Workshop on lessons learned from C-ITS pilots and deployment initiatives

Report of the workshop, 22.11.2017, INEA, Brussels
Deliverable 4 of sub-activity 4.4
(Cooperative ITS Services Deployment Support)

Version: 1.0

Date: 20th March 2018

www.its-platform.eu

Document Information

Authors

Name	Organisation
Mikko Tarkiainen	VTT
Satu Innamaa	VTT
Ilkka Kotilainen	Finnish Transport Agency
Eetu Pilli-Sihvola	Finnish Transport Safety Agency
Torsten Geissler	BASt
Sandro Berndt	BASt
Holger Drees	BASt
Paul Wadsworth	Capita
Ludovic Simon	CEREMA

Distribution

Date	Version	Dissemination
28.11.2017	0.1	Initial contents
11.12.2017	0.2	Initial version with notes of presentations
12.12.2017	0.3	Edited after the first internal review
20.12.2017	0.4	Edited after the review by all authors
22.12.2017	0.5	Conclusions section expanded
01.03.2018	0.9	Final Draft for Sub-Activity Meeting
20.03.2018	1.0	Published version

Preface

EU EIP

The EU ITS Platform (EU EIP) is the place where National Ministries, Road Authorities, Road Operators and partners from the private and public sectors of almost all EU Member States and neighbouring countries, cooperate in order to foster, accelerate and optimize current and future ITS deployments in Europe in a harmonized way. In order to foster cooperation and the necessary consensus between EU Member States, the EU ITS Platform will facilitate the establishment of a commonly understood state of the art and promoting the actual take-up of EU specifications, guidelines, best practices and/or methodologies.

Sub-activity 4.4: Cooperative ITS Services Deployment Support

Sub-activity 4.4 aims at developing and providing deployment guidance to road authorities and operators on Cooperative ITS (C-ITS). It capitalizes on the results of preceding C-ITS-related activities developing a mechanism for setting up deployment guidance for road operators concerning C-ITS services.

It aims at collecting and updating the lessons learned from recent pilots and deployment initiatives as well as at advising and guiding road operators and road authorities in dealing with potential implementation issues concerning C-ITS. In particular, business and operating model implications of C-ITS for all relevant stakeholders and hybrid communication concepts have been examined.

This deliverable

This deliverable is a report from the "EU EIP C-ITS workshop for lessons learned in C-ITS corridor pilots", which was held in Brussels on 22nd November 2017. The purpose of this document is to give an overview of the workshop and summarise the presentations and panel discussions. This deliverable also makes conclusions of the workshop results. The next steps are identified in the end of the report. The results of the workshop will be utilised in up-coming tasks of the C-ITS sub-activity of the EU ITS Platform project.

Glossary

Abbreviation	Explanation
3G	Third generation mobile telecommunications technology ("UMTS")
4G	Fourth generation mobile telecommunications technology ("LTE")
5G	Fifth generation mobile telecommunications technology
ACEA	The European Automobile Manufacturers' Association
CAM	Cooperative Awareness Message
C-ITS	Cooperative Intelligent Transport Systems
DAB	Digital Audio Broadcasting
DENM	Decentralized Environmental Notification Message
EC	European Commission
EIP	European ITS Platform
EIP+	European ITS Platform+
EU	European Union
ICT	Information and Communication Technologies
IEEE	Institute of Electrical and Electronics Engineers
ITS	Intelligent Transport Systems
ITS G5	European profile standard for communications in the 5 GHz band (based on IEEE standard 802.11/802.11p)
PKI	Public Key Infrastructure
POLIS	European Cities and Regions Networking for Innovative Transport Solutions
R&D	Research and Development
RDS-TMC	Radio Data System – Traffic Message Channel
TEN-T	Trans-European Network - Transport

