces with other modes?

ITS systems are expected to improve the interfaces between transport modes by making multimodal travel information available to users and improving continuity of traffic and freight management services across modes.

Within priority area I, the actions taken to achieve priority action (a), i.e. provide EU-wide multimodal travel information services, are most relevant to this question. Some Member States have included this information within their NAP to allow easy access and interoperable data to all users and modes, with EU-wide implementation expected in 2019. However, as noted before, this delegated act has only recently been adopted, so it may be too early to properly assess the benefits.

Within priority area II, progress has been made on providing ITS services that enable interoperable/e-ticketing for public transport and intermodal freight management, particularly between road and rail. The digitalisation of freight transport has also further improved connectivity between road and rail through the development of innovative tools that allow more efficient freight movements. Reponses to the data request show that six out of ten national authorities felt that intermodal traffic management solutions have been moderately implemented in their country, while 5 out of 10 felt similarly for intermodal freight management.

Priority areas III and IV currently do not include actions focused specifically on interfaces with other modes, and therefore are expected to have had limited impact in this regard.

During the group discussions, stakeholders noted that the Directive has been particularly effective in promoting multimodal and in some cases, cross-border ITS services. This is a positive development compared to the baseline scenario, where it was expected that each mode and Member State would develop their own systems independently.

5.2.4.2 Sub-question 7.2: Have the adopted ITS services had an impact on road safety?

Road safety impacts are largely expected from priority areas III and IV, with eCall deployment, advanced driver assistance systems, vulnerable road user protection measures, truck parking information and C-ITS services all contributing to this objective in different ways. Priority areas I and II may also have some impact due to improved traffic management, which could reduce the risk of accidents, and the improved availability/accessibility of regulatory data (e.g. speed limits and other traffic), which allows drivers to be better aware of the traffic rules, and will also support intelligent speed assistance (ISA) and automated driving. The impact on road safety is identified by a change in road safety indicators, including road accidents and fatalities.

A summary of the available information is provided below:

- The eCall impact assessment estimated a reduction of all road accidents by 1% to 7.5%, and a 2% to 15% reduction in the severity of the injury. Over a 20-year period, the study estimates that regulatory measures requiring eCall would save nearly 7,000 lives and mitigate over 70,000 serious injuries. eCall has been extensively tested through projects such as HeERO, and I_HeERO, which have ensured that the system works as intended and is interoperable across the EU. However, the device is only mandatory in new types of vehicles from 31 March 2018, and so the impacts up until now have been limited.
- The NEXT-ITS and NEXT-ITS2 deployment corridor estimated (preliminarily) a small reduction in the number of fatalities from traffic management ITS services (0.87 fatalities per year between 2012 and 2015 and 0.11 fatalities per year between 2015-2017). A reduction of injury accidents is also estimated to be 31 per year between 2012 and 2015, and 2.45 per year for 2015-2017. As expected, improved traffic management will only have a small positive impact on road safety.
- Safe and secure truck parking information services are expected to help drivers locate adequate rest facilities, reducing the likelihood of dangerous parking and exceeding the driving times. However, the impact on safety from truck parking projects has not been evaluated, so it is difficult to estimate the magnitude of this effect.
- In the national reports, reporting on the KPI of 'change in road accidents results in death or injury' was variable, and different levels of disaggregation were offered by each country, so no assessment at European level could be made. Finland estimated a 14% decrease in accidents based on recent project experience, Germany a 30% decrease. Spain reported detailed figures (before and after ITS implementation or improvement) for interurban roads and urban roads, with contrasted results: strong improvement for interurban roads (e.g. 56% less fatalities, 31% less accidents with victims), bad results for urban roads (e.g. 68% more fatalities, 26% more accidents with victims) – these figures may deserve additional analysis, in particular regarding the typology of victims (e.g. VRUs in urban areas), the type of deployed ITS and possible other factors influencing these changes. Sweden did not produce a KPI but provided indicative savings based on project experience; between 2014 and 2016, 400 new cameras along a road network of around 1000 km saved the lives of four people.

To conclude, the primary actions affecting road safety are eCall and C-ITS. However, they are both in the early stages of deployment, so the current impact has been small but is expected to increase in the future as eCall gains fleet penetration and C-ITS services are deployed on a larger scale.

5.2.4.3 Sub-question 7.3: Have the adopted ITS services had an impact on the level of congestion?

ITS services in all four priority areas are expected to reduce the level of congestion. In particular, ITS services from priority areas I, II and IV are expected to have a large impact on congestion by improving traffic management and using data to inform users of alternative routes. Safety-related ITS services (priority area III) may indirectly reduce congestion caused by accidents. For example, eCall may help by reducing the time taken to respond to accidents.

The Arc Atlantique deployment corridor expressed the benefits as a reduction in vehicle hours lost (VHL). Over 2.5 million VHL per year are estimated to be saved over the 8 deployment projects

covered by Arc Atlantique, resulting in €23 million in time savings[58]. However, these figures are extrapolations from shorter evaluation periods, in some cases of only a few days, and so may differ from actual results.

The NEXT ITS and NEXT-ITS2 deployment corridor noted that ITS projects across the five countries covered have reduced vehicle hours driven by 1.8 million and nearly half a million per year between 2012-2015 and 2015-2017 respectively, and hours spent in congestion by 166,000 and 135,000 per year for the same time periods[59]. These benefits are largely due to improved traffic management, and are expected to increase in the third iteration of the project when further systems are integrated into the TMS. The impact by technology varies significantly, as shown in Table 9.

Table 9: Impact of ITS services on vehicle hours driven and in congestion from NEXT-ITS2 projects

KPI	Vehicle hours driven	Vehicle hours in congestion
Forecast and real-time event information	0.4%	-1.0%
Traffic condition and travel time information	-0.2%	-1.5%
Safety-related traffic information	-0.5%	-1.5%
Weather information service	0.0%	-0.1%
Dynamic lane management	0.0%	-0.3%
Variable speed limits	-0.3%	-0.5%
Incident warning and management	-2.0%	-10.0%
Ramp metering	-1.0%	-10.0%
Traffic management plans	-0.3%	-3.0%

The Ursa Major deployment corridor reported a reduction of 51% of rush hour car trips, and an improved traffic flow that resulted in an average of 51,500 less kilometres driven, and 800 vehicle hours lost (VHL) saved, from the ITS trial in Rotterdam involving 5,000 participants (timeframe not specified). Additionally, the traffic monitoring and control on the A24/A25 in Italy reduced travel time by 2.5% to 4.9%, with an increased traffic volume of 1.5% to 4.6% for vehicles, and 2.3% to 6.8% for heavy goods vehicles **(**HGVs). Finally, the national traffic management plans in Switzerland saved 777,000 hours of lost traffic time due to traffic jams or road closures (timeframe not specified).

Although not summarised at a deployment corridor level, individual projects in the corridors (EasyWay I and II, MedTIS, and SEE ITS) also reported reductions in congestion thanks to ITS deployment.

The eCall impact assessment estimated that deploying eCall led to a 3-17% reduction in congestion following road accidents (by allowing faster response times).

Finland reported on this KPI based on recent project experience, which showed a 1.1% improvement in travel time as a result of ITS for road transport, and 15.3% for public transport (with the assumption that all public transport users use the services). The Netherlands provided analysis of the impact of various measures on congestion from 2005-2015: a 9% improvement in travel time was attributed to ITS specifically thanks to ramp metering and dynamic route information, in addition to

[58] Arc Atlantique, 2016. Arc Atlantique Traffic Management Corridor: Evaluation Report. [Online] Available at: https://www.its-platform.eu/filedepot_download/2090/6260

[59] NEXT-ITS Evaluation Report 2013-2015, and NEXT-ITS2 Evaluation Report 2015-2017. [Online] Available at: https://www.its-platform.eu/filedepot_download/2003/6291

benefits from existing traffic management measures implemented before 2000. However, the Netherlands also noted that other measures such as incident management are not yet taken into account in their reporting.

In summary, the ITS services deployed so far have had a positive impact on congestion, as demonstrated by the deployment corridor evaluations. However, this impact varies significantly by Member State depending on the level of deployment, and it is therefore difficult to quantitatively assess the EU-wide impact.

5.2.4.4 Sub-question 7.4: Have the adopted ITS services had an impact on the levels of CO_2 and other emissions?

A wide range of ITS services are expected to impact on the levels of CO_2 and other emissions. ITS is expected to improve the efficiency of the transport system, and a reduction in driving hours will result in a reduction in emissions. For example, ITS systems that help drivers avoid congestion means that they spend less time driving. Areas of congestion also have high concentrations of pollutants due to the high density of vehicles in one place, and reductions in congestion can thus reduce the level of pollutants in that area. Parking information can reduce emissions by minimising the amount of time drivers spend looking for parking space. ITS services can also encourage intermodal travel, which can reduce emissions by increasing the use of public transport (e.g. bus and rail) and active modes (walking and cycling).

The impact on the levels of CO_2 and other emissions by ITS services has been evaluated in several studies/deployment projects. However, the impacts are presented in a variety of forms/units, making it difficult to compare the results, or to extrapolate to an EU level. The key available information is summarised below:

- The NEXT-ITS and NEXT-ITS2 deployment corridor estimated preliminarily a reduction of 65,000 tonnes and 11,500 tonnes of CO_2 per year, between 2012-2015 and 2015-2017 respectively from a range of ITS services[60]. The larger impacts expected in the first phase are a result of higher levels of deployment being achieved in that period, while the second phase focused on improving network performance, filling any gaps, and improving cost efficiency. Incident warning and lane management were estimated to be the most impactful technologies, resulting in a 2% reduction in emissions.
- Most projects within Arc Atlantique did not quantitatively estimate the emission reductions. One project deployed a traffic management plan and estimated CO_2 emission reductions of 6.35 tonnes per year.
- The deployment projects within the Ursa Major deployment corridor are estimated to reduce emissions by 367 tonnes of CO_2 (timeframe not specified) from the 5,000-participant trial in Rotterdam, and 3,650 tonnes of CO_2 per year from Switzerland's traffic management plans.
- The deployment corridor project MEDTIS aimed to achieve a 5% reduction in CO_2 emissions on strategic bottlenecks of the corridor through the implementation of traveller information services on the TEN-T Mediterranean corridor[61]. However, the evaluation of this deployment project has not been completed yet.

[60] NEXT-ITS Evaluation Report 2013-2015, and NEXT-ITS2 Evaluation Report 2015-2017. [Online] Available at: https://www.its-platform.eu/filedepot_download/2003/6291
[61] Arc Atlantique, 2017. Activity 3 - Impact Evaluation. [Online]

- The Finnish ITS action plan (which included a wide range of ITS services[62] deployed nationwide) was estimated (preliminarily) to reduce national road traffic-related CO_2 emissions by 4% by 2015[63]. In contrast, the reduction in CO_2 emissions reported as a benefit KPI in the Finnish ITS national report estimated a 1.2% reduction in emissions from ITS services, a factor of three lower, although this might reflect the fact that the implementation is not yet completed.
- Sweden did not provide a KPI on CO_2 emissions but gave estimations based on calculations from a socioeconomic model of CO_2 emissions; CO_2 emissions are estimated to have decreased by 24,566 tonnes during 2014-2016 thanks to 400 road safety cameras along around 1000 km of road network.

In conclusion, the evidence presented above supports a small positive impact on CO_2 and pollutant emissions, but the magnitude of the impact is currently difficult to estimate, as the wide variety of deployment activities and assessment measures make it difficult to estimate an EU-wide impact. Each project covers different ITS applications and technologies in a specific geographical scope.

5.2.4.5 Limitations of analysis of impacts

The analysis of impacts for this evaluation question has some important limitations that need to be mentioned before presenting the conclusions to this evaluation question. In particular, ITS services in general are at an early stage of deployment and a large number of different services are concerned, which are deployed unevenly across and within countries. This is also reflected in the responses by national authorities to the data request; where some feel that there are already visible benefits, for most categories more respondents feel that the benefits are not yet visible, but are expected in the future.

To estimate the impacts of the Directive's implementation at EU level, the support study explored the use of a model. However, it was considered that the modelling currently could not provide reliable indicators of the expected impacts of the adopted measures at EU level, and that emerging results from ITS deployment projects were currently a better indicator of the expected impacts[64].

It has to be noted that the figures presented in this section are based on different sets of services being tested, adding significant variation to the expected impacts. The projects undertaken were also likely chosen to demonstrate services in locations where the highest benefits were expected to be achieved, such as areas of high congestion or emissions. Therefore, the benefits seen may not be applicable to all situations.

It is also difficult to separate baseline impacts from those resulting directly from the Directive. The deployment corridor projects are funded by CEF, and in some cases are the continuation of deployment corridor projects that already began before the Directive came into force. It is likely that these projects would have been carried out also without further policy intervention, although possibly with less focus on ITS deployment.

Available at: https://arcatlantique.its-platform.eu/activities/activity-3-impact-evaluation

[62] Services covered ICT infrastructure, traffic information, incident management, enforcement, and traffic management and control.

[63] EasyWay, 2011. Evaluation of Renewal of Road Weather Information System and the Finnish Road ITS Action Plan. [Online] Available at: https://portal.its-platform.eu/filedepot_download/1004/3215

[64] See Section 6.4 of the support study for more details.

5.2.4.6 Conclusions

The Directive has increased the uptake of the required ITS infrastructure and specifications, which will help to accelerate the deployment of ITS services that are expected to positively impact the functioning of the transport system. To date, the scope and geographic coverage of ITS services has been relatively limited, so there have been very small positive impacts on interfaces with other modes, emissions, congestion and safety. Positive impacts are expected in the future as deployment becomes more widespread.

Improvements in the interfaces with other modes are expected as a result of better availability of intermodal travel information, advances in e-ticketing and improved freight management.

There has been a limited positive impact on road safety, as the key services in this area are still in the pilot stage (C-ITS) or are just starting to be deployed (eCall). The Directive has helped ensure EU-wide deployment of the eCall infrastructure, but actual impacts will not be seen until the device is widely adopted in the fleet. Both eCall and C-ITS have the potential to realise significant improvements in road safety.

The impacts on congestion and emissions observed in the scope of pilot projects and reported in the national reports were directly related to improved traffic management and the availability of real-time traffic information, which led to reduced vehicle driving hours and less time spent in congestion. The Directive has encouraged the provision of real-time and multimodal traffic information, and is expected to enable the development of improved traffic management centres. However, to date, the deployment of end-user ITS services that will impact on congestion and emissions is still relatively limited.

There is very limited data on the actual impact of ITS on CO_2 emissions, with only Finland reporting a 1.2% reduction in the national reports. A similar figure is reported in preliminary studies for a range of ITS services and C-ITS. The reduction in time spent in congestion is estimated to be up to 10% depending on the specific service, although again limited impact data has been provided. Some studies also estimate a reduction in total time spent on roads of up to 3%. These figures demonstrate the potential for ITS to achieve benefits in emissions and congestion, which will likely materialise once large-scale deployment occurs.

Table 10: Summary table of the impacts

+++	Clear positive impact
++	Some positive impact
+	Limited positive impact
o	No impact
-	Limited negative impact
--	Slight negative impact
---	Clear negative impact
/	Insufficient evidence to draw a conclusion

Sub-question	Impact of the Directive / action plan	Comments / justification
Level of deployment of ITS services that lower emission levels, reduce congestion and increase safety	o (current) + (expected in future)	Significant progress in deployment of NAPs and specifications, but limited deployment of ITS services that lower emission levels, reduce congestion and increase safety. However, more impacts are expected in the future.
Improved interfaces with other modes	+ (current) Possible further positive impacts expected	The Directive has been effective in providing guidelines for such systems, but deployment is still limited.

Sub-question	Impact of the Directive / action plan	Comments / justification
Impact on road safety	o (current) + (expected in future)	eCall and C-ITS are expected to have a significant impact on road safety, but have not been deployed on a significant scale yet, so the impact so far is minimal.
Impact on levels of congestion	o (current) + (expected in future)	Deployment projects have achieved notable congestion and emission reductions, but are still limited to pilot stage deployment and with limited geographical coverage. Therefore, impacts have been small.
Impact on levels of CO_2 and other emissions	o (current) + (expected in future)	

5.2.5 Question 8: What main factors have influenced and/or stood in the way of achieving the objectives of the Directive?

We examined internal and external aspects that may have influenced the effectiveness of the Directive.

The analysis of internal aspects included:

- The role of the dedicated bodies and experts at EU level and their possible limitations;
- The role of national authorities and the parameters that affected implementation of the Directive and the delegated acts at the national level;
- The role of other players.

In relation to the external aspects, the analysis focused on:

- Changes in ITS technology;
- The role of other legislation.

In addition, we examined the extent to which there have been other unintended or unexpected effects as a result of the Directive.

5.2.5.1 Role of internal factors

Role of dedicated bodies and experts

The Directive identifies the following bodies and experts:

1. The European ITS Committee, composed of Member State representatives. The role of the Committee is to advise the Commission before the adoption of standardisation requests, guidelines and other non-binding measures to facilitate Member States' cooperation relating to priority areas, guidelines for reporting by Member States, as well as working programmes [cf. Articles 8, 9 and 17(2) and (5) in combination with Article 15 of the Directive].
2. The European ITS Advisory Group, composed of high level representatives from ITS service providers, associations of users, transport and facilities operators, manufacturing industry, social partners, professional associations, local authorities and other fora. Its main objective was to advise on business and technical aspects. The group was expected to provide a solid framework for concertation and cooperation with industrial players, for reflection and discussion on industrial and provider-based requirements and priorities and for reviewing draft delegated acts.
3. Member States experts, gathered within the ITS Member States Expert Group. These national experts are appointed by Member States to provide technical support for the development of

the delegated acts. Depending on the specific priority area and topic considered, Member States can appoint different experts.

Considering **the ITS Committee and the experts gathered within that committee**, the following can be retained.

Overall, 22 meetings took place between December 2010 and May 2018, with a high level of participation from Member States. The meetings have served for the purposes described in point 1 above, as well as a forum for discussion with experts on the Directive's implementation. The relevance of those meetings was highlighted in the follow-up of the 2nd High Level Structural Dialogue on Connected and Autonomous Vehicles[65].

The available minutes focus on the information provided by the Commission and the areas in which input was requested; they do not always give a clear indication of the role of the Member States in practice. However, as noted, one objective of the meetings was to give an overview of different ongoing activities in order to maintain a common level of knowledge among experts. A review of the topics analysed suggests that besides being informed on developments in the different priority areas, the experts were also asked to contribute to the development of future actions, such as for example in the case of the methodology and scope for testing connected and automated vehicles across Europe, and being consulted on the scope of the different delegated acts being prepared.

The **ITS Advisory Group** was officially established on 27 January 2012 after an open call for applications and has 25 members who cover a broad group of interests[66]. The Advisory Group met four times, the last time in 2015. The level of participation varied over time, and the input received was not always as relevant as expected. It is also considered that the structure of the Advisory Group is limiting, given the broad range of topics covered. A respondent was of the view that the Advisory Group did not provide an opportunity to feed into the design of the specifications and the regulation, but was rather a mechanism to inform the industry about proposed actions that were already designed. As a result, some high-level representatives of industry lost interest.

In order to address the perceived limitations of the ITS Advisory Group, less formal ad hoc meetings (Friends of ITS) were organised and chaired by the Commission. These meetings bring together members from both the ITS Committee and the EU ITS Advisory Group. This group has already met six times since 2013. Participation in these meetings has been extended to include additional experts, research institutes, additional companies and non-EU country representatives. However, in terms of the level of participation, following the first meeting in 2013 that included both members of the Committee and the Advisory Group, the number of participants has also decreased[67]. Nonetheless, these meetings have helped create a more integrated dialogue between the Commission, Member States and other stakeholders.

[65] BMVI, 2017. "Action plan automated and connected driving" from the 2nd High Level Structural Dialogue on 14th-15th September 2017 in Frankfurt/M. [Online]
Available at: https://www.bmvi.de/SharedDocs/EN/Documents/DG/action-plan-automated-and-connected-driving.pdf?__blob=publicationFile

[66] 9 individual companies including OEMs and IT companies, 8 trade/professional associations, 2 city representatives and 1 local transport authority, 2 NGOs, ! Research organisation and 2 individual experts.

[67] There were representatives of 22 non-government organisations during the 1st meeting in 2013. There were only representatives of 8 non-government organisations in 2016 and 11 in 2017 (6/2017).

Considering, overall, the role of the ITS Advisory Group and of the expert meetings described in the previous paragraph, input from the national authorities suggests that the two structures have contributed to improving coordination and cooperation between stakeholders. Out of the 10 authorities responding to the data request, 6 indicated that there has been at least some positive contribution from the Directive in establishing clear coordination mechanisms (Austria, Ireland, Latvia, Norway, Slovenia, Czechia). Others felt that there was only a limited (Greece, Finland) or very limited role (the Netherlands, Slovenia). Similarly, 6 out of 10 authorities felt that the Directive's implementation has made at least some contribution to cooperation between the public and private sector (Greece, Finland, Ireland, the Netherlands, Norway, Slovenia, Czechia).