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

1. Introduction

The EU ITS Platform (EU EIP) sub-activity 4.4 "Cooperative ITS Services Deployment Support" organised a workshop entitled "EU EIP C-ITS workshop for lessons learned in C-ITS corridor pilots" in Brussels on 22nd November 2017. One of the goals of the EU ITS Platform (EU EIP) and its predecessor studies (most recently European ITS Platform (EIP+)) is to collect and share information and lessons learned from the C-ITS pilots and deployment initiatives. In 2016, EIP+ project published a White paper on Cooperative ITS Services which included a section for lessons learned. Lessons learned was collected from active or recently finalized C-ITS deployment initiatives and the results were organized to organizational, functional, technical, business, legal, security, privacy and other categories. [Berndt, S. et al. 2016b]

The lessons learned collection was complemented by a survey on C-ITS deployment preparation among the participating road authorities and operators in the EIP+ activity on C-ITS. The survey was done in the end of 2015 and nine European road authorities or operators answered to the questionnaire. [Berndt, S. et al. 2016a]

The survey results show that the road authorities and operators are active in the C-ITS deployment area but the expectations of the scale of use varies. The road authorities and operators are engaged in multi-stakeholder coordination groups like the C-ITS Platform, the Amsterdam Group and the C-Roads Platform. Furthermore, CODECS (COoperative ITS DEployment Coordination Support) project has also organised together with the Amsterdam Group a workshops series "C-ITS Deployment is underway!". These open workshops were dedicated to follow the progress on C-ITS Deployment in Europe and road authorities and operators have been active in these events. CODECS has also held a workshop concentrating on Hybrid communication which is one of the key topics and open issue in C-ITS deployment. [Codecs 2017]

The C-Roads Platform has become the flagship of European Commission for C-ITS deployment. The aim of the C-Roads Platform is to develop harmonised specifications taking the C-ITS platform recommendations into account, linking all C-ITS deployments and planning intensive cross-testing. The C-Roads Platform is an authority driven platform, bringing Member State authorities and road authorities together with the aim to deploy interoperable C-ITS services across Europe.

2. Workshop organisation, programme and participation

The EU ITS Platform (EU EIP) together with C-Roads Platform contributed to the sharing of lessons learned with a workshop in 22 November 2017. The Innovation and Networks Executive Agency (INEA) hosted the workshop at their office in Brussels.

With the increased number of C-ITS deployment initiatives, the one-day workshop format has approached its limits to cover broad range of C-ITS topics or projects. Therefore, this workshop was be focused on the road authority and operator viewpoint and to the results and lessons learned. Timing of the workshop enabled sharing of the final results from the EU C-ITS Platform (2nd phase), corridor deployment projects (NordicWay, SCOOP, C-ITS Corridor), and the first results from the C-Roads Platform. The workshop provided a view to where do we stand and what is going on in C-ITS deployment in Europe (e.g. EC/DG MOVE and INEA, C-Roads, EU EIP C-ITS sub-activity, key results of C-ITS Platform Phase-II, Hybrid Communication) and reflected these inputs in a panel on the higher level issues. The workshop was also devoted to more detailed technical lessons learned from corridor deployment projects as well as C-Roads, also these inputs were followed by a (second) panel discussion in the end of the event. The final programme of the workshop is presented in Figure 1 and Figure 2.

The workshop results are available from the EU EIP web site: http://www.its-platform.eu/highlights/eu-eip-workshop-lessons-learned-c-its-pilots

Figure 1. The workshop programme (morning).

Figure 2. The workshop programme (afternoon).

The workshop was organised in cooperation with EU EIP and C-Roads and the promotion of the event was done via EU EIP and CODECS channels. Soon after the announcement, the workshop was fully booked, including the extra seats which were obtained from the INEA.

More than 50 experts from 17 European countries participated to the event, see Figure 3. The participants of the workshop represented road authorities and operators, OEMs, suppliers, technology & service providers, research institutes and ITS associations.

Figure 3. Workshop participants.

3. Workshop findings

3.1. Morning session: Deployment Framework

3.1.1. OPENING AND INTRODUCTION OF THE OF EU EIP C-ITS DEPLOYMENT SUPPORT, TORSTEN GEIßLER, BUNDESANSTALT FÜR STRAßENWESEN BASt

The introduction to the workshop was provided by Torsten Geißler (BASt) as a leader of the EU EIP C-ITS (4.4: Cooperative ITS Services Deployment Support) sub-activity. The EU EIP project was introduced as technical management centre for ITS deployment during 2016 – 2020 and pilots and deployment initiatives since 2013. The pilots and deployment initiative landscape (as of 2013 and 2017) was described showing the progress and increasing of the activities in C-ITS arena. Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6203

3.1.2. EUROPEAN FRAMEWORK FOR C-ITS DEPLOYMENT, DAVIDE BRIZZOLARA, EUROPEAN COMMISSION, INEA & CLAIRE DEPRÉ, EUROPEAN COMMISSION, DG-MOVE

Davide Brizzolara as the host of the event welcomed everyone at INEA. In his presentation he showed that INEA has 48 ITS projects currently running, with 443 M€ EU funding. There are five main corridors (Arc Atlantique, Med TIS, URSA MAJOS, Crocodile and NEXT-ITS), which are fully supporting the EC policy. The importance is shown by increasing the investment in this area. There is a growing interest on C-ITS from public and private sectors. Harmonisation and interoperability requires strong coordination. There is a blending call 2017 for cooperative ITS (C-ITS).

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6213

Figure 4. Presentation from INEA provided by Davide Brizzolara.

Claire Depré from DG-MOVE stated that "ITS is connecting the dots". As, ITS community is very dynamic, the challenge is to bring everything that is happening together to make sure that we are all going to the same direction. This has been an objective since the EasyWay project (2007 - 2012). EC has some responsibility in it. EC is now trying to change how the interaction with the stakeholders is done. The cooperation is working much better now and we are working to find common understanding. At national levels, there is a tendency to connect very high decision makers with the project members. Also the industry is involved. With this new setting, EC can start to drive for the policy making. Europe as a whole is doing great in this and we are on the right track. Claire Depré explained the process of developing the delegated act on C-ITS. The industry is asking for legal certainty. This is learning by doing. Interoperability is the key in this which we want   to   achieve.

3.1.3. ROAD AUTHORITY SUPPORT TO THE DEPLOYMENT OF C-ITS, ILKKA KOTILAINEN, FINNISH TRANSPORT AGENCY

Ilkka Kotilainen presented the transport network for which the Finnish Transport Agency (FTA) is responsible. There is on-going discussion how much money should be invested into road maintenance to keep the roads in good condition. Kotilainen presented road authorities challenges and opportunities, which of C-ITS highlighted as an important opportunity.

There are currently new ecosystems with market evolvement. The clue is the connectivity between infrastructure and devices. There are harmonised C-ITS deployment in 16 member states under the C-Roads platform.

In Finland, there is a road transport automation roadmap and action plan for years 2016 – 2020. The socio-economic evaluation in NordicWay indicate the positive impact that C-ITS can bring to the society. C-ITS for road users: safety, reduced travel time, comfort of travelling, environment and better services.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6201

3.1.4. C-ROADS PLATFORM CURRENT STATUS, MARTIN BÖHM, AUSTRIATECH

Martin Böhm introduced the C-Roads platform. It works to harmonise the C-ITS for European countries. Link with the EU EIP is important as the road authorities are there. Road authorities have lot of experience and knowledge in road user services. That is important for C-Roads.

C-Roads was kicked off in December 2016 with first 8 countries. Now, there are 16 countries and 4 associate members. These members will do the C-ITS roll-out in Europe.

The platform is linking all the deployments. They develop, share and publish common technical specifications, and plan intensive cross-testing to verify interoperability. They also develop system tests based on the common communication profiles by focusing on hybrid communication mix, which is a combination of ITS-G5 and cellular networks. By doing so, C-Roads will pave the way to C-ITS in Europe. C-Roads is doing close cooperation with Car2Car Consortium.

In September, a publication on communication profile for ITS-G5 was released and it is available from the C-Roads web site (www.c-roads.eu). In addition, C-Roads has published a position paper on the usage of the 5.9 GHz band. It is expected that in short and long term several communication networks will be used.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6202

3.1.5. EU EIP C-ITS DEPLOYMENT SUPPORT: THE FIRST RESULTS, SANDRO BERNDT, BUNDESANSTALT FÜR STRAßENWESEN BAST

Sandro Berndt introduced the first results from the EU EIP C-ITS deployment support sub-activity. The tasks of this support includes: functional interoperability, deployment guidance and preparing for C-ITS services as part of regular operation. EU EIP project is cooperating with C-Roads and CODECS.