The **ITS Member State Expert Group** supports the preparation of the delegated acts. (Cf. in this regard the inter-institutional agreement on better law making[68]). A total of 58 meetings have brought together national experts who worked with the Commission in developing the technical specifications, and their subsequent implementation.

In the questionnaire sent out to members of the ITS Committee, ITS Advisory Group and ITS Member State Expert Group, most respondents were positive about the role and organisation of the different groups, highlighting that topics are generally thoroughly presented and discussed. Some stakeholders indicated that they would have liked to be consulted in an earlier stage of the decision-making. For the ITS Advisory Group, respondents indicated that only a limited number of meetings have been organized.

On the preparation of delegated acts, several respondents were positive about the interactive nature of the preparation of delegated acts, but noted that more technical experts should be involved in the work, emphasising in particular that the cost-benefit analyses for delegated acts should be prepared with the experts in a timely manner.

On the implementation of delegated acts, respondents were generally positive, although some noted that the follow-up meetings could have started sooner after the adoption of the delegated acts.

In addition to the groups described above, other expert groups (e.g. C-ITS platform, eCall implementation platform, Expert Group on Urban ITS) have brought together a large number of experts representing a broad range of stakeholders[69].

This combination of stakeholder groups has ensured an extensive debate, with broad sectoral and geographical coverage. This was also a conclusion reached in the mid-review of the ITS action plan and was additionally highlighted in the comments made by participants in the ITS workshop of 23

[68] Interinstitutional agreement between the European Parliament, the Council of the European Union and the European Commission on better law-making of 13 April 2016, Official Journal of the European Union, L123/1: Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016Q0512(01)&from=EN

[69] The C-ITS platform has a total of 87 members including individual experts, industry representatives, NGOs and national authorities. (see: http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3188)
The Expert Group on Urban ITS includes 25 individual experts with different backgrounds (authorities, industry and academia) from 14 Member States. (http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2520)
The eCall implementation platform has 41 Members including 13 from industry, NGOs and research organisations, 25 from national authorities and 3 other organisations. (http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2481)

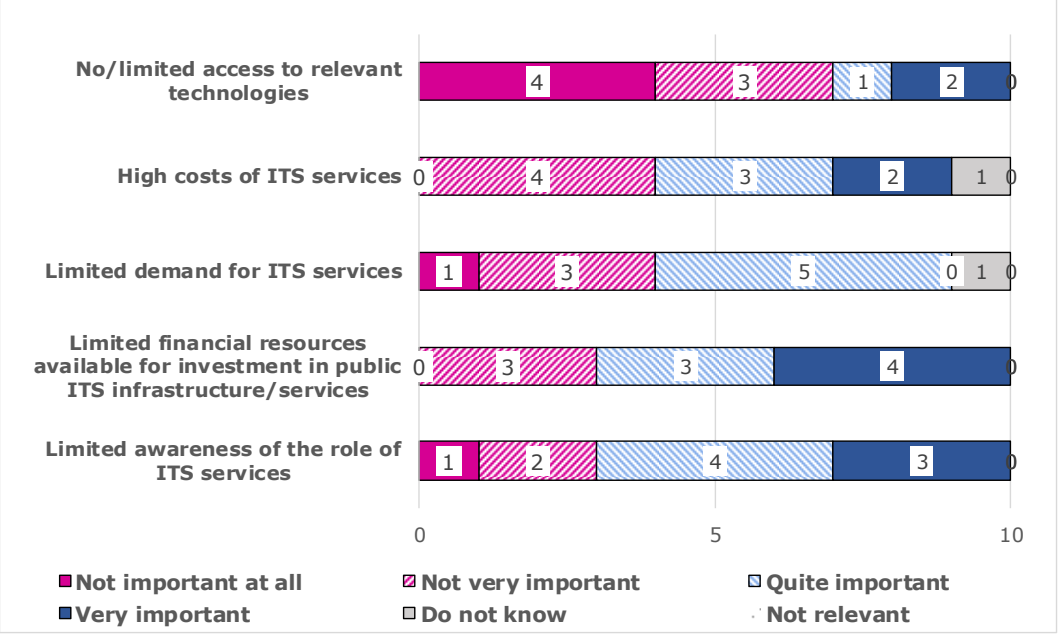
April 2018. This in turn has contributed to the cooperation between public and private stakeholders in the preparation and implementation of measures supporting a wide variety of ITS services.

Overall, the available evidence suggests that engagement with national authorities has worked well, while interaction with other stakeholders through the Advisory Group has not been as successful. Measures have been taken to address this, although it is not clear whether the issues have been entirely resolved. At the same time, there is still the view among stakeholders that the coordination mechanisms could be further improved, which probably reflects the balance between the need for extensive consultation and the need for setting clear direction.

Issues/barriers at national level

At national level, the limited availability of financial resources was identified as the most important obstacle by respondents to the data request (see Figure 6). This was also supported by a number of stakeholders during the interviews. A respondent noted that this factor is particularly important given the high upfront costs for development of information and for interlinking systems, whereas the financial benefits are only expected in the long term. Other stakeholders also agreed that financial resources have been a limiting factor, suggesting that only a few Member States have been investing in ITS at a sufficient level. This point was also identified as important in the analysis of the progress in implementing the ITS Directive among Member States in south east Europe[70]. The fact that the Directive's implementation followed the financial crisis likely limited the investment capacity in most countries.

Figure 6: Responses of national authorities to the question: What do you consider as the limiting parameters/constraints for the deployment of ITS services in your country? (n=10)



EU financial support through the CEF (with different levels of co-funding, e.g. 20% for works, but 50% for studies/pilots, 80-85% for cohesion countries and up to 100% for programme support actions) has helped address these limitations and has been a driving force for funding the NAPs and

[70] Mitsakis, E. et al., 2014. Current status and future prospects of Intelligent Transport Systems deployment in South East Europe, http://mpra.ub.uni-muenchen.de/61537/: MPRA Paper No. 61537.

PSAPs, exchanging experiences at the pilot and deployment level and participating in cross-border actions.

Besides financial constraints, limited awareness of the role of ITS was also seen as a limiting parameter by 7 out of 10 respondents. A participant in the group discussions pointed out that some authorities did not have the requisite administrative capacity to respond to the obligations arising from the Directive and the delegated acts. A respondent suggested further training on ITS-related issues is clearly needed in some Member States. In south east Europe, delays in adopting ITS actions were attributed to the absence of a national ITS strategy for most of these countries; legal and administrative barriers were also seen as problems leading to delays in these Member States[71].

A respondent also pointed to other issues that may introduce barriers at national level:

- continuing conflicts of interest between more standard measures for addressing congestion issues (expansion of roads) and the use of ITS-based solutions; and
- limited interest for cooperation at sub-national level between different public transport companies, or between urban, inter-urban authorities.

Linked to the last point, some respondents also suggested that the view of some local authorities is that the Directive - and the associated CEF funding - are focused on deployment of the TEN-T network on the motorways [72] and that is has limited relevance in their jurisdiction.

5.2.5.2 Role of external factors

Fast evolution of technology

The fast evolution of ITS technology is considered by most stakeholders to represent a challenge for the Directive and for ensuring that expected impacts materialise. According to a respondent, the speed of development creates concerns that investment in specific solutions would become obsolete in the near future. In some cases, they may lead to decisions being postponed.

The responses to the public consultation underline the challenges along several different fronts that necessitate frequent updating of the legal framework to reflect new business models and ITS services arising from new technological developments.

Role of other legislation

Privacy and data protection issues and provisions related to liability remain an area of concern for a number of stakeholders, particularly in relation to C-ITS but also other priority areas (I and II). The analysis in the context of evaluation question 15 on the coherence with other legislation concludes that the Directive is in line with the applicable legislation. However, the responses to the public consultation imply that these issues are not fully resolved in practice and are seen as limiting the development and uptake of ITS services.

Other unexpected or unintended impacts

[71] Mitsakis, E. et al., 2014. Current status and future prospects of Intelligent Transport Systems deployment in South East Europe, http://mpra.ub.uni-muenchen.de/61537/: MPRA Paper No. 61537.
[72] It should be noted that TEN-T network also includes urban nodes.

An identified unexpected impact is the impact on non-EU countries. The Australian case study clearly pointed out that developments in the EU have had a direct impact, driven by the fact that most are imported from the EU. As a result, the Australian authorities decided to follow the EU ITS architecture framework and adopt standards developed by the EU standardisation bodies (such as DATEX). Furthermore, some other countries decided to also use the eCall specifications, such as Turkey and the Gulf Cooperation Council countries. Other indirect impacts on non-EU countries are also expected through joint participation in international standardisation bodies.

5.2.5.3 Conclusions

A summary of the impacts is provided in Table 11.

Table 11: Summary table of the impact of internal/external factors on effectiveness of the ITS Directive

+++	Clear positive impact
++	Some positive impact
+	Limited positive impact
o	No impact
-	Limited negative impact
--	Slight negative impact
---	Clear negative impact
/	Insufficient evidence to draw a conclusion

Sub-question	Impact on effectiveness of the Directive	Comments/justification
Role of coordination mechanisms	+	Overall positive role in terms of improving cooperation and coordination. However, not fully achieving to provide operational coordination mechanisms.
Implementation at national level	-	Limited financial resources, low awareness and weak administrative structures had a negative role in ITS deployment and the adoption of an ITS strategy. This has been partly and gradually addressed via the EU support mechanisms and the increasing level of co-funding provided for Member States with reduced financial resources.
Technological change	/	Evolution of technology and business models are expected to pose challenges to the appropriateness and effectiveness of the Directive on an ongoing basis.
Role of other legislation	/	No evidence of a positive/negative role identified. See evaluation question 15 for analysis on coherence.

5.3 Efficiency

The main sources of input for the efficiency questions were the data requests sent to national authorities, input provided by the Commission, the group discussions and available literature (in particular, the impact assessments carried out for the Directive and individual delegated regulations).

5.3.1 Question 9: What are the costs associated with the implementation of the Directive?

A range of stakeholders are bearing the costs associated with the Directive's implementation. The most important ones are:

- the European Union
- Member State national authorities
- ITS service providers

- other stakeholders (e.g. private road users, hauliers, OEMs, and telecommunications network providers).

5.3.1.1 Costs to the European Union

Costs to the European Union result from a range of activities, from developing legal instruments to monitoring and reporting.

Coordination of meetings

The Directive sets out that the European Commission must be assisted and advised by the European ITS Committee and the European ITS Advisory Group. While the ITS Committee is made up of Member State representatives, the ITS Advisory Group includes 25 high level representatives of a range of stakeholder groups including service providers, associations of users and the manufacturing industry. Furthermore, the Commission is supported by Member State experts through the ITS expert group, which meets regularly to prepare and implement delegated acts. The most significant cost considered here is the reimbursement of participants.

In addition to these working groups that are specifically mentioned in the ITS Directive, there are several other working groups that are linked to it, such as the Friends of ITS, the C-ITS deployment platform and the European eCall Implementation Platform (EeIP). Since attendants of these working groups are not reimbursed, the costs to the Commission are assumed to be zero.

Table 12: Costs to the European Union – meetings

Cost category	Cost element	Proposed unit	Unit cost[73]	Number of units	Total cost for 2010-2017
Working group meetings	ITS Committee	Cost/meeting	€ 17,550	22	**€ 386,100**
	ITS Advisory Group	Cost/meeting	€ 13,000	4	**€ 52,000**
	ITS expert group	Cost/meeting	€ 8,775	58	**€ 508,950**

Organising additional events around ITS results in a cost of €200,000 per year, totalling €1.6 million for the entire period (2010-2017).

Commissioning of consultancy studies

Several consultancy studies were commissioned to prepare the delegated regulations, the mid-term evaluation of the ITS action plan and other support studies.

Table 13: Costs to the European Union – Consultancy studies

Cost category	Cost element	Proposed unit	Unit cost	Number of units	Total cost for 2010-2017
Consultancy studies	For each delegated regulation	Average cost/study	€ 200,000	5	**€ 1,000,000**
	Mid-term evaluation	Cost/study	€ 150,000	1	**€ 150,000**
	Preparatory studies	Average cost/study	€ 100,000	22	**€ 2,200,000**
	Development of KPI Guidelines	Cost/study	€ 150,000	1	**€ 150,000**
Total cost:					**€ 3,500,000**

[73] All costs estimated at 2018 prices.

Development of standards

The most relevant standardisation activities for ITS are the ones under:

- EC standardisation request M/546 on urban ITS[74]
- Standardisation Mandate M/453 EN on Co-operative Systems for Intelligent Transport[75]
- eCall.

Costs for the European Commission arise from paying the European standardisation organisations to develop standards. While M/546 on Urban ITS directly falls under the ITS Directive, the standardisation activities for C-ITS and eCall do not fall under a specific mandate under the ITS Directive. It should also be noted that M/453 on C-ITS predates the ITS Directive. However, since these standardisation activities are very closely related to the ITS Directive, we have considered them in the scope for this evaluation. The total cost in the period between 2011 and 2017 amounts to € 2.8 million.

EU access point

Under priority action e, the Commission is managing a European access point for truck parking data[76] to enable continuity of services throughout the EU. Preliminary estimates suggest that the one-off costs for the website development/set-up would be €125,000 and that recurrent costs would be €25,000 per year.

Funding of ITS deployment/research

The two key funding programmes supporting ITS deployment were the TEN-T programme for 2007-2013 and the Connecting Europe Facility (CEF), which covers 2014-2020. Funding for research, technology development and innovation was available via the seventh framework programme for research and technological development (FP7 – which covered 2007-2013) and through Horizon 2020 (which covered 2014-2020). In addition to the above funding sources, funding in ITS was available from the European Structural and Investment Funds (ESIF), most notably from the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

The costs identified focus on costs directly linked to ITS. However, some of this funding will have been made available under the baseline. For this evaluation, we are assuming that without the ITS Directive the funding streams between 2007 and 2013 would have continued at the same level.

[74] M/546 COMMISSION IMPLEMENTING DECISION C(2016)808 of 12.2.2016 on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport - http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=search.detail&id=568

[75] M/453 standardisation mandate addressed to CEN, CENELEC and ETSI in the field of information and communication technologies to support the interoperability of co-operative systems for intelligent transport in the European community - http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=search.detail&id=434

[76] Available at: http://data.europa.eu/euodp/en/data/dataset/etpa

Table 14: Costs to the European Union – Funding ITS projects

Cost category	Cost element	Number of projects	Total cost for 2007-2020
Funding of ITS deployment	TEN-T (2007-2013)	12	€ 262 million
	CEF (2014-2020) programme support actions	-	€ 16 million
	CEF funding (2014-2020) for ITS deployment	48	€ 452 million
	Increase in funding between TEN-T and CEF	-	**+ € 206 million**
Funding of ITS research, technology development and innovation	FP7 funding (2007-2013)	10	€ 45 million
	Horizon 2020 funding (2014-2020)	21	€ 101 million
	Increase in funding between FP7 and H2020	-	**+ € 56 million**
Other sources of funding (ERDF and CF)	Total ESIF funding (2007-2013)	289	€ 510 million
	Total ESIF funding (2014-2020)	152	€ 2,094 million
	Increase in funding between 2007-2013 and 2014-2020	-	**+ € 1,584 million**

Sources:

- *European Commission. Innovation and Networks Executive Agency - ITS for Road. [Online] Available at: https://ec.europa.eu/inea/en/ten-t/ten-t-projects/projects-by-transport-mode/its-for-road [Accessed 21 05 2018].*
- *European Commission. CEF - Intelligent Transport Services for road (ITS). [Online] Available at: https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/projects-by-horizontal-priority/intelligent-transport-services-for-road-%28its%29 [Accessed 21 05 2018].*
- *European Commission. Commission Expert Group - Intelligent Transport Systems - Meetings. [Online] Available at: http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=1941*
- *European Commission. CORDIS: Projects and Results.*
- *European Commission. H2020 Transport: Intelligent Transport Systems.*
- *European Commission, 2018. Data for research. [Online] Available at: http://ec.europa.eu/regional_policy/en/policy/evaluations/data-for-research*

Costs to national authorities

National authorities were contacted to report on costs of the ITS Directive through a specific data request. Additional comments were received during the group discussions. While quantitative estimates were received for many cost elements, the variation in the cost estimates was often high and the number of responses for specific cost elements low. In these cases, the costs are clearly more uncertain, and average cost estimates have to be treated with caution. Qualitative input from the stakeholders was able to provide some additional context. However, it generally highlighted that estimating costs is difficult and often uncertain.

There do not appear to be systematic differences in the cost estimates when split by the level of ITS deployment, geographical location, EU13/EU15 and labour cost levels, although this is possibly due to the large uncertainties involved. It was therefore decided to not normalise the received cost values but to calculate straight averages.

Costs for transposing the Directive and developing the national ITS framework

A key element in the costs for national authorities is any activities linked to the transposition of the ITS Directive into national law. While establishing the national ITS framework is not specifically requested by the ITS Directive, it is closely linked to the transposition process. The transposition in many cases is accompanied by national consultation activities beforehand. Out of 10 respondents, 5 provided an estimate for such consultation activities, with an average cost of € 19,300. More Member States were able to provide costs for developing the national ITS strategy with an average cost of € 298,000 and the transposition of the Directive with a cost of € 103,000. The highest costs in this

category are linked to the development of necessary mechanisms/structures to support implementation of ITS at national level at € 361,000, for which six Member States were able to provide information.

The cost estimates vary significantly between Member States. While some of this variation might be due to different labour costs, some of it might be down to the size of the country, level of advancement or the complexity of the national ITS system. Due to the lack of qualitative background information on the provided costs, it is not possible though to provide conclusive explanations for the variations.

Creation and operation of national access points

The delegated regulations for priority actions a[77], b[78], c[79] and e[80] require each Member State to set up a national access point (NAP), a single point of access for users to the ITS data under the respective priority actions. Member States, however, are free to decide whether to use the same access points as established under other delegated acts under the ITS Directive. An analysis of the NAPs established shows that a majority of the Member States take advantage of that option to use the same national access points across different priority actions[81].

In the data request sent out to national authorities, Member States were asked to indicate the initial (one-off) costs for developing the infrastructure for the NAPs as well as ongoing operating costs. The average estimated cost for creating a NAP range between €195,000 for priority action a to €352,000 for priority action c. It has to be noted, however, that for priority action a, only 3 countries were able to provide an estimate (as opposed to 7 countries for priority action b and 8 countries for priority action c). The limited information for priority action a, is in line with what would be expected, given that the delegated regulation under this action only came into force in 2017. Given the timelines for implementing the delegated regulation, it might be too early to develop a meaningful cost estimate for the NAP for priority action a at this stage.

Looking at the range of values for actions b and c, it becomes clear that there is quite a spread in estimates, Austria and Ireland being at the lower end of the scale, whereas Greece, Finland and Sweden are at the upper end. The Netherlands sits at the upper end for action c, whereas it is at the lower end for action b. Whether this can be explained due to the reuse of previous investments for the NAP between these two actions (the same web portal[82] is used) is not clear.

The annual operating costs show a pattern similar to the set-up costs and range from €22,000 per year for priority action a, to €46,000 per year for priority action c.

Preliminary cost estimates for NAPs are available for priority action a from the impact assessment support study[83]. The costs for creating the NAP were estimated as € 49,000, whereas the annual operating costs were estimated to be €25,000 per year. While the operating costs align well with the

[77] Provision of EU-wide multimodal travel information services.
[78] Provision of EU-wide real-time traffic information services.
[79] Provision, where possible, of road safety-related minimum universal traffic information free of charge to users.
[80] Provision of information services for safe and secure parking places for trucks and commercial vehicles.
[81] Available at: https://ec.europa.eu/transport/sites/transport/files/its-national-access-points.pdf
[82] National Toegangspunt ITS, Available from: https://nt.ndw.nu/#/parking-overview
[83] TRL, 2016. Study on ITS Directive, Priority Action A: The Provision of EU-wide Multimodal Travel Information Services. [Online] Available at: https://ec.europa.eu/transport/sites/transport/files/2016-05-its-directive-multimodal-services.pdf

reported final costs, the set-up costs seem underestimated compared to the data provided by Member States.

Upgrading PSAP for eCall

The Delegated Regulation for priority action d on the harmonised provision for an interoperable EU-wide eCall establishes specifications for upgrading PSAPs. Decision 585/2014 additionally requires Member States to upgrade the public safety answering point (PSAP) infrastructure required for the proper receipt and handling of eCalls, in order to ensure the compatibility, interoperability and continuity of the harmonised EU-wide eCall service.