The version 1.0 of the "Interoperability requirements for C-ITS services with infrastructure involvement" (deliverable 1) is now available and it includes e.g. state of play, knowledge base, profiling issues and common requirements engineering. The output of the C-Roads and CODECS activities are reflected in the next updated version of the deliverable.

The first draft of the "Implementation aspects for C-ITS services with infrastructure involvement" (deliverable 2) includes implications of C-ITS strategies, business and operating model implications, hybrid communication concepts, lessons learned from C-ITS pilots and deployment initiatives. EU EIP is aiming to prepare C-ITS to be part of regular operation.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6204

3.1.6. OEM VIEWPOINT TOWARDS DEPLOYMENT, ALAIN SERVEL, PSA GROUP

Alain Servel explained the OEM viewpoint towards deployment of C-ITS. There has been pre-deployment of Day-1 services in France since mid-2014. Functional specification of V2X have been produced based on European standards. The security and privacy mechanisms have been verified, conformance of ITS-G5 and its interoperability has been evaluated and validated. Evaluation of ITS-G5 - 3G/LTE-4G hybrid communications roaming will be done in Phase 2.

In the V2X ecosystem, trajectories of vehicles have been sampled and broadcasted with detected road hazard events via hybrid communication. There have been 13 use cases, 5 of them triggered by the driver. Aim is to detect them automatically in the future.

Lessons learned: specifications can take a long time to converge on a same understanding of more recent standards. A new specific CAM-I have been specified and developed to signalise road-side units and services. Security success can be achieved by use of high number of pseudonyms and their changes and hardware architecture that requires at a minimum dual core computing resources.

There are some risks on security standard evolutions in Europe. V2X system interoperability was proven early. High number of tests between different partners were necessary to validate successfully the ecosystem.

First vehicles will be post-equipped in Jan 2018, 1000 vehicles by the end of 2018 and the first evaluation results expected in mid-2018. V2X is needed to support ADAS, ITS Day-2 services and level 3-4 automated driving in the future.

[Presentation not public]

3.1.7. PANEL DISCUSSION 1: HIGH LEVEL ISSUES

The morning session panel was moderated by Torsten Geißler and to the panel participated Claire Depré, Risto Kulmala, Martin Böhm and Alain Servel, see Figure 5.

Figure 5. Panel discussion on high-level issues.

The panel discussion in the morning session focused on the high-level issues in C-ITS deployment. Based on the NordicWay results, it can be said that there is a business case for road operators. For private industry to deploy C-ITS service, public incentives are need to support the first deployments. Starting point for road authorities is to replace the current Radio Data System – Traffic Message Channel (RDS-TMC) with new mature C-ITS technology. Privacy and security issues might need some more time to be finalized, but in 2019 we can deploy C-ITS Day-1 services to increase traffic safety. Currently we are speaking about very simple and limited C-ITS messages for Day-1 services. But for Day-2 or 3 these will evolve and when deployment of these starts we have the roles of different stakeholders already agreed and ready.

Today we can see a lot happening in C-ITS industry. During the C-ITS development, some use cases have been identified that are not so interesting to industry. Services should be as a driver, not the technology. The Commission's third mobility package (2018) will have more visibility for Cooperative, Connected and Automated Mobility (CCAM). The C-ITS deployment strategy states that we should enable to start of the deployment in 2019, so we are on the track. It was stated that the deployment of C-ITS can be started in 2019 with existing mobile networks and ITS G5 deployments. All stakeholders seem to agree to share safety critical data. For example, ACEA position

paper states that there is willingness to share data to TMC. Road operators also have to provide their digital plans to service providers and OEMs.

Currently to focus has been only on Trans-European Network - Transport (TEN-T) network, so we are lacking other roads and cities. However, TEN-T is the starting point and needed for harmonisation. In the future, we need to continue and look at urban areas also. The interoperability should spread everywhere.