While the upgrade of the PSAP itself is not mandated directly under the ITS Directive, these costs are closely linked and presented below. When asked about the initial one-off costs for upgrading PSAPs for eCall, 8 Member State representatives in the data request indicated that the cost on average would be €775,000, which is in the same order as the €30.7 million for EU-27 estimated in the eCall impact assessment. Only 2 Member States were able to also give the annual ongoing costs, indicated in both cases as € 550,000 per year.

To be able to explain some of the differences in estimated costs it needs to be considered that EU funding has been made available to Member States for the upgrade of PSAP through the HeERO 1, HeERO 2 and I_HeERO projects. During the first phase of the HeERO project, 9 Member States[84] received support to carry out the start-up of an interoperable and harmonised in-vehicle emergency call system. During the second phase, another 6 countries[85] joined. Under the I_HeERO project, 17 countries[86] participated. Of the Member States that have provided cost data for the upgrade of PSAP, Austria, Czechia, Greece, Finland, Ireland, the Netherlands and Slovenia have received funding under one of the HeERO projects. The estimates provided by Member States are all close together, even though not all of them were covered under HeERO, which suggests that EU funding is not systematically excluded from these estimates. Final conclusions on the costs incurred by Member States are thus difficult to make. When analysing these values it has to be kept in mind that costs for upgrades can vary depending on the number of PSAPs. While typically there are two PSAPs per Member State, there are few exceptions where the number is significantly higher. The largest number of PSAPs in Europe can be found in Germany with 290, followed by France with around 100[87]. In these cases the upgrade process could become a lot more complex and costly[88]. For this evaluation, however, no figures on PSAP upgrade costs could be obtained for these two countries.

Participation/cooperation

Under the ITS Directive, Member States participate in the ITS Committee and expert groups to help prepare delegated acts. Nine Member States that participated in the data request were able to provide a cost estimate for such participation. The average annual cost for participation in EU ITS bodies/coordination activities is estimated at €24,700. Costs for other cooperation activities (for instance within the ITS corridors or C-ROADS) were provided by seven Member States with an average of € 100,000 per year.

[84] CZ, DE, EL, FI, HR, IT, NL, RO, SE
[85] BE, BG, DK, ES, LU and Turkey
[86] AT, BE, BG, CY, CZ, DE, EL, ES, FI, IE, IT, LU, NL, PT, RO, SI, UK
[87] I-HeERO, 2018. Activity 1.2 - Blueprint Overview Germany, s.l.: s.n.
[88] Although the impacts per PSAP might be limited through arrangements, for instance in France a private company is filtering the eCalls to manage the false calls before they arrive at the PSAPs.

Costs for monitoring and enforcement

Estimates on the annual costs for monitoring/enforcement actions to ensure that ITS specifications are applied at national level were provided by seven Member States with an average value of €39,000 per year. On the other hand, many Member States struggled to provide costs for monitoring/enforcement actions to ensure compliance with data protection, privacy, security and use of data or thought it was not applicable. Only Czechia, Finland and Slovenia provided costs at an average of €14,000.

Member State representatives were furthermore asked about providing costs for monitoring/enforcement of compliance with the different delegated regulations under the ITS Directive. For priority action a, only Ireland was able to provide a cost estimate in the range of €50k-100k. As outlined before, the fact that this Delegated Regulation has come into force only in 2017 explains the limited number of responses. For the other priority actions, more Member States were able to provide a response. Annual reported monitoring costs range from average values of €17,000 per year under action e to €53,000 per year under action d.

Other costs

Apart from the costs that were covered by the data request, all Member States were given the opportunity to report on any other costs associated with the different delegated regulations. Only a few Member States responded, which suggests that these additional costs are not systematic and might not be experienced by every Member State, or might be covered under some of the previous cost categories. This would also be in line with the observation that for a lot of costs a wide range of estimates were provided. This suggests that there are no systematic substantial additional costs to the ones covered by the data request.

5.3.1.2 Costs to ITS service providers

ITS service providers (which could also include national/local road authorities) are primarily faced with costs for complying with the delegated regulations of the Directive. The impact assessment support studies assumed that there would be costs associated with ITS service providers having to meet data quality standards and setting up databases/interfaces (e.g. for DATEX II, INSPIRE) to allow the exchange of data.

On the other hand, cost savings were also assumed e.g. for multimodal travel information service providers in reduced data discovery costs, reduced aggregation costs and a reduction in the number of interfaces required. Furthermore, benefits are expected for digital map providers participating in TN-ITS, which is concerned with the exchange of information on changes in static road attributes. It helps map providers to keep their maps up to date for such attributes by automatically retrieving the information on changes from the road authorities[89], instead of lengthy and cumbersome data collection on the ground at local, regional and national levels.

While ITS service providers were contacted as part of this study and participated in the group interviews, none of them were able to provide cost estimates for activities such as the ones outlined above. All participants were presented with the preliminary costs, but stakeholder groups struggled to provide detailed comments or alternative estimates.

[89] For example, the TN-ITS services active in Finland, Norway and Sweden already have a total automatic data update rate of more than 1 million per year, erticonetwork.com/map-updates-from-eu-funded-platform-support-isa-in-saving-lives/

On the side of TPA operators, a Greek motorway operator highlighted that the presented costs from the impact assessment were in line with actual costs. However, additional costs might result from applying technologies different from the ones considered for the impact assessment (e.g. parking information through mobile apps rather than variable message signs).

Possible cost reductions could result from the creation of an open system and harmonisation which will reduce prices due to increased demand and competition. Operators will have more incentives to invest in ITS technologies if the expectations are clear. Additional cost savings, as highlighted by an ITS service provider, could arise from NAPs when scaling up and if one-to-one agreements are avoided. This would help with extensions of cooperation and creation of information to final users.

All in all, stakeholders were only able to qualitatively comment on the costs rather than provide concrete estimates.

5.3.1.3 Costs to other stakeholders

In addition to the stakeholder groups discussed above, there are other stakeholders that might have to bear costs related to the ITS Directive, such as private road users, hauliers, OEMs, and telecommunications network providers.

Over the course of this evaluation, no specific information was received on the costs for these types of stakeholders. While these stakeholder groups have not been targeted specifically through individual data requests, the full range of stakeholder types were given the opportunity to participate in the group discussions. Here they were presented with the preliminary costs as assumed in the support studies for the preparation of the delegated acts.

For costs under priority action d - eCall, the eCall impact assessment assumed that there would be no additional costs for users for a 112-based eCall, nor for network providers for the submission of the 112-based eCall. Vehicle manufacturers, on the other hand, were expected to have costs of €150-180 per vehicle for the in-vehicle system[90]. Costs under priority action d – truck parking information services, for other stakeholders are reported as zero[91]. The study specifically mentions that hauliers will have no additional costs, as it is assumed that truck parking information will be integrated into other products (fleet management services and devices, navigation, tachographs etc.).

Presented with these assumptions, none of the group discussion participants objected or highlighted any additional costs that would materialise. It is therefore assumed that there are no significant additional costs for these stakeholder groups apart from the assumed preliminary costs.

5.3.2 Question 10: How do the costs associated with the implementation of the Directive compare to the benefits generated by it? Is there any indication that costs may be disproportionately high?

5.3.2.1 Sub-question 10.1: How do the costs compare to the benefits?

While stakeholders during the group interviews were generally positive about the impacts of the Directive and thought that the benefits outweighed the costs, many struggled to quantify the actual benefits. The main reason given for this is that it was considered too early to be able to measure

[90] These costs are not linked directly to the ITS Directive.

[91] https://ec.europa.eu/transport/themes/its/studies/its_en , ITS Action Plan – Priority Actions E and F - Information and Reservation Services for Safe and Secure Parking Places for Trucks and Commercial Vehicles - Final Report

benefits. Group discussion participants, however, did provide qualitative input to the question whether the benefits linked to ITS are justified by the costs. Across all priority areas, there was consensus that in the long-term the benefits will justify the costs.

A respondent highlighted that direct benefits such as profits from the investment on ITS have not materialised due to the lack of suitable business models. However, intangible benefits, which are harder to quantify (e.g. closing the gap between advanced and non-advanced ITS Member States, the collection of data that can be used for the provision of public services and the fact that the data is now openly available), have materialised and will provide opportunities for data analytics and knowledge creation. An independent ITS expert in this context stated that it is not possible to estimate whether the benefits outweigh the costs in an empirical way due to the current lack of suitable benefit KPIs. Some examples for direct benefits for ITS service providers were mentioned, but could not be quantified. These include cost savings for providers of multimodal travel information services (MMTIPS) through reduced data discovery costs and aggregation costs or cost reductions for digital map providers participating in TN-ITS, which helps map providers to keep their maps up-to-date for static road attributes by retrieving the information on changes from the road authorities.

While benefit data at the Member State level is not available to carry out a cost-benefit analysis for ITS overall, two participants were able to provide project level benefit cost ratios from C-ITS pilot projects. The Finish Transport Agency provided results from a socio-economic evaluation of 1,300 C-ITS users that showed that in the first 3-4 years benefits for society would be negative, but after that, if services and users are scaled up, the minimum impact maximum cost would be two times the investment[92]. The representative from the Greek Transport Institute was able to provide preliminary cost-benefit estimates developed as part of the C-Mobile project, which looks into C-ITS services in eight cities in Europe. Most of the benefit cost ratios expected for 2020 range between 2 and 5, and thus the anticipated benefits could outweigh the costs significantly[93].

5.3.2.2 Sub-question 10.2: Is there any indication that the costs were disproportionate?

Given the previously highlighted difficulties in estimating costs and benefits, it is naturally difficult for stakeholders to comment whether the costs were disproportionally high. Nevertheless, a range of stakeholder groups[94] in the group discussions were specifically asked to comment on a detailed breakdown of costs by stakeholder type and priority action. In the case of priority areas with delegated regulations in place, these were substantiated with estimated preliminary costs from the respective impact assessments. Stakeholders were generally in agreement with the costs presented.

Some of the costs presented were considered to be higher in reality, such as setting up a NAP or costs under eCall if extended from passenger cars to freight transport, coaches and buses (e.g. for trucks transporting dangerous goods, additional costs might be associated with including additional relevant information). However, in none of these cases was it mentioned that the costs would then be disproportionate. This is in line with the observations from the data request. While national authorities

[92] SINTEF, 2017. NordicWay Evaluation Outcome Report. [Online]
Available at: https://uploads-ssl.webflow.com/5c487d8f7febe4125879c2d8/5c5c02add707426eba903956_NordicWay%20Evaluation%20Outcome%20Report%20M_13%20(secured).pdf
[93] CERTH-HIT, 2018. C-Mobile - D2.1 Ex-ante Cost-Benefit Analysis. [Online]
Available at: http://c-mobile-project.eu/library/
[94] Including national authorities, ITS service providers, user associations

were not asked to specifically comment on disproportionality of costs, no free text responses were submitted to highlight any concerns about the level of the reported costs.

The lack of comments from stakeholders suggests that there were no significantly disproportionate costs that could be attributed to the Directive.

5.3.2.3 Conclusions

Stakeholder input has shown that it is currently difficult to give a true assessment of whether the observed costs are proportional compared to the benefits as many stakeholders agree it is too early to assess benefits, especially given the limited availability of benefit KPIs at present.

The consensus from the group interviews, however, is positive; costs are seen to be proportionate, and if the benefits do not already justify the costs, they will in the long term. In the short term, the costs to society might outweigh the benefits, but after services and users are scaled up, the balance will become positive. Profits for road operators from ITS investment (positive returns) are not necessarily expected but positive indirect impacts are. These include closing the gap between advanced and non-advanced ITS Member States through an enabling environment, better collection of data that can be used for providing public services and openly shared data.

No specific qualitative responses were received that indicate that costs associated with the Directive's implementation are disproportionately high.

5.3.3 Question 11: Has the Directive given rise to (unexpected) administrative burdens or inefficiencies?

The stakeholders interviewed for this study did not generally identify any significant unexpected administrative burdens linked to the actions under the Directive. Only a national authority highlighted an issue, as they consider that it is difficult to get private parties to adhere to the specifications. The response did not quantify the magnitude of the costs associated with any unexpected efforts. Finally, the literature review did not highlight any causes for concern.

Regarding unexpected savings, input from the group interviews suggest that actions under the Directive could have reduced administrative burdens in a few cases. For example, as stated by a motorway operator representative during a group interview, under priority area III (road safety and security applications), the data format standardisation has a clear positive effect on the cost of developing ITS services for safe and secure truck parking (SSTPs).

The extent to which administrative burdens could potentially have been reduced was difficult to explore with stakeholders, given the general problems with quantifying costs. As a result, it is not surprising that none of the stakeholders offered suggestions on how burdens could be reduced. The general impression from the group interviews and the data requests was that stakeholders are satisfied with the level of administrative burden. Based on this, we conclude that, presently, there are not any major missed opportunities to deliver the Directive's objectives more simply or efficiently.

5.3.4 Question 12: To what extent does the Directive allow for efficient policy monitoring (e.g. reporting mechanism)? How far do the monitoring processes allow for efficient collection of all relevant information?

5.3.4.1 Introduction

Member States have a range of reporting requirements under the ITS Directive which are stated in Article 17 of the Directive. These included an initial report on national activities (2011), information

on national ITS actions envisaged over the following five-year period (2012) and three-yearly national ITS reports (2014, 2017 to date). Furthermore, there are additional reporting requirements under delegated regulations.

To assist Member States with their reporting duties, in 2016 the Commission produced a common structure for the ITS national reports, allowing Member States to report on the implementation of the Directive and of the delegated acts in one single document. For the first time in 2017, this included a specific section for KPIs (e.g. on costs, benefits, deployment).

The Commission is required to submit a report every 3 years to the European Parliament on the progress made in implementing this Directive.

5.3.4.2 Member State process and completeness of reporting

A detailed analysis of the latest national reports / implementation is provided in the Commission Report to the European Parliament and to the Council and a dedicated staff working document published together with this evaluation.

It is usually the Transport Ministry that is responsible for developing the ITS report, supported in the data collection by transport directorates, the national traffic management and other organisations. Preparatory work may also include developing tools to help with data collection (e.g. the "ITS Library" to help with KPI analyses in Czechia, or preparation of specific data collection tables in Greece) and coordination with relevant stakeholders.

Responses received through the national authorities' data request suggest that data collection typically takes between 3 to 6 months. With regard to the reporting under delegated acts (if submitted separately) the process appears to be less time consuming, with a majority of Member States indicating that this takes less than 3 months.

When asked about whether the common reporting structure developed by the Commission had been helpful, the large majority of respondents (9 out of 10) were affirmative. However, one Member State highlighted that the KPI measurements were difficult to interpret, as there are no unified instructions in Europe to calculate them. Another Member State noted that there have been improvements over time: the first reports had many problems, lacking consistency, harmonisation, and a common format and differing in their degree of detail, but improvements were noticeable following the Directive's adoption and with the help of the guidance. Also, it was felt that the proposal of common ITS KPIs has improved the quality of the reports. Other problems identified with the reporting were resource constraints (Ireland) and difficulties collecting data for the financial KPIs due to the lack of national follow-up on the requested level (Sweden).

With every submission of national reports, the Commission does an analysis of the Member State reports. Regarding the completeness of the 2014 reporting, most of the 29 reports (28 Member States and Norway) followed the 2011 guidelines for reporting, although with various levels of accuracy. This did not facilitate the comparisons of core activities across Member States and made it difficult to align the national activities with the actions of the ITS action plan and priority areas/actions of the ITS Directive. The length of the reports was variable, from a few pages to more than 150 pages. This was due in part to the varying levels of ITS deployment across Member States, but it also reflects the different level of detail provided.

Eighteen reports provided figures on past and future investments in ITS research and deployment (e.g. Germany), figures on equipment and operating costs (e.g. Denmark), figures on the number of

equipment (e.g. Spain) or figures on project costs (e.g. Czechia). However, without a general context for those figures, it was not always easy to interpret and compare them. At the time, it was concluded that the availability of comparable performance indicators and percentages would have made it easier to benchmark and monitor ITS deployment across Europe. As a result, a subsequent common structure[95] for reporting included a list of KPIs. The selected KPIs aim at a balanced distribution between benefit and deployment of KPIs and different ITS priority areas. As outlined above, there is a broad consensus among Member States that the guidelines have been helpful.

Nevertheless, the analysis of the 2017 national reports still shows a lot of variance in the quality and completeness of the reports. This is mainly due to the voluntary nature of the common structure for reporting KPIs, as only around half of the countries followed it. Some Member States added further sections detailing aspects such as their national ITS strategy, important technological developments, recommendations to the Commission and appendices containing lists of all ITS projects underway in the country. In their reports, a limited number of Member States did not provide details on the national projects being carried out within each priority area and instead only reported on their obligations related to the delegated regulations. Additionally, the level of detail related to the KPIs greatly varied. Where KPIs are provided, those most commonly reported are deployment indicators (11 countries), whereas benefit indicators (4 countries) and financial indicators (8 countries) are less well covered.

In conclusion, while the direction is positive in terms of the quality and consistency of reporting, in 2017 it had still not reached a level allowing for clear comparisons of Member State activities or comprehensive policy monitoring across the EU.

Reporting costs

Member State representatives were asked to provide estimates of the resources that went into developing the national 2017 ITS Directive report and the reports on delegated acts, if submitted separately. The costs for the reporting range from €1,000 to €50,000, with an average of € 15,000 for the 2017 report. Only four Member States provided costs for other reports on delegated acts that where submitted separately. The average costs here were € 6,000. None of the national authorities highlighted any unexpected or disproportionate costs in this context. The subsequent monitoring and reporting costs for the Commission are estimated at €32,000[96] per reporting cycle.

5.3.4.3 Conclusions

The analysis of the 2014 and 2017 Member State reporting has shown that there have been positive trends in terms of quality and consistency in the reporting over time. This has been helped by the guidance provided for the reporting format, which has generally been viewed positively by authorities.

The most significant remaining issue is the difficulty in ensuring comparability between Member States. This is due to the differences in both the structure and level of detail of the reports. Crucially, the voluntary nature of the KPI reporting meant that only a few Member States actually provided estimates - and even then, the comparability across Member States was low. Thus, despite the

[95] https://ec.europa.eu/transport/themes/its/road/action_plan/its_national_reports_en

[96] Estimate based on consultancy efforts linked to the Member State report analysis: 1 day per report x 28 reports x an average day rate of €550-€600 x 2 (to account for Commission processing and overhead costs)

improved quality overall, it is still difficult to conduct comprehensive monitoring on the basis of these reports.

There are no indications to suggest that the costs are considered disproportionate.

5.4 Coherence

5.4.1 Question 13: To what extent are the provisions of the Directive internally coherent? Do provisions overlap or contradict?

The analysis for this evaluation question was based on a mapping of the Directive and its first four delegated regulations, complemented by other sources, including engagement with stakeholders and a review of relevant reports[97]. It aimed to identify whether there were any conflicts, overlaps or inconsistencies between the provisions of the Directive and its delegated regulations. The evaluation also covered other legislation that has been introduced in relation to eCall, namely Regulation (EU) 2015/758 (type approval requirements for eCall in-vehicle systems in cars and vans) and Decision No 585/2014/EU on the deployment of the interoperable EU-wide eCall.

Overall, there were no reasons to suggest that the provisions of the ITS Directive, its first four delegated regulations and related legislation were not coherent with each other. Minor issues were identified with the definitions used in the various pieces of legislation. As it is the framework for the delegated regulations, the definitions of the ITS Directive apply to all of the delegated regulations, yet some similar definitions are repeated (e.g. of 'ITS service provider' and 'service provider') and terms are defined slightly differently, e.g. 'traffic data'. It is either the case that some of the definitions in the delegated regulations are not needed, or that they might be better specified to ensure a clear set of definitions that are applicable across the Directive and its delegated regulations.

The legislation analysed under this evaluation question makes appropriate references to other EU legislation, e.g. in relation to privacy, data protection, security, liability and the re-use of public information, rather than trying to set out their own provisions or cross-refer to other ITS legislation. This makes sense and is considered to be coherent, given that it would be redundant for the ITS legislation to reinvent relevant procedures that have been developed in other contexts. The extent to which these other pieces of legislation are coherent with the ITS Directive is assessed in evaluation question 15.

The main issue that was identified was in relation to the reporting requirements that fall upon Member States, which differ in terms of the timing and frequency of reporting. As noted before, the Commission has introduced a common structure for reporting under the Directive, which allows Member States to report on the implementation of the Directive and the delegated regulations in a single document; Member States found this to be helpful. Formalising this arrangement in legislation and extending it to reporting under future delegated regulations could be considered as a way to ensure that the administrative burden on both Member States and the Commission continues to be minimised.

An initial assessment of the internal coherence of the provisions of the Directive and its delegated regulations was presented to stakeholders in the group discussions. There were no suggestions from stakeholders of any substantial issues with respect to the internal coherence of the Directive and its delegated regulations. It was noted that there was some overlap between priority area III, the focus of

[97] Details of this initial mapping can be found in Section 6.13 of the support study

which was on ITS safety and security applications, and priority area IV, which also covered some safety applications as part of its actions to link the vehicle with transport infrastructure. However, as the actions within these two priority areas were well defined, this is not considered to be an issue.

5.4.2 Question 14: Is the framework provided by the Directive still coherent with current ITS deployment?

The way in which the ITS Directive was developed aimed to ensure that it focused on ITS that were 'mature, sufficiently interoperable and able to create a catalytic effect across Europe'[98]. In other words, the Directive was expected to provide a framework within which ITS services that meet these criteria could be implemented. The evaluation of the extent to which the framework provided by the Directive is coherent with the current deployment of ITS services explored whether specifications are in place, e.g. in the ITS Directive's delegated regulations, ***for all*** of the ITS services that are being widely deployed.

Member States reported a number of actions that they had implemented in addition to the specifications in the delegated regulations. Applications that were mentioned as being implemented beyond those in projects included improved infrastructure for collecting traffic data, variable message signage, nationwide journey planners, connected traffic signals, the upgrading of national traffic management systems, speed limit enforcement and large animal detection. Even though these actions were listed separately, some could be considered covered by one of the delegated regulations. Additionally, many of these activities were projects, rather than being wide-scale deployment.

In contrast, the review of the deployment KPIs indicated some ITS services that are not yet covered by specifications. Nine Member States reported activities in relation to C-ITS and 5 reported that they were implementing ITS to provide information to the freight industry. While for C-ITS a delegated regulation was prepared in parallel to this evaluation, there is no similar delegated regulation planned to develop specifications for ITS to provide information solely to the freight industry. However, it should be noted that work on freight is ongoing in Working Group 2 of the Digital Transport and Logistics Forum (DTLF), which may look at the need for specifications for freight ITS applications.

5.4.2.1 Conclusions

With the available evidence, it is difficult to conclude whether or not the framework provided by the Directive is fully coherent with the current levels of deployment of ITS applications, especially since the level of deployment cannot be determined clearly. Some of the ITS applications for which specifications exist are not being widely deployed yet across the EU. It has to be considered, however, that the specifications have been developed in consultation with Member State experts and other stakeholders precisely to support widespread deployment, and that the focus for each specification has been on services that were mature and sufficiently interoperable at the time of adoption.

The review of actions reported by Member States did not clearly reveal an ITS application, which is not covered by the current framework and at the same time is both being widely deployed and which would benefit from action at the EU level to accelerate its deployment. The possible exception to this could be ITS targeting the freight industry, as these were reported to be reasonably comprehensive for the TEN-T road network in 5 Member States.

[98] p.6 of the ITS action plan

5.4.3 *Question 15: To what extent is the Directive still in line with other relevant EU interventions in the field (e.g. EU strategic policies, legislation on ePrivacy and data protection, data security, reuse of public sector information, conformity assessment and vehicle type approval)?*

This question aims to identify whether there are any conflicts, overlaps or inconsistencies with other relevant EU policy documents or specific pieces of legislation, and to identify the potential importance of any issue identified.

5.4.3.1 Detailed analysis

Concerning **strategic policy documents**, ITS are identified in the 2011 Transport White Paper[99] (and other recent transport communications) and in the digital single market strategy[100] as providing opportunities for transport, including helping transport deliver its various objectives, such as decarbonisation and the improved efficiency of infrastructure use. Indeed, the implied importance of ITS is increasing. The earlier documents, including the 2011 Transport White Paper and the CARS 2020 report[101], took a more limited perspective on the future of ITS than later documents, such as the Commission's C-ITS strategy and its GEAR 2030 report[102], particularly in relation to connected and automated vehicles. The importance of these vehicles was further underlined with the publication of the Communication *On the road to automated mobility: An EU strategy for mobility of the future* in May 2018.

This development is also clearly seen when comparing the 2015 digital single market strategy with its 2017 mid-term review. In relation to transport, the 2015 strategy talks about travel planning and e-freight, while the 2017 mid-term review gives prominence to cooperative, connected and automated mobility. No information from stakeholders, or information found in any other document, suggested that the ITS Directive and its delegated regulations were not coherent with EU strategic documents. Indeed, the current action on C-ITS and CCAM reflects the fact that the Directive is evolving in response to the wider, strategic policy framework where the focus is more on connected and automated mobility.

The ITS Directive and its first four delegated regulations already draw on provisions in many other **specific pieces of EU legislation**. This is appropriate, as the ITS Directive and its delegated regulations include a range of different activities, including but not limited to the handling and processing of data, that are already governed by other EU legislation. Rather than developing new provisions in these areas, the Directive and its delegated regulations specify the need for ITS applications and services to operate in accordance with relevant EU legislation, including:

- General Data Protection Regulation (EU) 2016/679 (which has replaced Directive 95/46/EC referred to in Article 10(1) of the ITS-Directive[103]).

[99] White Paper Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system COM(2011) 144 final.
[100] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: a Digital Single Market Strategy for Europe COM(2015) 192 final.
[101] http://ec.europa.eu/DocsRoom/documents/7143/
[102] https://ec.europa.eu/growth/content/high-level-group-gear-2030-report-on-automotive-competitiveness-and-sustainability_en
[103] According to Article 94(2) of Regulation (EU) 2016/679, references to Directive 95/46/EC must be construed as references to that Regulation.

- Directive 2002/58/EC on privacy and electronic communication, which should eventually be replaced by a new Regulation, to be elaborated following the Commission's proposal issued in 2017 [COM (2017) 10].
- Directive 85/374/EEC concerning liability for defective products.
- Decision No 768/2008/EC on a common framework for the marketing of products (in relation to conformity assessment).
- Directive 2002/22/EC on users' rights relating to electronic communications networks and services, which will be replaced with effect from 21 December 2020 by Directive (EU) 2018/1972[104].
- Directive 2003/98/EC on the re-use of public sector information, which will be replaced with effect from 17 July 2021,by Directive (EU) 2019/1024.[105]
- Directive 2007/46/EC on the type-approval of motor vehicles and their parts or related equipment

The **General Data Protection Regulation** (GDPR) was the legislation most often raised by stakeholders in relation to the way in which the ITS Directive links with other pieces of legislation. As noted in the 2014 Commission report on the implementation of the ITS Directive, relevant provisions on the protection of personal data have been included in the various specifications that have been adopted in the delegated regulations under the Directive.

Rules on ePrivacy (such as the current Directive 2002/58/EC on privacy and electronic communication, also known as the ePrivacy Directive) and rules on the protection of personal data (such as previously Directive 95/46/EC and currently GDPR) are closely linked, as the former complements and particularises the latter. The new ePrivacy Regulation is at the moment in the legislative process. Among others, the objective of the proposal is to adapt ePrivacy legislation to align it with the GDPR.

The importance of ensuring data security and protection was identified as a specific area of the ITS action plan. A 2012 report, which was prepared in the context of the ITS action plan, made a number of recommendations about how to take forward the protection of personal data in the context of ITS[106]. The mid-term evaluation of the ITS action plan concluded that the relevant actions were close to completion and that stakeholders did not have strong views about what needed to come next. It recommended that the Commission should assess and follow up the recommendations of the previous report. But it did not recommend much in the way of further regulatory action in this area, other than proposing that issues relating to the protection of personal data be streamlined within other actions, as evidenced in the delegated regulations.

[104] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, OJ L 321, 17.12.2018, p. 36.
According to Article 125 of that Directive, references to Directive 2002/20/EC shall (as from 21 December 2020) be construed as references to Directive (EU) 2018/1972

[105] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information, OJ L 172, 26.6.2019, p. 56.
According to Article 19 of that Directive, references to Directive 2003/98/EC shall (as from 17 July 2021) be construed as references to Directive (EU) 2019/1024.

[106] Rapp-Trans et al., 2012. ITS & Personal Data Protection. [Online] Available at: https://ec.europa.eu/transport/sites/transport/files/themes/its/studies/doc/2012-its-and-_personal-data-protection_-_final_report.pdf

Looking at the Directive and the existing delegated regulations, reference is typically made to both legislation on data protection and on ePrivacy in the same articles or recitals. In the case of eCall, this includes a separate article on privacy and data protection containing certain specific rules, whereas the other delegated regulations rather contain general reference to the legislation on data protection and ePrivacy in the recitals.

However, in their response to the public consultation for this evaluation, stakeholders were not convinced that the objectives of the actions relating to 'security and data protection aspects in handling data in ITS applications' had been fully met in an effective manner[107]. When respondents were asked to elaborate their reasons, the only concerns mentioned relating to data protection were about a lack of clarity around the roles and responsibilities for protecting personal data for multimodal journeys and the need for action on data protection in the context of C-ITS, which related to the C-ITS delegated act in preparation at the time.

That data protection was raised in the evaluation in the context of C-ITS can be explained by the fact that the preparation of a delegated act on this topic took place in parallel to the evaluation. In the support study for the impact assessment on C-ITS, the GDPR was commonly raised as an important factor for the future of C-ITS in the case studies and the public consultation. In interviews with the C-Roads projects, several noted that the GDPR would have a significant impact on the way in which the C-ITS services which they were implementing dealt with data protection and security, including the application of the principle of 'data protection by design and by default'. Similarly, several respondents to the public consultation for the C-ITS IA raised concerns about the way in which the GDPR would be applied to C-ITS.

However, some of those involved in the group discussions also raised the GDPR in the broader context of ITS, e.g. in relation to priority area I on the use of road, traffic and travel data and in priority area II on traffic and freight management services, particularly as more detailed (although not necessarily personal) data will be required once more advanced services are deployed.

While in the stakeholder engagement undertaken for this report, the proposed ePrivacy regulation was not mentioned as much as the GDPR, in the stakeholder workshop, representatives of the automotive sector referred to both. The need for guidance and legal support to understand implications of the proposed ePrivacy regulation was also underlined.

Two other current proposals were also mentioned at the stakeholder workshop by representatives of the automotive sector in the same context as the GDPR and the proposed ePrivacy regulation. These were the proposal that would establish a European cybersecurity certification framework for ICT products and services (COM (2017) 477; referred to as the 'Cybersecurity Act') and the proposed European Electronic Communications Code (COM (2016) 590 final/2). The latter was also raised as an issue in the public consultation undertaken in support of the development of the upcoming delegated regulation on C-ITS. As with the GDPR and proposed ePrivacy regulation, stakeholders were concerned about the uncertain implications of these initiatives on ITS, and C-ITS in particular. The importance of considering ITS, and automation in the transport sector more generally, in all of these developing policy frameworks was underlined.

The Commission's 2014 report on the ITS Directive's implementation noted that relevant provisions on liability have been included in the adopted specifications. The ITS Directive refers to the **Product**

[107] See Section C, Question 1 in the public consultation; Annex A to the support study.

Liability Directive in Article 11, and Regulation 885/2013 refers to this Directive in a recital. Another delegated regulation contains provisions on liability, but it does not refer to the Product Liability Directive. Clearly where ITS involves a physical product, the Product Liability Directive should apply, as it explicitly focuses on 'industrially-produced movables'. On the other hand, the most relevant concerns raised in relation to liability in the context of ITS relate to data, which is not covered by the Product Liability Directive.

As with data protection, liability was treated separately in the ITS action plan and was the subject of a report prepared under the action plan. This made a number of recommendations, including that a common platform should be established to provide general principles for handling liability issues (including the rights and duties of each stakeholder). It also noted that, while the product liability Directive had helped to harmonise the approach to product liability across the Member States, there were still national differences in the way in which the legislation was implemented (RappTrans, 2012).

The mid-term evaluation of the ITS action plan reached the same conclusion in relation to liability, i.e. that the relevant actions were close to completion and that stakeholders did not have strong views as to what further action was needed. It proposed that the recommendations of RappTrans (2012) be analysed and followed up, as necessary, and also re-iterated the recommendation about developing a common platform on liability issues (Ramboll, 2013).

In their responses to the public consultation for this evaluation, stakeholders were not convinced that the objectives of the actions relating to liability issues had been fully met in an effective manner (see Section C, Question 1 in the public consultation; Annex A). While stakeholders did not subsequently explain their concerns, liability was mentioned in response to other questions, including that there was a need for more clarification in relation to liability issues around the use of ITS. In the other stakeholder engagements, there were few mentions of liability, although one stakeholder suggested that there needed to be a more balanced approach in the context of ITS, as the focus was on data held by public authorities, whereas liability for data held by private companies was not discussed.

No concerns were identified regarding the way in which the ITS Directive and its delegated regulations relate to EU legislation on **conformity assessment**, **user rights in relation to the use of public electronic communications services**, **open data and the re-use of information held by the public sector** (Directive 2003/98/EC and its recast Directive (EU) 2019/1024) or **spatial information.** It is coherent that the ITS Directive contains provisions on conformity assessment and states that these should be applied in accordance with Decision 768/2008 on conformity assessment, as appropriate. The eCall delegated regulation contains provisions on conformity assessment – for PSAPs – and these make an explicit reference to a harmonised standard, while the other delegated regulations have provisions on the assessment of compliance.

The eCall Delegated Regulation is the only one piece of legislation to refer directly to Directive 2002/22/EC on users' rights relating to electronic communication networks, which is appropriate as it is the only one of the ITS services covered by the first five delegated regulations that requires the public to directly use such a network. The ITS Directive and four out of five delegated regulations (except the eCall Delegated Regulation) refer to Directive 2003/98 on the re-use of public information in some way, which is appropriate as all use – at least to some extent – information that might be held by public authorities. Finally, Delegated Regulations (EU) 2015/962 and (EU) 2017/1926 make reference to Directive 2007/2 on spatial information, which is again appropriate, given that they are concerned with spatial information the most.

The requirements in relation to conformity assessment, as well as the type approval, of vehicles and their components is set out in the **Vehicle Type Approval Directive 2007/46**. The ITS Directive is coherent with the Vehicle Type Approval Directive from the perspective of conformity assessment, as the ITS Directive explicitly notes that any conformity assessment provisions in the context of ITS should not duplicate those that would be undertaken in the context of the Vehicle Type Approval Directive. Similarly, the requirement that eCall systems be fitted in all new cars and vans was implemented by a regulation amending the Vehicle Type Approval Directive, rather than the ITS Directive.

While it was the Vehicle Type Approval Directive that was amended to require all new cars and vans to be fitted with in-vehicle eCall systems, the **General Safety Regulation 661/2009** sets out the vehicle type approval requirements for other safety measures. Currently, this Regulation does not contain an explicit reference to the potential importance of ITS in the safety of vehicles.

However, a proposal amending the General Safety Regulation was adopted as part of the Third Mobility Package, which was subject to a public consultation in the autumn of 2017[108]. The accompanying staff working document (SWD(2016) 431) set out a potential timetable for implementing further safety measures that could be required in new cars between 2020 and 2030, including intelligent speed adaptation (ISA) and pedestrian and cyclist detection systems. It also gave initial consideration to mandating selected car-to-car and car-to-infrastructure measures but decided not to assess these further at that time. Looking forward, the Commission has to undertake a similar review and present a report of the review, along with any necessary proposals to amend the Regulation, to the European Parliament and the Council every 3 years. In its CCAM strategy, the Commission stated its intention to use the General Safety Regulation to introduce various CCAM-related safety requirements.

Regulation (EU) 2015/758, which requires eCall in-vehicle systems to be fitted in all new types of cars and vans as from 31 March 2018, noted that it was important to undertake periodic roadworthiness testing of the in-vehicle eCall systems in accordance with Directive 2014/45/EU[109]. Whereas the Vehicle Type Approval Directive ensures that a vehicle is fit to be used on the roads when it is new, the Roadworthiness Testing Directive ensures that a vehicle continues to be fit to be used throughout its lifetime. Consequently, it would make sense for in-vehicle eCall systems to be tested during the periodic roadworthiness test. Currently, Directive 2014/45/EU does not set out the testing of eCall as one of the items to be tested as a minimum. However, it is possible to amend the above mentioned Directive by means of delegated acts, if the mandatory requirements relevant for the type-approval in Union safety or environmental legislation are modified and following a positive cost-benefit analysis. The Commission has already initiated a study to look at the possible inclusion of eCall in the roadworthiness tests.

While the Vehicle Type Approval Directive, the General Safety Regulation and the Roadworthiness Directive were not mentioned as being an issue in relation to ITS in the context of the stakeholder engagement undertaken for this evaluation, all three were mentioned by stakeholders in responses to

[108]European Commission, Public Consultation on the revision of the Vehicle General Safety Regulation and the Pedestrian Safety Regulation, Available from: https://ec.europa.eu/info/consultations/public-consultation-revision-vehicle-general-safety-regulation-and-pedestrian-safety-regulation_en#questionnaire, Accessed on 04/04/2018

[109] Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC Text with EEA relevance, OJ L 127, 29.4.2014, p. 51–128

the public consultation undertaken for the impact assessment of the C-ITS Delegated Regulation. A report submitted during the public consultation by a road safety organisation and organisations concerned with periodic vehicle inspections called for changes to be made to both the Vehicle Type Approval and Roadworthiness Testing Directives in light of the implementation of C-ITS. Organisations representing cyclists wanted C-ITS to be included in the revision of the General Safety Regulation and also called for the implementation of intelligent speed assistance.

Delegated Regulation 885/2013, which sets out requirements for the provision of information services to commercial vehicle drivers on safe and secure parking spaces, makes a direct reference to such services enabling drivers to comply with **legislation on mandatory rest periods.** The Commission has already proposed to amend the relevant regulation, (i.e. Regulation (EC) No 561/2006[110]), as well as Regulation (EU) No 165/2014[111], providing for the use of tachographs that permit the positioning of vehicles (see COM (2017) 277).

As noted in recital 44 of Directive (EU) 2019/520, the technologies used by electronic road tolling and by C-ITS are similar, and the potential for merging these should be explored in the future. There were some references in the public consultation undertaken for this evaluation on the need for a more unified approach to tolling systems in the EU, but even more references in the responses to the public consultation undertaken for the IA on the C-ITS delegated regulation. These included the need to ensure that C-ITS did not interfere with electronic tolling, while some stakeholders noted the potential for a better link between C-ITS and electronic road tolling. In an interview, a stakeholder underlined that it needs to be ensured that all transport applications that require the use of parts of the radio frequency spectrum do not interfere with each other, including EETS and ITS applications, but also potentially other applications, such as digital tachographs.

5.4.3.2 Conclusions

No issues were identified in the relationship between the ITS Directive and strategic EU policy documents. Indeed, the strategic documents are evolving in their references to ITS, and particularly to C-ITS and CCAM, to reflect the way in which the relevant technology is developing.

Similarly, the ITS Directive and its delegated regulations were found to be generally coherent with other specific pieces of EU legislation. Rather than reinventing processes and procedures in the context of the ITS Directive, instead relevant provisions in other pieces of legislation were drawn upon, although some potential issues were mentioned by stakeholders or identified by the analysis undertaken for this section.

Concerns about the impact of the GDPR were mentioned by some stakeholders, but these were mainly in relation to the way in which the GDPR relates to C-ITS, which is not in the scope of this evaluation. However, a number of stakeholders also saw potential issues with the GDPR and other

[110] Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85 (Text with EEA relevance) – Declaration, OJ L 102, 11.4.2006, p. 1–14

[111] Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport, repealing Council Regulation (EEC) No 3821/85 on recording equipment in road transport and amending Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport (Text with EEA relevance), OJ L 60, 28.2.2014, p. 1–33

ITS. Similar concerns were also mentioned about the proposed ePrivacy regulation, the Cybersecurity Act and the European Electronic Communications Code.

There is no suggestion that the ITS Directive and its delegated regulations are incoherent with product liability legislation, although there does appear to be a need to make liability issues clearer in relation to data. Furthermore, the results of the ongoing evaluation of the Product Liability Directive, and its potential amendment if there is one, should be taken into account, if necessary.

The Vehicle Type Approval Directive was considered to be coherent with the ITS Directive, while the importance of testing the in-vehicle eCall systems in the context of the Roadworthiness Testing Directive was underlined by Regulation 2015/758. It is coherent that such actions are taken in the context of these other pieces of legislation and not the ITS Directive. Given that a review of the General Safety Regulation is undertaken every 3 years, it might be anticipated that future reviews will consider whether or not particular safety-related C-ITS should be made mandatory in the same way as will be done for other potential new safety features.

The Roadworthiness Testing Directive that sets out the items to be tested as a minimum in the EU, does not currently mention ITS. It is appropriate that a decision as to whether or not to mandate a particular (C-)ITS safety application in vehicles be made on the basis of an assessment of the benefits, costs and feasibility, as is being done in the context of the review of the General Safety Regulation. If a particular ITS application is made mandatory in vehicles, it should also be assessed whether the testing of a particular ITS application should be introduced as a harmonised minimum requirement.

5.5 EU added value

5.5.1 Question 16: What is the added value resulting from the EU intervention compared to what could be done at national, regional or international level without such intervention?

The focus of this question is to assess the value of adopting common rules at EU level as compared with action at other levels.