3.2. Afternoon session: Lessons learned

3.2.1. EC 5G CALL PRESENTATION, ERIC GAUDILLAT, EC CONNECT

Eric Gaudillat provided information about the call for projects validating 5G for cross-border connected and automated mobility (CCAM). The 5G Action Plan was made for the competitiveness of EU industries and pooling investments of different industries in scale. Eric introduced 5GCAR project briefly. ICT-18-2018 '5G for CCAM' targeted to cross-border trials along 5G corridors. Target is 2-4 projects, up to 50 M€, call closing on 17 April 2018.

A question came from the audience on securing 5G bandwidth all along Europe as now many different frequencies are planned to be used. The Commission intents to coordinate them.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6214

3.2.2. NORDICWAY FINAL RESULTS AND LESSONS LEARNED, RISTO KULMALA, FINNISH TRANSPORT AGENCY

Risto Kulmala gave an overview of the results and lessons learned from the NordicWay project. All the NordicWay Final Event slides (and later reports) can be found from www.nordicway.net.

NordicWay was aimed to prepare for large-scale deployment of cellular C-ITS. In the Nordic countries, there are low traffic volumes, high-quality cellular network with low pricing for unlimited data packages and aim to still improve safety. Thus, the solution to go for cellular based C-ITS services was natural.

The architecture to solve the data sharing among partners (TMCs, service providers, road users) was one of the key results. Cloud-based solution was found. DATEX 2 and Decentralized Environmental Notification Message (DENM) were used. It was found that standards are not enough. Much effort was needed on profiling within standards (in particular DATEX 2).

Ecosystem enabler is another key result. The ecosystem supports further innovation. New communication infrastructure was not invested, existing infrastructure was utilised. Scalability was a design principle from the start, reflected in the architecture. Several demos were made and published, including cross-border demos.

Low latencies (0.3 - 2 seconds) obtained in cellular networks (3G, 4G) and the interchange node latency was only around 60 ms.

Impact assessment of the service was made for the Finnish part of the trial with 1300 road users. Service was found to be useful and willingness to continue the use of system was very high. Service was assessed have a positive impact on safety. The benefit-cost ratio for 2019 - 2030 period was assessed to be at least 2.3.

The work will be continued in NordicWay 2.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6207

3.2.3. C-ITS CORRIDOR, SANDRO BERNDT, BUNDESANSTALT FÜR STRAßENWESEN BAST

Sandro Berndt gave an overview of the results of C-ITS corridor, especially from Germany part of the corridor. The documents from the C-ITS corridor Germany are available from http://c-its-korridor.de/?menuId=43&sp=en.

The system architecture was seen to be stable in cross-border tests, data model was also stable and in use. System was successfully tested in 5 test cycles. More than 100 test drives by Hessen Mobile under normal traffic conditions. Evaluation was performed under different use cases, but the results are not yet finalised or published.

Internal analysis shows that the communication range of the ITS-G5 is over 300 meters in 82% of cases, in optimal conditions in 96% of the cases. DENM always with correct content.

Handbook was made for the organisational aspects (Operational Concept), made for the other federal states. This handbook was very well received. There is a roll-out plan for the German Federal States. DATEX II still requires an effort as it is not very suitable for the C-ITS concept as it is now.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6206

3.2.4. SCOOP@F, LUDOVIC SIMON, CEREMA

Ludovic Simon presented the results of SCOOP@F. In total 3000 vehicles on 2000 km of road network with several test sites including cross-tests. Priority services include data collection, roadworks warning and hazardous location notification. Solutions have been made together with the OEMs. Services included in OEM's navigation system. Multi-brand operability between PSA and Renault ensured. Fully operational Public Key Infrastructure (PKI) and privacy from the design of the system were included. Procurement gone through standard procurement processes. A thorough validation process defined. Interoperability tested between pilot sites and with foreign countries.

French catalogue made on C-ITS services with detailed description based on a European template. A complete set of specifications made filling the gaps of standards, tested and upgraded from experience. Most of them open and available from the SCOOP web site: http://www.scoop.developpement-durable.gouv.fr/en/. A robust back-end architecture defined. SCOOP@F platform is a direct link between the driver and the road operator, interface with traffic management systems, works in DATEX II. Validation includes lab tests, test-track and open road tests. Vehicles are now ready for driving.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6205

3.2.5. C-ROADS: THE FIRST RESULTS, MARTIN BÖHM, AUSTRIATECH

Martin Böhm presented briefly 17 C-Roads pilots, which are currently running. The NordicWay, SCOOP and the C-ITS corridor projects were skipped as they had been already presented in the workshop.

- In Austria in Vienna area, test cycles include infrastructure based C-ITS messaging and one goal is to verify if the in-vehicle systems from OEMs will understand the messages. The specifications are still evolving.

- In Belgium, large piloting planned for 2019 and there is a link to the InterCor project (http://intercor-project.eu/).

- In Czech Republic, ITS-G5 already deployed in one road section. Specific problems include the roadworks trailers, which are crashed often, and level crossings with light rail.

- In Hungary, there is already established C-ITS test site, which is following ECo-AT (European Corridor – Austrian Testbed for Cooperative Systems; http://eco-at.info/) project specifications.

- In Italy, there are several C-ITS tests and deployments including hybrid communication solutions.

- In the Netherlands, a TestFest was organised during 2017. There are also links with the InterCor project.

- In Portugal, there are 900 km motorways to be installed with C-ITS (hybrid solution) along the Atlantic corridor.

- In Slovenia, there are severe weather problems, including heavy fog, ice rains, snowing. A hybrid communication solution planned.

- In Spain, there are several pilots with ITS-G5 and cellular solutions covering hundreds of kilometres on motorways.

- In UK, hybrid communication solution planned for the InterCor project. The next TestFest in UK focusing also hybrid communication in C-ITS.

Presentation is available from: https://www.its-platform.eu/filedepot_download/2169/6208

3.2.6. PANEL DISCUSSION 2: URGENT TODOS AND NEXT STEPS FOR ROAD AUTHORITIES AND OPERATORS

The afternoon session panel discussion was moderated by Paul Wadsworth (Capita, UK) and the panel included Ilkka Kotilainen (FI), Sandro Berndt (DE), Ludovic Simon (F) and Martin Böhm (A).

The C-ITS deployments presented in the previous session was discussed first. The panel was asked how Germany might expand the implementation of C-ITS services beyond the current pilots. In Germany there is a restructuring of the road authorities and Federal States have a new funding stream for traffic management which includes C-ITS, but there still needs to be willingness to implement C-ITS on behalf of the State and take it in to operational use. It was recognised that C-ITS services need to be embedded to existing road traffic management strategy and TMC systems.

All road authorities see the safety benefits arising from C-ITS services as being the most important factor that will encourage wider deployment of C-ITS. In some counties the strategic road network is franchised to operating companies. In France, where this is the case, road operating companies are involved with C-ITS pilot projects. For wider deployment, it is likely that there will have to be changes to the contract between the road authority and road operator and they will need to stipulate the requirement to implement C-ITS services. However it is important that a standardised approach is taken, for instance the need to agree to use standardised C-ITS in roadworks trailers to achieve a common benefit.

Whilst contracts are the basis to widen deployment, a precursor to this is the need to learn together and harmonise traffic management plans with C-ITS as an integral

element. The current pilots and the C-Roads platform are developing best practice approaches, together they are working towards standardisation using feedback from current work. For instance C-Roads will be providing service profiles. It was pointed out that to accelerate C-ITS deployment, procurement cannot wait for profiles and other elements of the C-ITS system to be standardised. It takes a long time to develop and agree standards and there afterwards the profiles will have to be maintained. The process for this has not yet been agreed.

This discussion moved on to C-ITS communications services. The use of hybrid communication is already happening e.g. in the NordicWay architecture and this has proved successful. It was noted that 4G LTE is currently proving adequate for C-ITS services. With this in mind it was noted that a there is a need to deploy a C-ITS platform which enables new innovative services to be added as they are developed in response to need.

The topic of privacy was noted as being a challenge and different legislation in Member States makes the landscape complex. France has particular challenges. SCOOP@France has taken a first step in this area. It was noted that the beginning and end of a trip in France is considered private information and is not freely available. As an example, eCall is a safety system, installed into vehicles and it cannot be switched off. In similar way, it was expressed that C-ITS services for safety purposes should not be able to be switched off.