5.5.1.1 EU action compared to action at the national or local level

According to the text of the Directive, action at EU level is justified by the key objective of the Directive, namely to ensure a coordinated and coherent deployment of interoperable ITS throughout the EU. This is in response to the identified problem of a fragmented, non-coherent and uncoordinated development of ITS.

Thus, action at EU level was justified on the basis that:

- If no action was taken at EU level, Member States would continue to develop individual solutions, causing a fragmented technological spectrum and endangering future harmonisation and standardisation. Action as provided for in Article 91 TFEU was therefore justified.
- The action undertaken aimed to address transnational aspects such as the interoperability of equipment and services and establishing an internal market for ITS services for traffic and travel information and traffic management. As argued, these were all actions that could not be addressed effectively at national level.
- Action at EU level can be expected to have clear benefits by reason of the effects (e.g. of common rules on liability, as well as data security) and of scale (e.g. reducing the cost of ITS applications thanks to common specifications and economies of scale).

Subsequent analyses of the need for EU action in the context of the development of the delegated acts also supported the conclusion that action at the EU level was needed to guarantee the interoperability and continuity of specific services across the EU.

Thus, from a legal perspective, the value of EU action in the context of the ITS is justified in the context of the development of a common transport policy and in terms of the development of a Trans-European network as set out in the Treaty.

Beyond the legal perspective, input from stakeholders also supports the overall view of the added value of EU intervention.

Respondents to the public consultation were directly asked to consider the value of action at EU level versus action at local level. Asked whether the Directive's objectives could have been better accomplished through further action at national and local level and only non-legislative tools at EU level (Section B, Question 12, Annex A), 53 out of 84 thought the objectives could definitely not or probably not have been better accomplished. Only a few representatives (mainly from private companies or associations) considered that local action would be sufficient (5 stated 'Definitely yes', 7 'Quite likely') with 12 more stating 'Maybe'.

Individual comments in favour of action at national or local level highlighted that solutions should be tailored to the needs of the individual countries and their level of development. However, it should be noted that in most respects both the Directive and the delegated acts do not impose the development and deployment of specific services or solutions. In contrast, reflecting the analysis on the effectiveness of the Directive, a large number of organisations supported the role of EU action, and reported a number of benefits:

- Industry representatives pointed to the fact that EU action ensured a coordinated and integrated approach between Member States and avoided national approaches.
- Public authorities pointed to the Directive's role in coordinating and mobilising all the actors involved, setting out the respective roles and responsibilities and helping find a common way forward that overcomes the differences in the legislative frameworks. The application of harmonised standards throughout the EU would enable intelligent cross-border transport and ensure security and interoperability.
- Representatives of NGOs also suggested that EU action was necessary to ensure that ITS was applied in cases where significant collaboration between stakeholders was needed.

Participants in the group discussions and the interviews were also generally supportive of action at EU level, focusing on how ensuring interoperability and common standards can have broader positive effects. Three of the participants in the first group discussion all stated that taking action at EU level is essential for the development of ITS. A representative of a technology company focused on the importance of adopting common standards at EU level and the fact that a national or local approach could be particularly problematic from the point of view of the industry. Referring to the potential from promoting interoperability, the representative of the Finnish Transport Agency added that the EU action has created a more supportive context for developing European markets in relation to ITS. Along similar lines, the representative of the French ministry suggested that the development of national access points using common standards provided a possibility for any service provider to use data in any EU country to build a service that is truly European.

In relation to these expected benefits of EU action, the analysis of the effectiveness has pointed to the Directive's positive role of ensuring the adoption of minimum common standards of service and data exchange and the promotion of cooperation and coordination – particularly when considered jointly with the implementation of EU funded projects. However, when considering the measurable impacts of the EU action (in terms of safety, congestion or emissions), the benefits of EU action compared with the benefits of action at national or local level are still not visible in most areas.

The comparison with other regions also point to the value of action at the central level, i.e., in the case of the Union, the Union level as opposed to the Member States level. An illustration to the same effect is provided by the case of Australia where absence of specific action at the higher (national) level has meant that initiatives at state or city level have been rather ad hoc with no considerations of interoperability issues. Efforts to support cooperation through guidance and other voluntary approaches have not led to similar tangible results. In the US, action at federal level has taken place but with greater focus on non-binding action, including funding for pilot actions and ITS deployment. States are given greater flexibility to adopt their own approach in deploying ITS, but in this case the presence of an overarching ITS architecture helps avoid the problem of a lack of interoperability and compatibility[112].

5.5.1.2 EU action compared to international action

In parallel with the work at EU level, there is a significant level of international activity. The UN Economic Commission for Europe (bringing together 56 countries of western, central and eastern Europe, Central Asia and North America) established a roadmap on ITS in 2011. It identified areas and activities that UNECE was expected to embark upon either as a continuation of ongoing tasks or as new initiatives. Harmonising policies, promoting interoperability, harmonising variable message signs and ensuring data security and addressing liability concerns were among the actions identified.

Rather than expecting to replace action at the national or regional level, UNECE activity should primarily be seen as complementary and supportive of action taken at national or regional level. By making specific reference to the EU ITS policy framework in place (ITS Directive and ITS action plan), the UNECE roadmap suggests that the objective should be to build on these development in Europe and aim to extend them across all UNECE members. On the possible establishment of a UN legal framework on ITS, the conclusion in 2011 was that this was still premature[113].

Besides UNECE, significant work at the international level takes place in Technical Committee 204 of the International Standardisation Organisation. It currently has 12 working groups that cover a broad range of thematic areas, and that reflect the 4 priority areas identified in the ITS Directive[114]. A total of 126 international standards had already been published by 2017 in the ITS thematic area, together with 66 more technical specifications. 80 standards were also under development in 2017. It should be noted that the EU (and individual Member States), US and Japan play a very important role in ISO's work in the ITS area and chair and coordinate most of the working groups. Furthermore,

[112] UN ECE, 2011. Intelligent Transport Systems for sustainable mobility. [Online]
Available at:
http://www.unece.org/fileadmin/DAM/trans/publications/Intelligent_Transport_Systems_for_Sustainable_Mobility.PDF

[113] idem

[114] ISO, 2017. ITS Standardization Activities of ISO/TC 204. [Online] Available at:
https://isotc.iso.org/livelink/livelink/fetch/-8846111/8847151/8847160/ITS_Standardization_Activities_of_ISO_TC_204_2017.pdf?nodeid=19311162&vernum=-2

work in the European standardisation bodies (CEN, ETSI) plays an important role in informing and shaping the international standards.

Further work at international level takes place in the International Telecommunications Union, which develops recommendations covering communications systems and equipment that need to be adopted as mandatory by its members (183 Member States and more than 800 organisations). Other bodies, such as the International Road Federation and its Policy Committee on ITS aim to operate as platforms for the exchange of experience between ITS experts from all over the world on the development of policy frameworks.

Finally, in the context of the Harmonisation Task Groups established since 2012 between the European Commission and the US Department of Transport there were consistent efforts to promote a harmonised approach in developing standards for cooperative ITS to promote cooperative ITS interoperability[115]. This cooperation was extended to Australia, including it in the work of the more recent task groups[116].

Overall, the review of existing initiatives at international level suggests that an extensive set of mechanisms is in place, covering most of the areas also covered by the Directive. This is also reflected in stakeholders' responses to the public consultation, where there was some support for the view that the Directive's objectives can be better met through action at international level. In total, 19 out of 83 provided a positive assessment (3 stated "Definitely yes", 16 "Quite likely"). Still, 41 out of 83 stated that the objectives could not have been better accomplished (30 stated "Definitely not" and 11 more "Probably not"). While only a few respondents elaborated on the added value of relying only on international action, the main point raised concerned the international character of ITS technology and thus the need, whenever this is possible, to use international standards. Others pointed out that continuity of transport beyond the EU borders was a reason to prefer the use of international standards where available.

Thus, the review of the existing structures and the input from stakeholders suggests a certain level of support relying only on international legal action. However, this would likely not have provided the comprehensive legal framework and the clear mandate for action across all EU-28 to support the deployment of ITS, particularly in terms of the establishment of mechanisms such as the NAPs. Action to establish/upgrade PSAPs to support the establishment of eCall would also have remained voluntary, most likely leading to lower deployment.

5.5.1.3 Conclusions

The EU added value and the opinions of the stakeholders generally validate the notion that action at EU level has had clear benefits when it came to addressing the key problems and needs identified at the time of the legislation's adoption.

Action at national level – even if promoted by non-binding action at EU level – would likely not address the key problem of incoherent, inconsistent and fragmented development of ITS. In the

[115] EU-US ITS Task Force, 2012. Overview of Harmonization Task Groups 1&3. [Online] Available at: http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=1931 [Accessed 05 06 2018].

[116] HTG6 Team, 2015. Harmonisation Task Group 6 - Cooperative ITS security policy. [Online] Available at: https://www.preserve-project.eu/sites/preserve-project.eu/files/preserve-ws-htg6-results.pdf [Accessed 05 06 2018].

broader context of developing a common transport policy as well as Trans-European networks (as set out in the Treaty), action at EU level was necessary to ensure interoperability.

The responses of stakeholders generally support this conclusion, referring to the positive role that EU action had in terms of ensuring that consistent action was taken across the EU-28, with the potential for developing a cross-border ITS market and solutions.

Relying on action at international level received a greater level of support among certain stakeholders. They pointed to the international nature of transport and the need to ensure interoperability beyond the EU border as well as the fact that developments in ITS technology are largely taking placing outside the EU. It is also the case that there is a set of mechanisms and structures at international level (UNECE, ISO) that work towards greater harmonisation and interoperability. However, at this point, the existing structures seem to be complementary to actions taken at national or regional level. They cannot be considered sufficient to ensure a comprehensive EU-wide approach in developing ITS in the way that is currently provided for by the ITS Directive.

5.5.2 Question 17: What would be the most likely consequences of stopping or withdrawing existing EU intervention?

As described earlier, in the majority of Member States progress has been made in developing the necessary infrastructure covering the different priority areas and in adopting common EU-wide data collection and exchange standards. Furthermore, the EU-wide eCall system became operational in 2018. In addition, the national reports refer to a number of national and European projects and initiatives in the different priority areas.

All this represents a significant level of effort and investment already made, and that would remain in place even if the ITS Directive was repealed. It is also reasonable to expect that most aspects of the national legal frameworks that were developed as a result of the Directive will remain in place. Furthermore, existing national ITS plans would likely remain a basis for future actions in each Member State. Interoperability and continuity are also expected to remain important considerations, particularly among those Member States with a high level of cross-border traffic. But in the absence of an EU level framework, one would expect bilateral arrangements that could lead to a patchwork of different solutions.

In summary, the existing achievements of the ITS Directive would in practice not disappear were it to be repealed. The main impact would likely be a significant decrease of future benefits arising from deployment of ITS services. This would be in part due to the withdrawal of mechanisms that coordinated action at the EU level – including the focus provided by a clear policy agenda and timetable, as well as the coordination mechanisms to ensure action is taken in a consistent form. Action at national level would likely be more geared towards national priorities, reflecting the different needs and level of development of ITS. Over time this would lead to a more uneven level of investment on ITS infrastructure among Member States, eventually leading to a more fragmented and incoherent development of ITS across the EU.

A second important reason for a slow-down in deployment would be the reduced level of EU financial support through the TEN-T and CEF programmes, which to date has played an important part in the development of some of the infrastructures. A reduction in deployment would particularly affect Member States with more limited resources and where investment in ITS is still lagging. It would also have a negative impact on the various cross-border pilot projects that aim to test and showcase the use of ITS services. Furthermore, in most cases the deployment of ITS services is still limited and has not

reached the point where clear business models have emerged. Thus, withdrawal of EU support may represent a setback in the process of developing the business case of some of these services.

Some cooperation would still be expected at international level in the context of the UN ECE and ISO work, as would cooperation among Member States via other less formal coordination structures. Such activities would still help set general priorities and direction (e.g. through the UNECE roadmap) and would facilitate the use of common standards and specifications to promote interoperability. Given that this is also the interest of industry involved in developing ITS infrastructure and services, interoperability would still likely remain a common feature of future developments. However, the voluntary nature of such forms of cooperation would risk slowing progress and would not be able to ensure that a common approach is followed across the EU. In addition, if the ITS Directive were repealed, specifications would remain unchanged without a clear way to evolve. As a result, specifications could become outdated in a fast evolving domain such as ITS. For example, eCall would not be able to switch to the use of new telecom networks, and the development of new ITS applications would be hampered, as their data needs would not be addressed in the specifications.

6 CONCLUSIONS

Relevance

The ITS Directive remains a relevant tool to address the issues of 1) lack of coordination in ITS deployment across the EU and 2) slow, risky and not-cost effective ITS deployment, as the use of ITS is increasing but is still not contributing fully to improvement of the road transport system. This is also due to the nature of ITS deployment, which despite improvements still often remains restricted to a limited geographical scope and is not continuous. Thus, there remains a clear need for further action on interoperability, cooperation mechanisms and data sharing to enable seamless, continuous ITS services across the EU.

The scope of the ITS Directive is also still relevant today, with the identified priority areas still covering the relevant topics, services and data. At the same time, as a result of societal and technological developments, a number of areas might require additional attention moving forward, in particular connected, cooperative and automated mobility, cybersecurity, privacy and data protection in the scope of ITS, and ITS in urban areas, freight and public transport.

The delegated acts adopted under the ITS Directive also remain relevant, while some stakeholders consider that the scope of some delegated acts could be extended to increase their relevance, for instance extending eCall to other vehicle types, adding requirements for information on alternative fuels infrastructure, low emission zones and vehicle sharing to support sustainable mobility, and the extension of geographical coverage for some data included in the current specifications. This has been reflected in the updated working programme of the Directive, drawn up in coordination with Member State experts and adopted on 11 December 2018[117]. It is important to remember that the actual implementation of, and deployment in line with, the delegated acts has started only recently, so it is still too early to assess the relevance of the delegated acts in a comprehensive manner, and this should be monitored.

Effectiveness

In general, the ITS Directive has had a positive impact on the deployment of ITS across the EU. However, given that the deployment of ITS and the implementation of the delegated regulations are still at an early stage, there is not enough evidence to determine if this already makes a significant contribution to improving the continuity of ITS services across the EU, and in turn to reducing the negative externalities (accidents, congestion, pollution) of road transport.

This is further complicated by the fact that the impacts of the ITS Directive cannot be easily discerned from that of numerous other EU, national and local policies that have been put in place that also address the negative externalities of transport. However, most stakeholders believe that the ITS Directive and its delegated acts have made a positive contribution in this regard, and the benefits have been demonstrated in specific deployments.

Specifications have been adopted as planned for 5 out of 6 priority actions (through delegated regulations), and other relevant standards have also been adopted (e.g. DATEX II for the exchange of data). Early indications suggest that these specifications led to increased interoperability and in some cases to the continuity of ITS services across Member States. It is expected that the impacts will become more apparent as ITS deployment is scaled up.

[117] C(2018) 8264 final, https://ec.europa.eu/transport/sites/transport/files/legislation/c20188264_en.pdf

National access points have been established in many Member States since the adoption of the delegated regulations, and although implementation is not yet complete, compared to the baseline scenario (where it was envisaged that only some countries would have set up NAPs), the developments represent significant progress in setting up an EU backbone infrastructure for ITS data. Although NAPs allow data to be shared, benefits will only arise once this is done in practice. Based on available evidence, the usage of the data provided by NAPs is still relatively low, with the possible exception of the services related to the exchange of static road attribute data used for updating digital maps[118].

Ensuring availability of the relevant data and ITS infrastructure was expected to lead to the deployment of continuous EU-wide services. Currently, only a limited number of interoperable ITS services have been deployed so far. The main driver of increased deployment to date has been in the context of cross-border corridors and pilot projects funded under TEN-T and CEF. But the framework provided by the ITS Directive is identified as a clear enabler of interoperability and continuity across these corridors/projects, which in turn could provide additional data to the NAPs that can be reused to deploy additional ITS services.

There are a number of factors that have influenced the Directive's effectiveness. First of all, following the 2008 crisis, the limited availability of financial resources has been an important obstacle for the faster deployment of ITS infrastructure and services among Member States, which was only partly addressed by the provision of EU funding. Also given the novelty of certain ITS services, some Member States and local/regional authorities have had low awareness of these services and a limited administrative capacity to implement them. The fast evolution of ITS technologies may also have led to delayed investment, with stakeholders waiting for more advanced services with clearer benefits to become available, especially for applications where the main benefits are externalities, and a large part of the benefits are thus not gained by the one making the investment.

Second, the ITS coordination mechanisms appear to have played a positive role. Engagement with national authorities (via the ITS Committee and the Expert Group) has worked well. Interaction with other stakeholders through the ITS Advisory Group has not been as successful, but stakeholder interaction through other platforms (e.g. the C-ITS Platform, eCall Implementation Platform, Friends of ITS) have ensured the necessary level of coordination and cooperation.

Third, despite the legislation in place, reluctance to share data continues to be a limiting factor. This is due to issues of lack of trust, high expected costs and unclear benefits for those providing the data.

Efficiency

The most significant costs for the EU are related to the funding made available for ITS. This covers deployment funding under CEF as well as research funding under Horizon 2020 and Structural Funds under ESIF. Other significant costs to the EU, although these are two orders of magnitude below deployment and research funding, cover standardisation activities and the costs of preparation and support studies for the delegated acts.

Substantial one-off costs were incurred in the Directive's transposition phase. Costs under the delegated acts are linked primarily to setting up and operating NAPs, Further ongoing costs for

[118] The latter could be related to the fact that navigation is one of the rare EU-wide (continuous) ITS services which existed before the Directive.

Member States are linked to cooperation and participation activities in the ITS coordination mechanisms.

Costs to ITS service providers are primarily linked to compliance with the delegated regulations, but cost savings are also expected to arise, for example, due to reduced data discovery costs and for digital map providers participating in TN-ITS. No quantitative data on these costs (or costs for other stakeholders) could be obtained through the consultation activities. However, qualitative comments suggest that the main costs are in line — or are expected to be in line — with those identified and estimated in the impact assessments supporting the delegated acts.

Considering that the benefits of ITS cannot yet be quantified, it is not possible to assess the cost-benefit ratio of the implementation of the ITS Directive. However, stakeholder input did not suggest that the costs associated with the Directive are disproportionally high, and no unexpected costs were highlighted. It is too early to give a true assessment of whether observed costs are proportional compared to the benefits but stakeholders are generally positive: costs are seen to be proportional and if the benefits do not already outweigh the costs, they are expected to do so in the long term when services and their use are scaled up.

Considering the cost-effectiveness of reporting obligations, the most significant remaining issue is the lack of comparability between Member State reports. The differences in structure, level of detail and the current limited nature of the KPI reporting mean comprehensive monitoring is still difficult based on these reports. To facilitate future evaluations, streamlining the reporting process for the ITS Directive and the delegated regulations should be continued. However, there is a positive trend in terms of quality and consistency of reporting over time, and there are no indications of disproportionate reporting costs.

Coherence

In general, the ITS Directive and its delegated acts are internally coherent. A point of attention is the frequency and timing of reporting obligations, which are currently not aligned. Also, in a fast developing field such as ITS, the consistency of terminology used in the different pieces of legislation needs continuous attention.

Another point of attention is whether the ITS Directive will continue to be focused on those services that are mature, sufficiently interoperable and able to create a catalytic effect across Europe. While at this early stage, and with the limitations in monitoring, it is difficult to draw an exact picture of interoperable ITS services across the EU, the analysis did not reveal a mature ITS service that was not covered by the current framework, with the possible exception of ITS targeting the freight industry, which are fairly comprehensive in several Member States.

In general, the ITS Directive is coherent with EU strategic policies and relevant other EU legislation and contributes to some extent to their achievement. Indeed, these other interventions seem to be evolving in their references to ITS, and particularly to C-ITS, to reflect the way in which the relevant technology is developing. Similarly, the ITS Directive and its delegated acts make reference to relevant provisions in other pieces of legislation, rather than introducing overlapping requirements.

Moving forward towards connected, cooperative and automated mobility, it is expected that there will be even more interdependence between the ITS Directive and other legislation, in particular on aspects related to vehicles, telecommunications, cybersecurity, liability and the processing and

availability of (personal) data. Thus, specific attention should be paid to ensure coherence between different instruments, while avoiding unnecessary administrative burden.

EU added value

Overall, the ITS Directive, with the resulting deployment of interoperable ITS services, is considered to have led to EU-wide positive results. The opinion of most stakeholders validate the notion that action at EU level had clear benefits when it came to addressing the key problems and needs identified at the time of the legislation's adoption.

The EU level is considered the most relevant for providing such a framework. Action at national level — even in combination with non-binding action at EU level — would likely not address the key problem of incoherent, inconsistent and fragmented development of ITS across the EU. Likewise, while at international level there are mechanisms and structures in place (such as the UN ECE, ISO) that can help both in terms of promoting cooperation and greater harmonisation and interoperability of ITS, they cannot be considered sufficient to ensure a comprehensive EU-wide approach in the way that is currently provided by the ITS Directive.

Likewise, it does not seem justified to repeal the ITS Directive. While direct backsliding is not expected, as Member States would retain their national implementing legislation and stakeholders aim to exploit investments already made in ITS, it is expected that this would lead to a slowing down of ITS deployment and risk increased divergence and fragmentation. Indeed, alternative measures would not be able to ensure the same level of coordinated action across the EU, due to the reduced ability to set priorities for future action at the EU level. In addition, if the ITS Directive were repealed, specifications would remain unchanged without a clear way to evolve. As a result, specifications could become outdated in a fast evolving domain such as ITS.

Annex I – Intervention logic

The problem drivers that the ITS Directive aimed to address, as set out in the Directive and the reports accompanying the delegated regulations, were:

- a lack of interoperability and continuity between applications, systems and services;
- a lack of concertation and effective cooperation among stakeholders; and
- issues related to privacy, data protection and liability related to the sharing of data supporting ITS services.

Slow and fragmented deployment meant that ITS were not expected to contribute fully to the requisite improvement in the functioning of the road transport system or to EU goals on air pollution, CO_2 emissions, congestion and road safety.

The **general objective** of the Directive is therefore to increase the deployment and use of continuous ITS services across the EU, improve the functioning of the road transport system (including its interfaces with other modes) and thus reduce the negative external effects of road transport.

The **specific objectives** are to:

- improve interoperability and continuity between applications, systems and services;
- establish effective coordination and monitoring mechanisms among all ITS stakeholders; and
- establish solutions for liability issues and for the sharing of data which supports ITS services in respect of legislation on privacy and data protection.

The **operational objectives** are to:

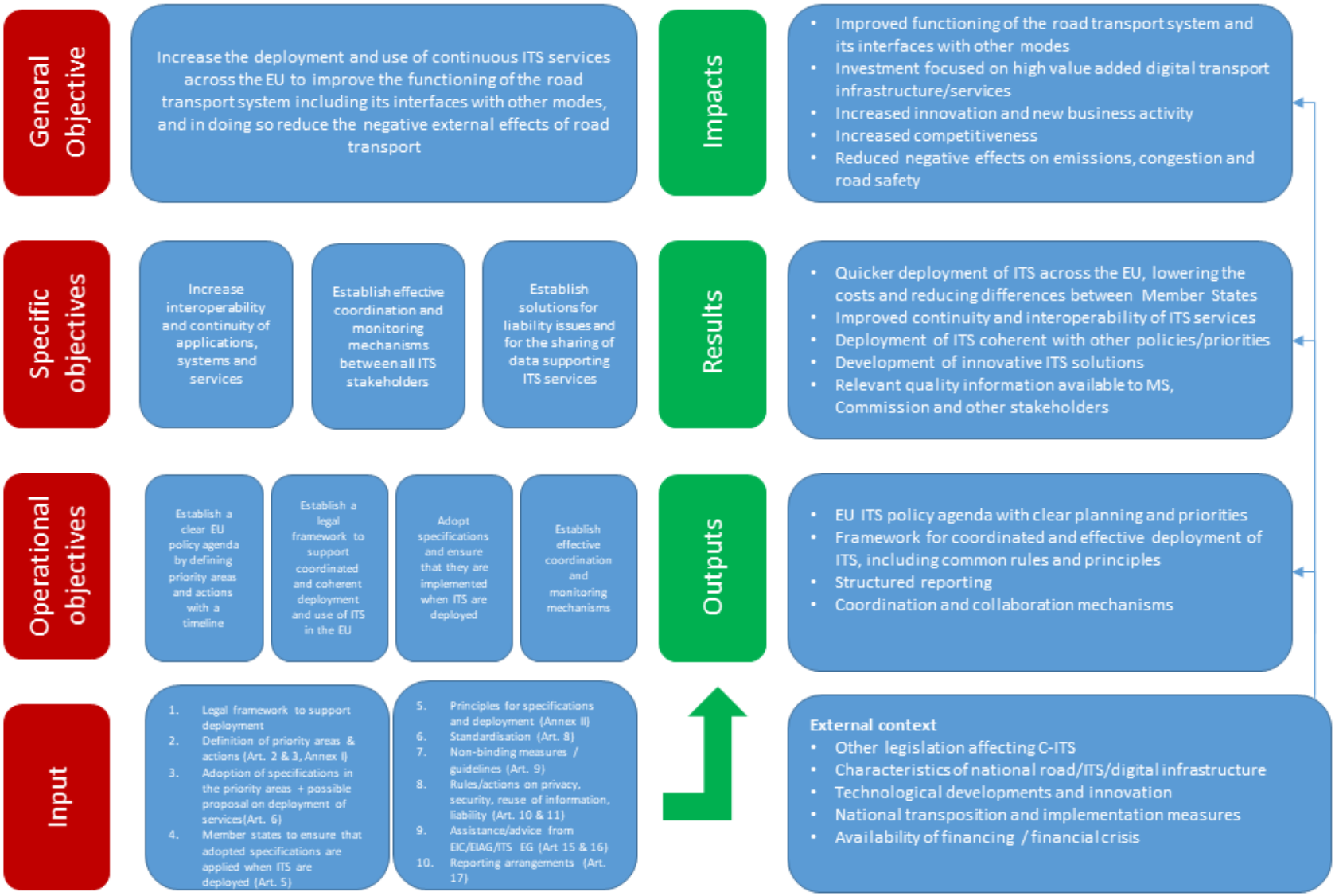
- establish a clear EU policy agenda by setting out priority areas and actions, with a timeline;
- establish a legal framework to support the coordinated and coherent deployment and use of ITS in the EU;
- adopt specifications and ensure that they are implemented when ITS are deployed; and
- establish effective coordination and monitoring mechanisms.

Figure 1 shows the intervention logic. Following the objectives are a set of required **inputs**. The inputs and resulting causal chain are further analysed in this section.

Figure 2 identifies the **outputs**, **results** and **impacts** corresponding to the objectives.

Figure 1: Intervention logic of the ITS Directive; Part A - From root causes to actions

Figure 2: Intervention logic of the ITS Directive; Part B - From operational objectives to results and impacts



Actions and causal chain

Achievement of the Directive's objectives depends on a set of actions involving various stakeholders. Through a causal chain, these actions should lead to the intended results.

At EU level, the **Commission** is responsible for work on specifications in the four priority areas, starting with the six priority actions (see Articles 2 and 3 of, and Annex I to the Directive). Where appropriate, these should be based on standards (Article 8) and adopted in the form of legally binding delegated acts (Article 7). The Commission is also responsible for developing a work programme with objectives and dates for the implementation of the various actions, and for setting a clear policy agenda and timeline.

The Directive identifies two bodies that form part of the governance structures and collaboration mechanisms at EU level:

- the **ITS Committee** (Article 15), which acts as an advisory body giving opinions on the draft standardisation requests under article 8 of the Directive, drafts of guidelines and other non-binding measures under Articles 9 and 17(2) of the Directive and draft working programmes under Article 17(5) thereof; and
- the **ITS Advisory Group** (Article 16), which is an advisory body, composed of high level representatives from relevant ITS stakeholders, to advise the Commission on business and technical aspects of the deployment and use of ITS in the Union.

Formulating the delegated acts requires various consultation activities and support studies. These mainly involve public consultations and consultation with experts from **Member States**, the **European Parliament** and the **Council**, in accordance with the interinstitutional agreement on better law-making[119].

The Commission will report to the **Parliament** and the **Council** on the functioning and implementation of the Directive and assess the need to amend it where appropriate.

The Directive requires the **national authorities**, in particular, to:

- transpose its provisions;
- Apply the provisions of the delegated acts and take other measures that may arise as a result of the implementation of the Directive. This includes investment in the necessary infrastructure (e.g. national access points) and other action to ensure that the specifications are applied to ITS applications and services where these are deployed;
- enforce the national provisions transposing the Directive, as well as the delegated acts, as necessary;
- cooperate in the implementation of the actions under each priority area, particularly where specifications have not been adopted;
- report on the implementation of the Directive and the delegated acts;
- participate in the ITS Committee and develop specifications and delegated acts; and

[119] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016Q0512(01)&from=EN

- ensure that EU rules on privacy, data protection, security, the re-use of information and liability are applied in the context of the operation of ITS applications.

The action to be taken by **industry** involves:

- participating in the ITS Advisory Group;
- providing input for the studies supporting the development of specifications, standards and delegated acts; and
- complying with the relevant requirements under the delegated acts.

The above actions are expected to lead to the following first-level results:

- clear and effective collaboration mechanisms at EU and national level;
- an EU ITS policy agenda with clear priorities and a clear timeline;
- a clear governance structure;
- implementation of structured reporting and monitoring processes; and
- a clear framework in support of the coordinated and effective deployment of ITS on the basis of common rules and principles.

In combination, the above should in turn lead to:

- faster deployment of ITS across the EU on the basis of the common priorities and coherent targets. This should lead to more consistent and coherent development among Member States, and lower costs;
- deployment of ITS that is coherent with other policies and priorities;
- deployment of innovative ITS solutions;
- better information available to all stakeholders to support further decision-making; and
- greater continuity and interoperability between the developed services and applications.

Annex II – Procedural information on preparing the evaluation

1. Identification of lead DG; agenda planning/work programme references

- The lead Directorate-General is DG MOVE.
- The evaluation was validated in Decide under reference PLAN/2017/944.

2. Organisation and timing

- The evaluation was launched on 23 February 2017 with the first meeting of a steering group consisting of the following DGs: SG, JRC, ENER, JUST, CLIMA, REGIO, ENV, RTD, CNECT and GROW. The group discussed the evaluation roadmap, including the evaluation questions, and the terms of reference for an external study to support the evaluation.
- The evaluation roadmap was published on 24 March 2017.
- The Commission conducted an open public consultation (OPC) on the evaluation from 5 May to 28 July 2017.
- The Commission contracted an external consultant to carry out the study to support the evaluation. This work started on 1 November 2017.
- The steering group discussed the inception report for the support study on 15 December 2017 and approved a revised version on 22 January 2018.
- The evaluation and the support study, including the results of the OPC, were presented to the ITS Committee on 8 February 2018.
- The steering group discussed the interim report for the support study on 5 March 2018 and approved a revised version on 22 March 2018.
- The steering group discussed the draft final report for the support study on 24 April 2018 and approved the final report on 16 August 2018.
- On 23 April 2018, a stakeholder workshop was held to present and discuss the draft findings and recommendations of the support study. The feedback from the workshop was reflected in the evaluation and the support study.
- The draft results of the support study were presented to the ITS Committee on 15 May 2018.

3. Evidence used

- The evaluation relies mostly on the support study on the *ex post* evaluation conducted by the external consultant[120].
- Evidence was also gathered from Member States' reporting under Article 17 of the Directive and direct consultations with Member States and stakeholders.

[120] Support study for the ex-post evaluation of the ITS Directive 2010/40/EU (2018) available at: https://ec.europa.eu/transport/themes/its/studies/its_en

Annex III – Synopsis report of stakeholder consultation

1. INTRODUCTION

Various stakeholder consultation activities were carried out in the context of the evaluation to gather both qualitative (opinions, views, suggestions) and quantitative information (data, statistics). Most of the activities were part of the evaluation support study, which was launched in November 2017.

This annex provides an overview of the stakeholder groups that were consulted and a summary and analysis of their responses. The consultation covered all aspects of the evaluation[121] and addressed key target groups using different methods, such as:

- the evaluation roadmap;
- an open public consultation (OPC);
- targeted consultations, including in-depth interviews for EU and international case studies, group discussions with experts and a data request to national authorities;
- a stakeholder workshop; and
- meetings with the ITS Committee.

The Commission held additional meetings with several stakeholders in the course of preparing the evaluation.

2. CONSULTATION METHODS

Publication of the evaluation roadmap

The evaluation roadmap[122] was published on 24 March 2017 and was open for feedback until 21 April 2017. Three responses[123] were received through the feedback mechanism, from private and public companies. Generally favourable, they made suggestions as to the focus of the evaluation and stressed the need for further action to support the continuity of ITS services.

Open public consultation (OPC)

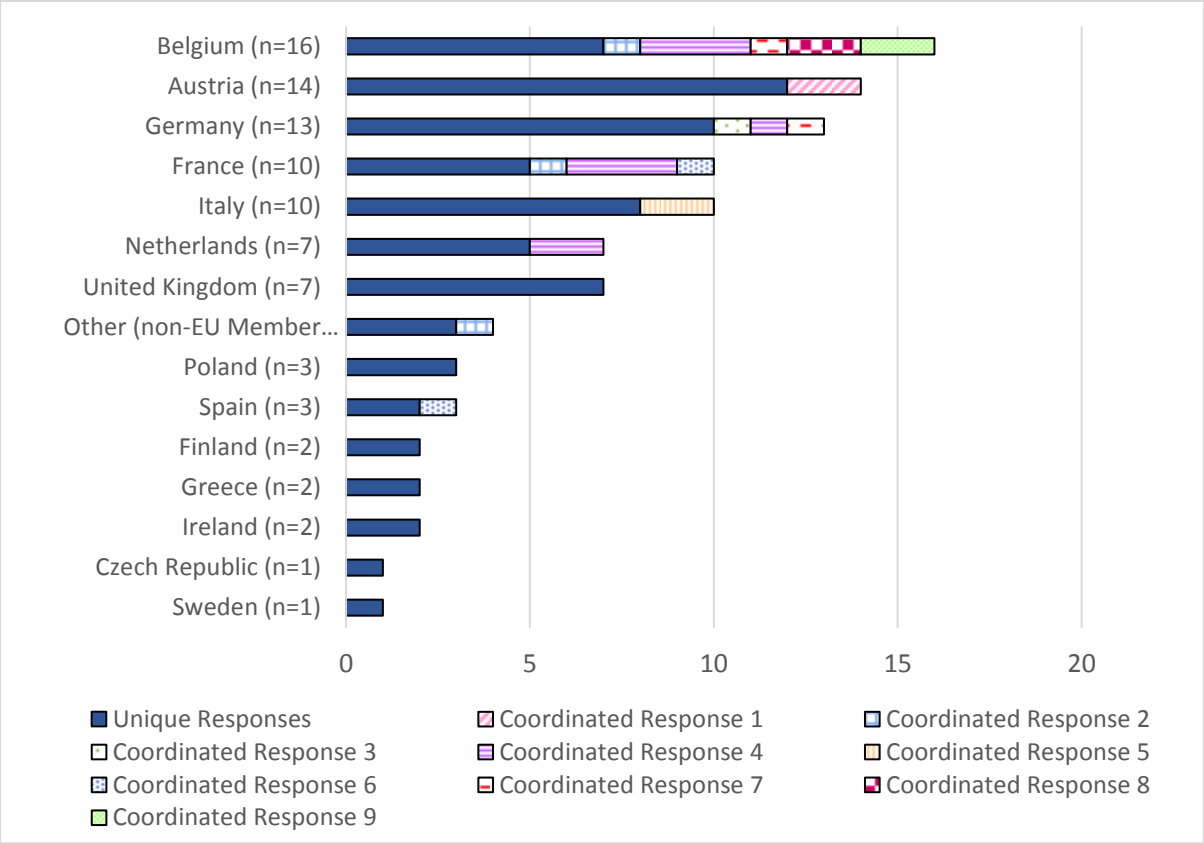
The OPC was launched on the Commission's website on 5 May 2017 and was open for responses until 28 July 2017 (12 weeks).[124] Together with the steering group, DG MOVE prepared:

- a general questionnaire asking stakeholders for their opinions on the effectiveness, efficiency, relevance and EU added value of the Directive; and
- a more detailed 'expert' questionnaire (that was nonetheless open to all stakeholders) on the achievement of individual actions under the ITS action plan and the Directive, and the effectiveness, preparation and implementation of the various delegated acts under the ITS Directive.

The consultant summarised the results of the consultation in a detailed report.[125]

[121] More detail can be found in the support study (Chapter 4 and Annexes A, E, F and G).
[122] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-1585949_en
[123] One response did not relate to the evaluation.
[124] https://ec.europa.eu/transport/themes/its/consultations/2017-evaluation-its-directive_en

Figure 9: OPC participants by main country of operation/residence



There were 97 responses to the consultation, from 14 Member States, Israel, Norway and Switzerland. The largest numbers were from Belgium, Austria and Germany, which contributed 43 responses between them (45% of the total). The majority of respondents (87 out of 97; 90%) were from EU-15 Member States, with only four (4%) from EU-13 Member States and six from non-EU countries, including Norway, Israel and Switzerland.

A broad range of interests was covered, with a particularly strong response from vehicle and equipment manufacturers/suppliers/repairers, ITS service providers and road/transport operators. This corroborates the expectation that these stakeholders are expected to invest most in ITS.

A total of 27 respondents (18%) indicated an interest in vehicle and equipment manufacture/repair, and 19 (13%) in ITS service provision and related ITS products. There were 27 road/transport operators (18%) and 6 logistics companies and integrators (4%). Another 24 respondents (16%) declared an interest as national, regional and local authorities, and 9 more (6%) as road authorities. Another 23 indicated interests in societal and/or consumer rights, research/academia/consultancies, and telecommunications.

Table 1: Classification of questionnaire respondents

Stakeholder group	Number of responses	% of responses
On behalf on an association	36	37%

[125] Published online in December 2017 (https://ec.europa.eu/transport/sites/transport/files/2017-evaluation-its-directive-analysis.pdf) and included in Annex A to the support study.

Stakeholder group	Number of responses	% of responses
On behalf of a private company	24	25%
On behalf of a public authority (ministry, agency, other – at national, regional or local level)	19	20%
On behalf on a non-governmental organisation	7	7%
Private individuals	6	6%
Other	5	5%
Total	**97**	**100%**

Table 2: Classification of respondents' interests (more than one possible)

Stakeholder category	Number of responses	% of responses
Vehicle and equipment manufacturers/repairers	27	18%
ITS service providers and related ITS products	19	13%
Road operators	15	10%
National public authorities	13	9%
Transport operators	12	8%
Regional/local public authorities	11	7%
Road authorities	9	6%
Societal interests and/or consumer rights	9	6%
Research/academia/consultancies	8	5%
Logistics companies and integrators	6	4%
Telecommunications providers	6	4%
Other	15	10%
Total	**150**	**100%**

Note: 'Other' includes insurers, a federal agency, a non-profit social service organisation, regional and national chambers of commerce, an intermodal operator, organisations in mobility retail and technical distribution, vehicle rental and leasing, and historic vehicle preservation, and national ITS associations.

Analysis of the responses suggested that 26 (27%) were coordinated on the basis of a template, with the largest coordinated response involving 9 participants. Since respondents were free to adapt the answers, we analysed these coordinated responses (except for the largest) individually (see below).

In addition to the responses to the questionnaire, 10 separate contributions and position papers were submitted and these have also been analysed.

Targeted consultations

Case studies

As part of the support study, three case studies looked at ITS deployment in the United States, Japan and Australia, using desk research and interviews with key stakeholders. The objectives were to gather information on:

- national ITS strategies and their efficiency in accelerating ITS deployment and reducing costs, in comparison with the EU approach;

- challenges and lessons learnt on the deployment of ITS services;
- ITS best practice; and
- current market and technological developments that can be used to inform the baseline and identify ITS priority areas.

Targeted questionnaires for advisory groups

As part of the evaluation of the Directive (in particular to assess the role and possible limitations of the governance structures at EU level), targeted questionnaires were open from July to October 2017 for:

- the ITS Committee (8 responses received);
- the ITS Advisory Group (3 responses); and
- the ITS expert group (26 responses).

Group discussions

Four group discussions with relevant experts were held between 1 and 16 March 2017, one for each of the priority areas in the Directive, with a total of 22 participants. There was significant interest across the EU, but limited participation from eastern Member States (only Estonia took part).[126]

Expert interviews

A further 13 interviews were carried out with individual stakeholders, mainly to fill information gaps, follow up where clarifications were needed and target those who had been unable to take part in the group discussions.

Data requests to national authorities

The purpose of the data requests was to collect data from national authorities to address remaining gaps following analysis of the national reports and desk research. In total, 10 responses were received, from EU-15 countries (AT, EL, FI, IE, NL and SE), EU-13 countries (CZ, LV and SI) and Norway.

Stakeholder workshop

A workshop with over 80 registered experts and stakeholders was held on 23 April 2018 to gather specific information, data, views and suggestions.

In the morning session, the consultants (Ricardo and TEPR) presented the analysis of the Directive's implementation, together with the preliminary findings of the evaluation support study. The subsequent Q&A touched on very different parts of the evaluation, from the role of the Directive in the digitalisation of transport and stakeholder involvement to technical aspects of the legislation. This was followed by a panel session in which eight ITS experts were asked to reflect on two themes in two rounds:

- the initial findings of the evaluation; and
- the need for future European action on ITS.

[126] Given that there is less ITS activity in those countries, this is to be expected.

In the afternoon, the consultants presented the draft conclusions from the study and the initial recommendations. A subsequent interactive session gave participants an opportunity to reflect on the recommendations, discuss them in more detail and provide feedback. The consultants produced an initial summary of the discussion and participants' comments.

At the end, the participants were invited to send the consultant further feedback on the study and to reflect on possible future needs.

Meetings with the ITS Committee

The Commission met the ITS Committee to report to the Member States on progress and highlight opportunities for their input. Meetings were held to present the objectives and approach of the evaluation and the consultation methods (8 February 2018), and to present and discuss the draft results of the support study (15 May 2018).

3. RESULTS OF CONSULTATION ACTIVITIES

The remainder of the report presents the main findings from the consultation process. These are structured according to the evaluation criteria.

Relevance

A large majority (over 75%) of respondents to the OPC stated that further action in all four areas under consideration was either absolutely essential or very important (see Figure 4), with opinions distributed fairly equally across stakeholder groups.

Figure 4: Respondents' views on importance of further action in the four priority areas

Action	Proposed areas for further action
7a	Optimal use of road, traffic and travel data
7b	Continuity of traffic and freight management ITS services
7c	ITS road safety and security applications
7d	Linking the vehicle with the transport infrastructure

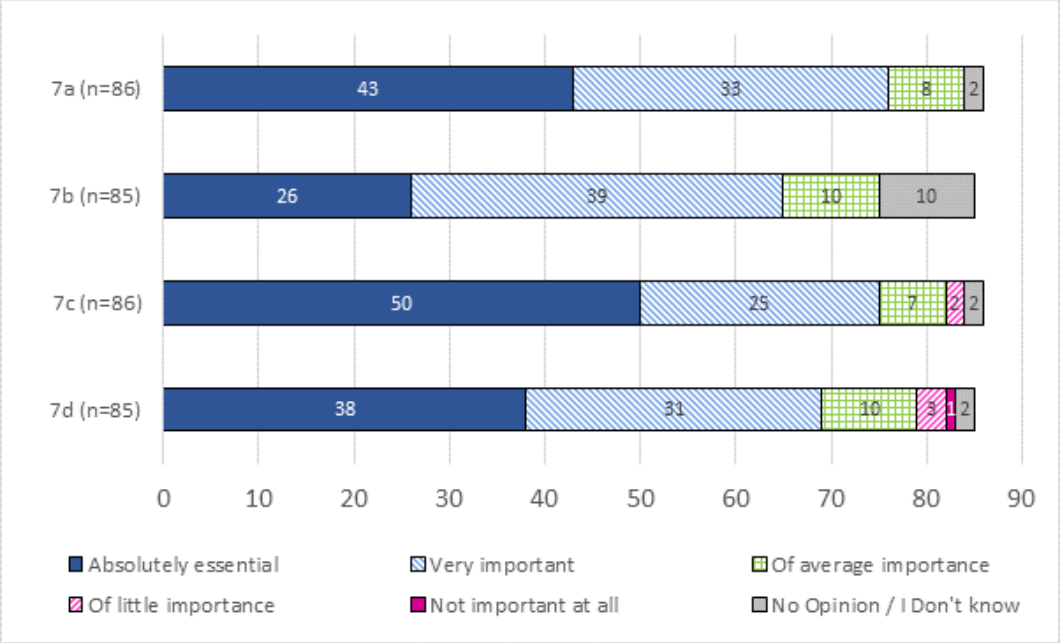
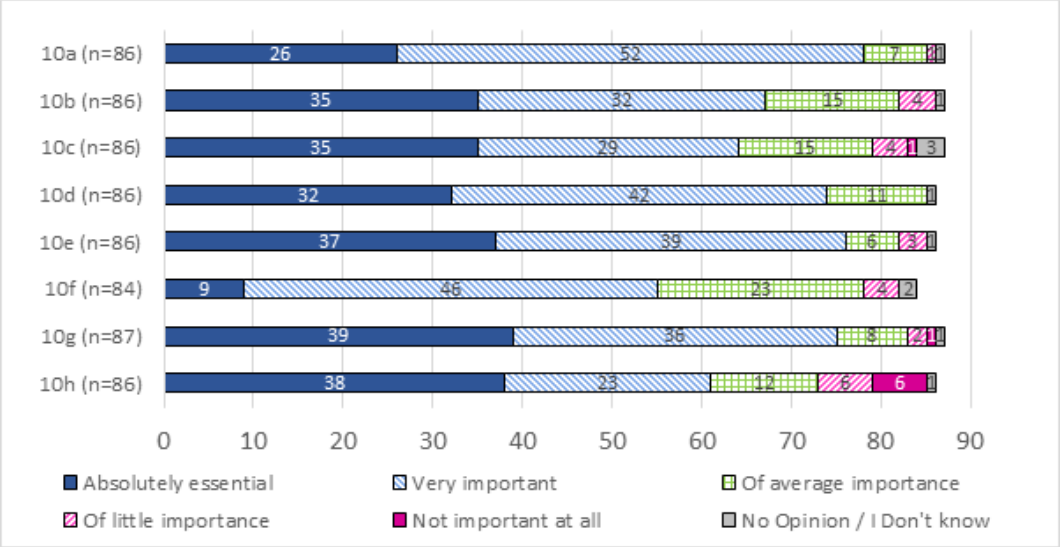

7a (n=86)
43
33
8
2
7b (n=85)
26
39
10
10
7c (n=86)
50
25
7
2
2
7d (n=85)
38
31
10
3
1
2
0
10
20
30
40
50
60
70
80
90
Absolutely essential
Very important
Of average importance
Of little importance
Not important at all
No Opinion / I Don't know

Figure 5: Respondents' views on importance of current actions in supporting the deployment of continuous and interoperable ITS

Action no	EU actions supporting the deployment of continuous and interoperable ITS
10a	Providing a strategic framework (e.g. ITS action plan)
10b	Providing a general legal framework (e.g. ITS Directive)
10c	Providing a coordination and governance framework (defining roles, responsibilities and platforms)
10d	Facilitating communication and cooperation between stakeholders
10e	Providing funding for ITS development and deployment
10f	Adopting guidance and other non-binding measures
10g	Developing standards for interoperability and continuity
10h	Adopting legally binding specifications for interoperability and continuity



Similarly, a large proportion (at least 65%) said that the EU actions supporting the deployment of continuous and interoperable ITS were either absolutely essential or very important (see Figure 5), with opinions distributed fairly equally across stakeholder groups.

The experts group generally agreed that the objectives of the Directive remain relevant and helped the deployment of ITS, although it is somewhat early to assess its implementation. While participants saw the actions taken as relevant, several said that consideration should be given to new actions and updating their scope in line with technological developments and evolving societal needs.

Throughout the consultations, diverse stakeholders suggested new problems or needs that they felt should be addressed by objectives and actions under the Directive. In particular, this included greater emphasis on CCAM and action on ITS in urban areas and in other modes of road transport, including public transport and freight.

Effectiveness

In the open public consultation, a large proportion of respondents (more than half for all the above objectives, except those on pollutant/CO_2 emissions and employment) said that the impact of the availability and use of ITS was positive or very positive (see Figure 6). Most stakeholders thought

that the future development of this impact would be positive (see Figure 7), which again reflects the fact that ITS is at a relatively early stage of deployment.

While many stakeholders found that current EU actions have had a positive impact on ITS deployment, a significant proportion were neutral when asked about the effectiveness of certain actions (coordination and governance, non-binding guidance, and legal binding specifications), which is in line with the observation that the effects of implementation have yet to emerge (see Figure 8).

At the level of individual measures, the picture is more mixed, with many respondents considering that these had not been completed, had been completed more slowly than expected or with less scope/ambition. The written feedback contains many 'No opinion / Don't know' responses – it seems that many respondents wanted to indicate a need for effective action in the area of their concern, such as access to data or urban ITS.

Objective no	Objectives affected by the availability and use of intelligent transport systems
3/4a	Improving the functioning of the transport system
3/4b	Increasing road safety
3/4c	Improving accessibility (ease of reaching destinations)
3/4d	Improving integration between different modes of transport
3/4e	Reducing pollutant and CO_2 emissions
3/4f	Reducing congestion
3/4g	Increasing employment in the EU
3/4h	Increasing competitiveness of the EU

Figure 6: Respondents' views on how ITS currently impact different objectives

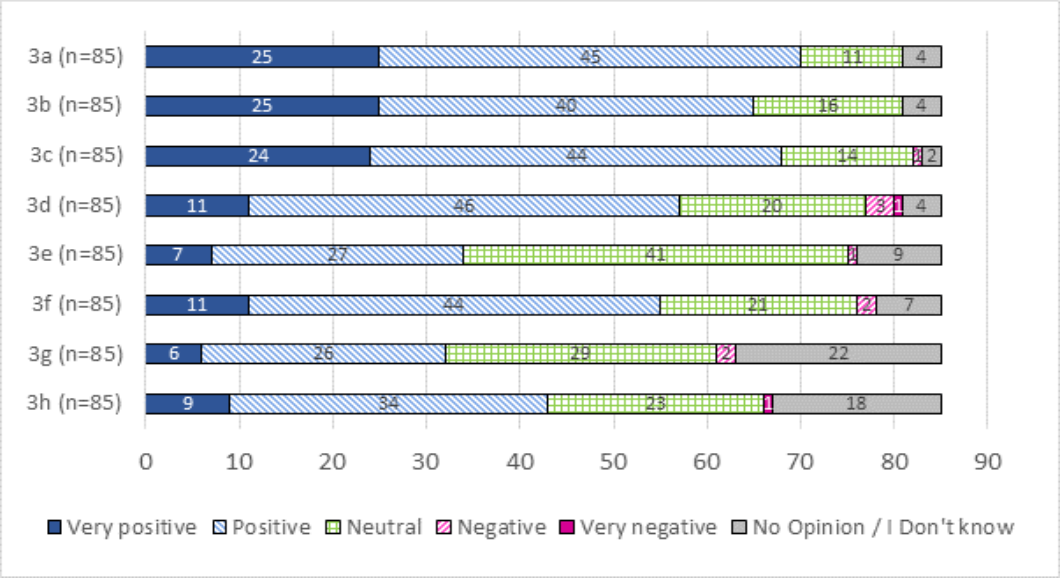


Figure 7: Respondents' views on how greater availability and use will impact the objectives in the future

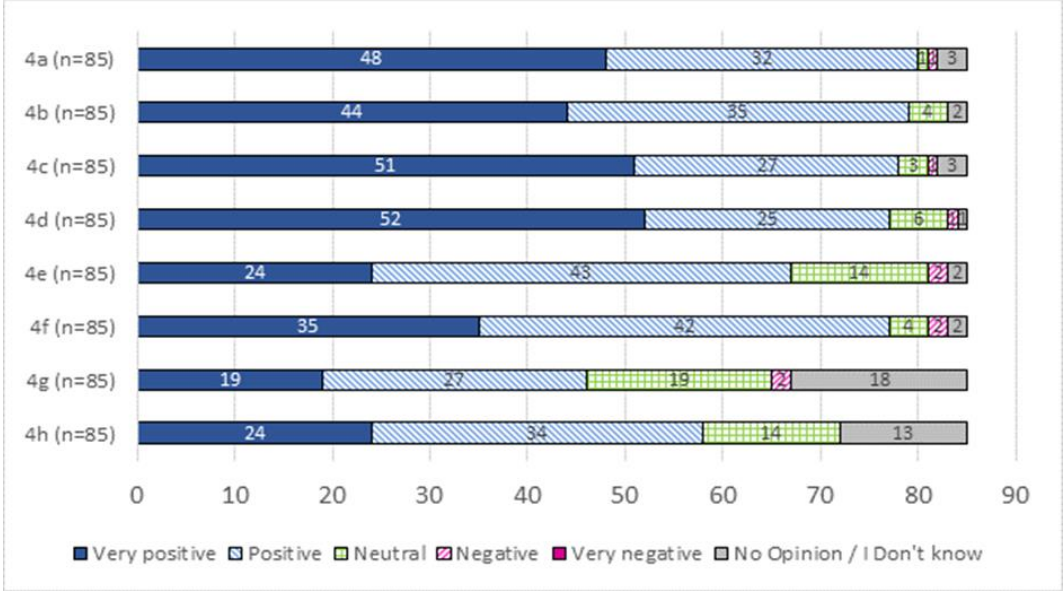
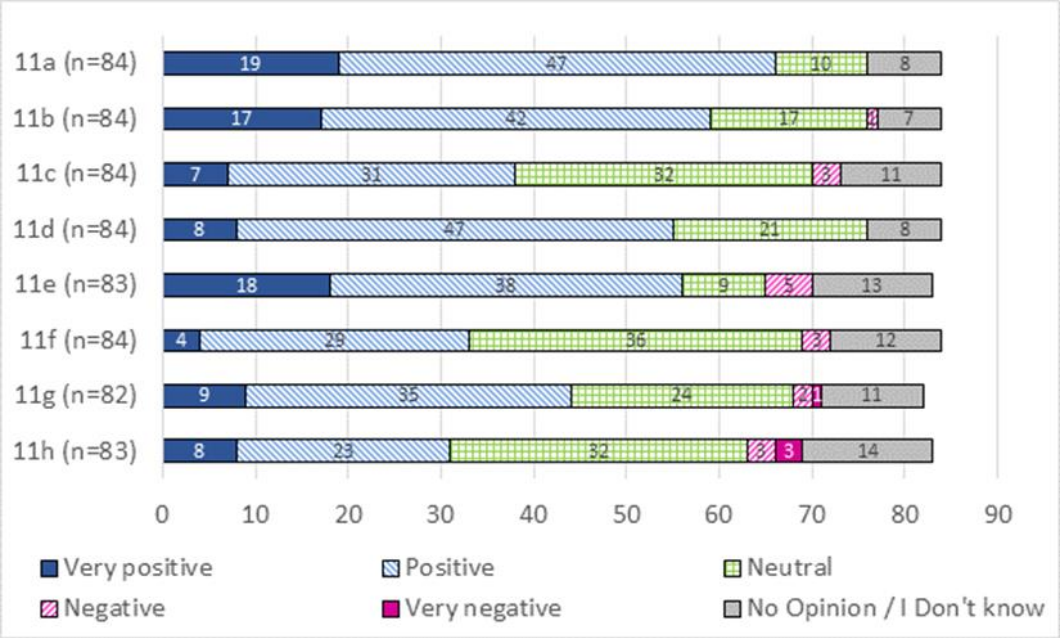


Figure 8: Respondents' views on how certain EU actions have impacted the deployment of continuous and interoperable ITS

Action no	EU actions for impacting the deployment of continuous and interoperable ITS
11a	Providing a strategic framework (e.g. ITS action plan)
11b	Providing a general legal framework (e.g. ITS Directive)
11c	Providing a coordination and governance framework (defining roles, responsibilities and platforms)
11d	Facilitating communication and cooperation between stakeholders
11e	Providing funding for ITS development and deployment
11f	Adopting guidance and other non-binding measures
11g	Developing standards for interoperability and continuity
11h	Adopting legally binding specifications for interoperability and continuity



Efficiency

The stakeholder consultations produced only limited quantitative information on the costs and benefits of ITS. Participants in the group discussions and interviewees were asked about the costs and additional costs that had been mentioned, but no substantial comments were made. They were in general prudent when it came to quantifying the costs and benefits and their proportionality, often mentioning the early stage of implementation. However, several said that the benefits outweigh the costs, and expected the cost/benefit ratio to improve further once services and their use are scaled up.

Coherence

In the OPC and group discussions, several participants pointed to security and data protection issues associated with handling data in ITS applications, and liability issues as possible gaps in the current legislation. These issues were often raised in relation to the parallel work on the C-ITS Delegated Regulation, but some also in relation to priority areas I (use of road, traffic and travel data) and II (traffic and freight management services), particularly as more detailed data will be required once more advanced services are deployed.

EU added value

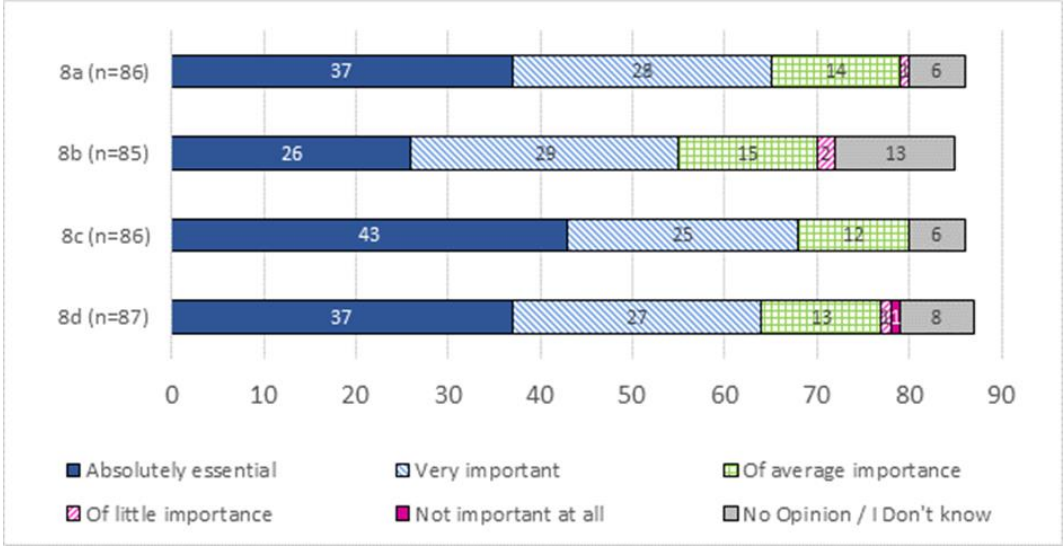
In the OPC, a large majority found that further EU action was needed in every priority area (see Figure 9). Participants in the group discussions and the interviews were generally supportive of action at EU level, focusing on the broader benefits of ensuring interoperability and common standards.

Arguments for EU action included the need to:

- ensure a level playing-field;
- ensure fair competition;
- deliver reliable and trustworthy systems;
- provide consumers with free choices; and
- ensure the mass deployment of ITS and the delivery of the associated societal benefits.

Figure 9: Respondents' views on the importance of further EU action in different areas

Area no	Proposed areas for further action
8a	Optimal use of road, traffic and travel data
8b	Continuity of traffic and freight management ITS services
8c	ITS road safety and security applications
8d	Linking the vehicle with the transport infrastructure



A large majority felt that action at national or local level would not be more effective in achieving the objectives, but the response for action at international level was more mixed (see Figure 10 and Figure 11). Arguments for EU action included the need to:

- ensure that the potential benefits of ITS were fully realised;
- ensure competition in the context of the single market;
- ensure interoperability and continuity of service across borders and between companies; and
- coordinate and mobilise actors across the EU.

On the other hand, some stakeholders argued that national and local initiatives were important to demonstrate the full benefits of ITS. The main argument for international action was the international nature of ITS technology and thus the need to use international standards where possible.

Figure 10: Could the objectives have been achieved better through action at national and local level?

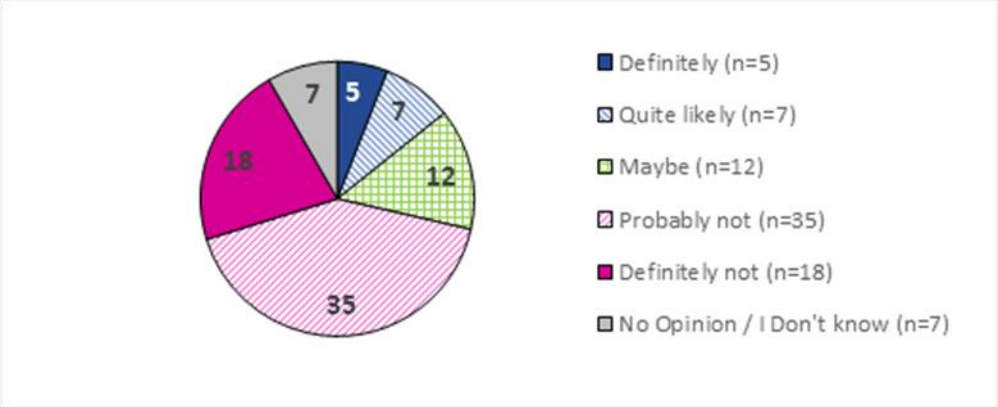
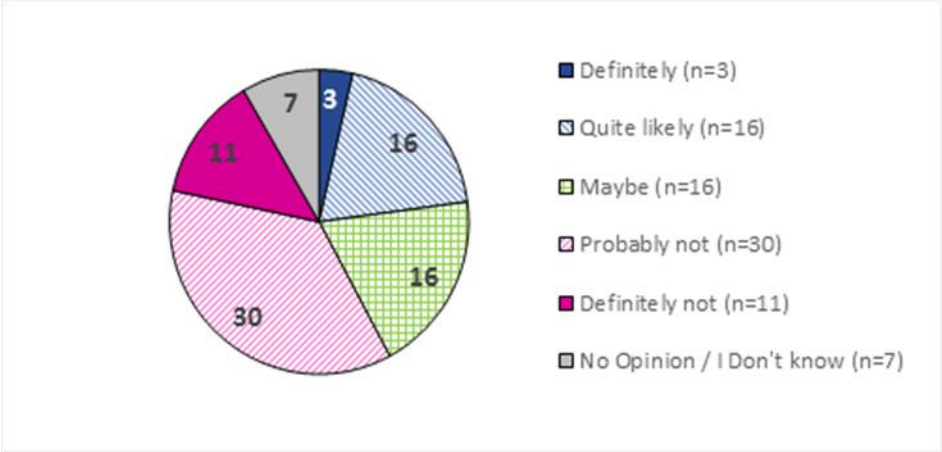


Figure 11: Could the objectives have been achieved better through action at international level?



4. CONCLUSIONS

The consultation activities largely achieved their objectives, as all relevant stakeholder groups across a significant number of Member States and non-EU countries were asked for their views, suggestions for improving the legislative framework and quantitative evidence where available.

In general, the information collected corresponded to the objectives and expectations *vis-à-vis* each stakeholder group. However, due to the limited availability of quantitative data, certain gaps remained, particularly as regards detailed and comparable information on the deployment, costs and benefits of ITS services. While the lack of quantitative data was not unexpected, it shows the need for consistent, more harmonised monitoring and reporting.

Notwithstanding the remaining information gaps, the consultation activities can be regarded as successful in terms of response rate and stakeholder engagement.

Annex IV – Methods and analytical models

The analysis was based on an evaluation matrix (see below) that was used to identify operational sub-questions, potential indicators, success criteria and relevant data sources for each evaluation question. The matrix was developed at the start of the support study and refined until halfway through the study to take account of gaps in data availability and incorporate suitable mitigation measures.

To allow for structured analysis of the collected data, the consultant prepared overview tables on:

- analysis of the 2017 national reports (Annex B to the study);
- the reported KPIs (Annex C); and
- the various sources of funding for ITS (Annex D).

The consultant also prepared summaries of:

- the open public consultation (Annex A);
- the group discussions (Annex E);
- the case studies (Annex F); and
- the stakeholder workshop (Annex G).

The staff working document on the analysis of the 2014 and 2017 reports provides more detailed analysis of the KPIs reported by the Member States. The national reports were a key source of information for the evaluation. To facilitate both the reporting and the analysis of the 2017 reports, it was proposed to Member States that they should use a new common reporting template and provide a series of KPIs on deployment, benefits and financial aspects. In addition, they were asked to submit all reports (one on the ITS Directive, three on the delegated regulations) in a single package using the common template.

This goal was achieved only partially; as for previous reporting exercises, the reports were delivered over a 1-year period, with only a third submitted on time and under half based on the template. In all, 40% of the Member States provided figures for KPIs, but the KPIs were covered only partially and 2017 was the first time they were reported, so in most cases they could not yet be readily compared or used to determine changes over time.

Additional methods (e.g. data requests, group discussions and interviews) were used to fill the information gaps that remained after analysis of the Member States' reports, but these are by nature less suited to gathering comparable information, so limitations remained as regards the indicators required for the evaluation, particularly on the costs of ITS.

To facilitate future evaluations, more should be done to streamline the reporting process for the Directive and the delegated regulations, perhaps when they are revised and/or when new delegated acts are adopted. A revision of the Directive could also be an opportunity to agree on improved reporting requirements (e.g. reporting structure, KPIs, etc.).

On the basis of the information received, evaluation and knowledge-sharing activities could be organised to provide Member States with further guidance on data collection and the calculation of KPIs, bearing in mind the need to maintain stable definitions of the KPIs so as to be able to track them over time.

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
Effectiveness					

1	To what extent have (a) the Directive and (b) the action plan been successful in speeding up ITS deployment and investment and lowering the costs?	• What is the level of deployment/investment of ITS applications and services (in each priority/action area)?
		  ○ To what extent is this deployment/investment attributable to the Directive and action plan, as opposed to other actions (e.g. national initiatives)?
		• How have the costs for ITS technology developed over time?
		  ○ To what extent have the Directive and action plan contributed to these developments?
		• To what extent has the definition of priority areas and actions under Articles 2 and 3 of the Directive helped to:
		  ○ establish a clear time-plan and priorities in the development of ITS?
		  ○ speed up the deployment of ITS across the EU?
		• To what extent has the Directive effectively addressed the root causes of the fact that ITS deployment is:
		  ○ incoherent and unfocused;
		  ○ fragmented and uncoordinated;
		  ○ limited in geographical scope?
		• What progress has been made (e.g. deployment, adoption) in priority areas covered by the action plan (e.g. electronic road tolling, promotion of safety-related ITS, urban ITS platform)?
		• How has the adoption of the Directive contributed to/facilitated the development of
			High-level indicators of the context of ITS deployment and cost:
			• Level and pace of deployment in each Member State – indicators will depend on data availability, but should include total and annual investment (EUR);
			• Coverage of ITS activities in each Member State – again, specific indicators will depend on data availability, e.g. % of network covered by ITS services, % of total vehicles with access to ITS services);
			• Cost data for selected ITS technologies over time;
			• Total and annual investment in development of new ITS (EUR);
			• Level of innovation related to ITS (new products, patents)
			Indicators of the extent to which root causes have been addressed (cross-reference analysis for evaluation question 2):
			• Extent to which evidence/data and stakeholder input suggest that ITS deployment:
			  ○ is more coherent and focused;
			  ○ is less fragmented and more coordinated;
			  ○ is not limited in geographical scope;
			• Extent to which evidence/data and stakeholder input suggest that the Directive has led to a more supportive context for the
				• Deployment / investment / coverage / innovation levels above the baseline and (directly or indirectly) attributable to the Directive and the action plan;
				• Costs lower than would be expected in the absence of the Directive;
				• Directive has successfully addressed the root causes/problems identified in the intervention logic, thereby creating more favourable conditions for deployment (cross-reference analysis for evaluation question 2) and speeding up deployment and innovation
					• Member States' reports;
					• Direct data requests to Member State authorities;
					• Studies supporting the impact assessments for different priority actions and action areas;[127]
					• Studies on EU-wide analysis of ITS;
					• Studies on innovation activity in ITS (specific data on patents/innovation counts are not available);
					• Interviews with ITS stakeholders (task 3.2);
					• Input from the OPC

[127] http://ec.europa.eu/transport/themes/its/studies/its_en

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
		new innovative ITS services?	development of new ITS solutions		
2	To what extent has the Directive been successful in improving the compatibility, interoperability and continuity of ITS across Europe?	**Questions on the role of inputs/actions:** • Have provisions and proposed actions to improve the compatibility, interoperability and continuity of ITS (Articles 1, 2, 3, 6 and 7, Annex II) been: o developed and introduced in all relevant areas? o adopted/implemented by the relevant stakeholders? o found to be appropriate and followed in practice? **Questions on level of success and impact:** • How many (or what proportion of) compatible/interoperable systems have been introduced? What is their coverage? o Is the number higher / the coverage more extensive after the introduction of the Directive? • How many planned ITS will be compatible/interoperable? What is their coverage? **Impact on innovation** • Has improved compatibility, interoperability and continuity of ITS across Europe contributed to the development of new innovative ITS services?	**Causal chain indicators:** • Relevant requirements, standards and measures have been developed to ensure compatibility, interoperability and continuity; • Status of standards/other actions (in development / adopted / under revision, etc.); • Level of use of standards; • Extent to which relevant stakeholders consider that compatibility, interoperability and continuity as a result of the Directive have contributed to the development of new ITS solutions **High-level impact indicators**: • Number of national ITS that are compatible with systems in other Member States (as compared with the period before the adoption of the Directive); • Proportion of planned ITS that will be interoperable	• Relevant standards have been developed, introduced, adopted and followed in each area; • Stakeholders report that systems across Member States have become more interoperable since introduction of the Directive; • Number/proportion of interoperable systems is expected to increase; • Improved compatibility, interoperability and continuity of ITS across Europe have contributed to the development of new innovative ITS services	• Member States' reports; • Direct data requests to Member State authorities; • Interviews with ITS experts / group discussions; • Studies on EU-wide analysis of ITS
3	To what extent has the adoption of specifications through delegated acts been effective? Specifically:	• Have the delegated acts adopted to date led directly to: o the adoption of common rules and principles for ITS deployment across the EU? o greater compatibility, interoperability and continuity of ITS applications and services	• Number/coverage of ITS measures/initiatives resulting directly from the requirements; • Type/level of benefits resulting from requirements of the delegated acts (speed of deployment, investment in ITS, costs	• Benefits that can be clearly linked to the introduction of delegated acts; • Evidence that other initiatives and	• Commission (2014) progress report and review of ITS action plan; • Member States' progress reports; • Direct data requests to Member

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
	• what are the additional benefits compared with the progress that could have been expected from non-binding measures only and/or standards? • would a follow-up initiative on deployment of that priority action (cf. Article 6(2)) have improved effectiveness?	in specific areas? ○ greater uptake / lower costs in deployment of ITS services in specific areas? ○ any other benefits (e.g. lower emissions)? • Would the same results have been achieved only on the basis of non-binding measures such as standards? • Would non-binding follow-up measures have increased the effectiveness of the delegated acts? • Have other initiatives or non-binding measures been successful in other areas, e.g.: ○ efforts before the Directive? ○ international case studies?	reductions, greater interoperability); • Uptake of non-binding follow-up measures complementing the delegated acts; • Type/level of additional benefits resulting from follow-up initiatives/measures	non-binding measures have more limited impact; • Additional/greater benefits expected from other initiatives that follow up the delegated acts	State authorities; • Studies supporting the impact assessments for different priority actions and action areas;128 • Interviews/group discussions; • Case studies
4	To what extent has the deployment of ITS helped to improve the functioning of the road transport system, including its interfaces with other modes? How has this helped in turn to reduce the negative effects as regards pollutant/CO_2 emissions, congestion and road safety?	**Questions on level of deployment/adoption of relevant ITS services** • Are new ITS systems and services expected to reduce emissions and congestion, and improve road safety? • Do the new ITS improve interfaces with other modes? **Question on actual/expected impact** • Have the new ITS services had an impact on: ○ CO2 and other emissions? ○ levels of congestion? ○ levels of safety?	• Number of ITS initiatives/services aimed at improving connectivity of road transport with other modes; • Number/coverage of ITS initiatives/services expected to reduce externalities of road transport (emissions, GHGs, accidents, congestion); • Expected impact of ITS services/initiatives as regards: ○ pollutant/ CO2 emissions; ○ congestion; ○ road-safety indicators (accidents, deaths)	• Uptake of relevant ITS is higher than the baseline / higher than expected in the absence of the Directive; • Significant reduction in emissions and congestion + increase in road safety (directly) attributable to uptake of ITS	• Studies on ITS products and services and their impact on the functioning of the transport system; • Member States' progress reports (from 2017, if available); • Interviews/group discussions; • Direct data requests to Member State authorities; • HIGH-TOOL129 model
5	• What main factors	• To what extent have the following played a role	• Extent to which stakeholders consider that	• Internal/external	• Interviews/group discussions

[128] http://ec.europa.eu/transport/themes/its/studies/its_en

[129] www.high-tool.eu/

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
	have influenced and/or stood in the way of achieving the objectives of the Directive? • Did the Directive cause any unexpected or unintended changes? • To what extent can effects be linked to provisions in other (EU) legislation? • What effects has the Directive had on areas targeted by other EU legislation?	in the implementation of the Directive: ○ internal aspects (speed of implementation/procedures at EU/national level, costs of implementation/resources allocated at national level)? ○ external aspects (developments in ITS technology, other)? • What, if any, have been the unintended or unexpected effects of the Directive for different stakeholders? • Has the Directive had cumulative impacts on stakeholders that were not expected? • To what extent are these a result of: ○ the design/implementation of the Directive? ○ market developments? ○ other (EU) legislation? • Do any stakeholder groups (e.g. SMEs) face specific problems and challenges? • Has the Directive had significant impacts on non-EU countries?	the following have played a role : ○ internal aspects (speed of implementation/procedures at EU/national level, costs of implementation/resources allocated at national level); ○ external aspects (developments in ITS technology, other); • Additional or unexpected (qualitative or quantitative) costs associated with the Directive; • Additional or unexpected benefits associated with the Directive	factors identified have not had a negative role; • The Directive has not had significant negative unexpected / unintended impacts	(task 3.2); • Direct data requests to Member State authorities
Efficiency					
6	What are the costs of implementing the Directive?	• What were the costs of implementing the Directive itself: ○ for authorities (transposition, establishing necessary structures at national level, reporting/monitoring)? ○ transport operators (participation in working groups, development of data collection tools)? ○ ITS service providers (if any)? • What were the costs of implementing the delegated acts: ○ for authorities (transposition, establishing	• Costs/savings due to different aspects of the Directive itself; • Costs/savings due to the delegated acts; • Differentiation between one-off (investment) costs and ongoing costs	• The costs were similar to or lower than what was anticipated	• Interviews/group discussions; • Member States' progress reports – financial indicators (from 2017, if available); • Direct data requests to Member State authorities

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
		necessary structures at national level, reporting/monitoring)? ○ other stakeholders?			
7	How do the costs of implementing the Directive compare with the benefits? Is there any indication that costs may be disproportionately high?	• What are the (economic, environmental, social) benefits generated by the Directive? • How do the costs compare with the benefits?	• Ratio of monetised benefits to be compared with the implementation costs; • Extent to which affected stakeholders consider that the costs are justified by the benefits	• The costs are in line with (or lower than) expectations; • The costs are lower than the benefits (positive CBA); • Stakeholder input suggests that costs are justified by the benefits (qualitative)	• Interviews/group discussions; • Direct data requests to Member State authorities; • Handbook on external costs of transport; • HIGH-TOOL model
8	Has the Directive given rise to (unexpected) administrative burdens or inefficiencies? Why? Could the objectives of the Directive be simplified and delivered more efficiently (considering technical and other developments)?	• Has the Directive led to any increases/savings in administrative burden? • Were all administrative costs necessary and proportionate?	• Administrative costs by type and across different stakeholders	• The Directive has not led to any significant unexpected administrative burdens or inefficiencies	• Interviews across all stakeholders; • Direct data requests to Member State authorities
9	To what extent does the Directive allow for efficient policy monitoring (e.g. reporting mechanism)? To what extent do the monitoring processes allow for efficient	• Are the reporting requirements (+ guidance template/KPIs) of Member States and the Commission (cf. Article 17) sufficient for monitoring the Directive? • What is the level of quality and comparability of data provided by Member States? • Are the costs of collecting the relevant data disproportionate compared with the expected	• Quality and completeness of Member States' and Commission reports and reporting of KPIs; • Costs of collecting relevant data and developing KPIs; • Availability of quantitative indicators (KPIs and others) of the effectiveness of the Directive	• The reporting mechanism in the Directive (Article 17) allows for efficient policy monitoring according to relevant indicators	• Analysis of Member States' progress reports; • Analysis of Commission reports related to the Directive; • Interviews with national authorities; • Input from ITS Committee and Advisory Board reporting template

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
	collection of all relevant information?	benefits of reporting?			and guidance on KPIs
Relevance					
10	To what extent have the objectives of the Directive proved relevant to the needs identified at the outset?	• To what extent have the objectives of the Directive proved relevant for addressing the problems identified (ITS deployment is incoherent and unfocused, fragmented, limited in functional and geographical scope)? • Are there any needs/problems that were not addressed?	Extent to which the specific and operational objectives stated map the problems identified (qualitative)	• The operational objectives of the Directive were relevant and proportionate; • No problems/needs were identified that have not been addressed.	• Desk research to map objectives to problems; • Wider evidence from the literature, e.g. reports that fed into the development of the Directive; • Interviews/group discussions; • Input from ITS Committee and Advisory Group; • Stakeholder workshop
11	To what extent are the original objectives and instruments of (a) the Directive and (b) the action plan still relevant and how do they relate to current problems and needs?	• To what extent are the instruments/actions in the Directive/action plan still relevant in the context of current problems/needs? • Are there any new needs/problems that need to be addressed?	• Extent to which the objectives properly map existing/new needs and problems; • Extent to which there are gaps	• The original operational objectives / instruments are still relevant and proportionate; • All current problems / needs are addressed by the existing objectives.	• Literature review, e.g. of current challenges for ITS (covered in other questions); • Desk-based mapping; • Interviews/group discussions; • Input from ITS Committee and Advisory Group
12	Are the specifications adopted through delegated acts still up-to-date and relevant, given technological and market developments (in ITS, but also in related industries such as the automotive, electronics and	• Are the specifications set out in the delegated acts for the various action areas still relevant in the light of recent technological and market developments? • Are there any new developments in the field of ITS or wider road transport technologies that need to be taken into consideration?	• Extent to which recent technological and market developments are covered in the delegated acts	The specifications adopted through delegated acts are still relevant in the light of recent technological and market developments	• Studies on recent technological and market developments; • Interviews/group discussions with industry experts on recent market developments; • Stakeholder workshop; • Input from ITS Committee and Advisory Group

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
	telecommunications sectors)?				
Coherence					
13	To what extent are the provisions of the Directive internally coherent? Do provisions overlap or conflict?	• Are there any conflicts, overlaps or inconsistencies among the provisions of the Directive and delegated acts?	Number and significance of complementarities, overlaps and conflicts between provisions of the Directive and delegated acts	No areas of overlap or inconsistency identified	• Desk-based mapping; • Commission reports on the functioning of the Directive; • Direct data requests to Member State authorities; • Stakeholder workshop; • Input from ITS Committee and Advisory Group
14	Is the framework provided by the Directive still coherent with current (public and private, EU and international) ITS deployment?	• Are any ITS applications being widely deployed for which relevant standards are not yet in place? • Does the framework cover areas of ITS application that are not being widely deployed (e.g. autonomous vehicles)?	• Number and significance of gaps between the Directive's provisions and ITS applications (whether or not widely deployed)	The Directive is coherent with current ITS deployment	• Commission reports on the functioning of the Directive; • Evidence of current ITS deployment (identified for other questions); • Interviews/group discussions; • Stakeholder workshop; • Input from ITS Committee and Advisory Group
15	To what extent is the Directive still in line with other relevant EU intervention (e.g. legislation and policy on privacy, data protection, data security, re-use of public sector information, conformity assessment and vehicle type approval)?	• Are there any conflicts, overlaps or inconsistencies with relevant EU legislation and policies on: ○ Privacy and data protection? ○ data security? ○ the re-use of public sector information? ○ conformity assessment? ○ vehicle type approval? ○ other areas?	Presence and significance of complementarity, overlap and conflicts between the Directive and other EU intervention	The Directive is coherent with other relevant EU intervention	• Commission reports on the functioning of the Directive; • Interviews/group discussions; • Analysis of relevant legislation (e.g. Directive 2002/58/EC and General Data Protection Regulation) and relevant reports

Question		Operational sub-question	Suggested indicators	Success / judgement criteria	Relevant data sources
EU added value					
16	What is the added value resulting from the EU intervention compared with what could otherwise be done at national, regional or international level?	• Is EU intervention justified to increase the deployment of ITS for road transport? • Was action at EU level required and justified? Is it still needed? • How does EU intervention improve on what could be achieved by intervention at another administrative level? • Are there case studies (e.g. particular Member States) that could provide good practice examples for national-level intervention? • What have been the extra benefits (or costs) of EU-level intervention?	• Assessment of national-level interventions and their effectiveness; • Assessment of EU legislation vs national legislation as drivers for national ITS deployment	• EU intervention has added value to ITS deployment; • National-level interventions would not have been sufficient	• Member State reports in the context of the Directive; • Interviews/group discussions; • Review of national approaches (case studies in USA, Japan and Australia); • Direct data requests to Member State authorities; • Stakeholder workshop
17	What would be the most likely consequences of stopping or withdrawing existing EU intervention?	• What national legislation is in place independent of EU-level legislation? • Would that national legislation be sufficient to achieve the same progress in ITS deployment? • What would be the most significant impacts of withdrawing the Directive and action plan? • Would there be benefits from withdrawing EU intervention?	• Extent to which national-level intervention would be sufficient to promote ITS deployment; • Extent of (positive/negative) impacts of withdrawing the Directive and action plan	• Withdrawing existing EU intervention would have a negative impact on ITS deployment	• Reviews of national legislation; • National reports on ITS deployment and how it is driven by national, as opposed to EU, legislation; • Interviews/group discussions; • Direct data requests to Member State authorities; • Stakeholder workshop