Other drivers for wider deployment include the need to improve air quality. Management of air quality is a policy objective of all road authorities. C-ITS could be used to improve air quality, for instance making use of geo fencing to manage hybrid vehicles and their petrol engine use during times of adverse pollution. In NordicWay, there was an example in the 'geo-fencing and hybrid electric vehicle' service. It was proposed that C-ITS should also be included in future MaaS strategies including services for public transport. Currently there is no guidance on this topic from the EU.

It was agreed that all current C-ITS services and pilots are properly evaluated and include interoperability. A strong body of evaluation knowledge can be used to inform future business cases for wider deployment. C-Roads is currently focused on technology evaluation, but as expectations grow, it may also look at policy aspects. It was further noted that evaluation needs to be continuous in response to iterative service development. In the NordicWay the positive evaluation report has proved invaluable in securing the second stage of the project which is due to commence in 2018. The evaluation report is available for review by European partners.

4. Conclusions and steps forward

At the workshop representatives from major European C-ITS Corridor projects and involved stakeholder organisations presented and discussed lessons learned from the first pilots and deployment initiatives. The panel discussions provided additional viewpoints to higher level issues as well as to the next steps for road authorities and operators when starting the deployment of C-ITS. As a conclusion the main findings from the workshop and steps forward are listed.

First of all, the topic of lessons learned from the C-ITS corridor pilots and deployment initiatives has attracted a large audience. It is very helpful for enabling faster and deeper learning from collaboration partners that "somebody" provides a platform for exchange of knowledge. This coincides with the EC having called in 2014 for the engagement in the C-ITS Platform as well as with the Amsterdam Group as a strategic alliance of C-ITS key deployment partners such as infrastructure organisations and the automotive industry. Co-funded actions such as EU EIP and CODECS can complement and leverage the efforts of those institutions.

It is also noteworthy that the organisation of the workshop at a central and accessible place in Europe, back-to-back with the NordicWay Final Event has boosted participation and engagement.

The workshop has reconfirmed the view of joint and separate responsibilities in the context of C-ITS deployment. There is no "one size fits all" business model but rather a multitude of them. Actually, in face of significant investment required and to stimulate buy-in, there has to be a business case for all, irrespective of the underlying performance indicators. Funding support might be appropriate for industry related to the aspects of serving the public interest. There is also need for quality evaluation reports that can inform future policy and business cases.

With respect to the Internet-of-Things (IoT) perspective, there is an ever increasing need to redefine or even remove the boundaries and limits of vertical applications. Strongly in line with it, the willingness of key deployment partners to share data and to collaborate on digital processes has substantially increased. EU policy and the process following the Transport Ministers' Declaration of Amsterdam following a pragmatic approach is paramount to this development. However, it has to be kept in mind that sharing and collaboration does not happen for its own sake but is related to principles of mutual interest and benefit.

The strong emphasis of key actors on C-ITS deployment is desirable. It should be also noted that the harmonisation results (e.g. harmonised profiles) might be taken forward to standardisation at a later point in time to flag even stronger their binding character. In this

respect, the current engagement of road authorities and operators in the standardisation bodies leaves room for improvement. Put in a broader perspective, the strong emphasis on deployment should not lead to a myopic scope. It is equally important to prepare the capabilities (services and use cases for Day Two and beyond, associated requirements of spectrum allocation, message sets etc.) for the future evolution and long-term viability of European C-ITS services and the hybrid communication of these services.

The first C-ITS services are focused on safety. There is also need to raise the profile or air quality and reduction of emissions with C-ITS services in the future. This might be a logical evolution as first services aim at Operating Environments on the high-level road network and will gradually expand to urban areas.

The workshop results will be used in EU EIP as follows:

- The report is published on the EU EIP web page (www.its-platform.eu). Its content is shared among the various platform activities. The workshop participants and addressees of the activity (see Vision and Mission Paper) findings are informed on the report availability.

- The report is also shared with the five ITS road corridors for information and dialogue. In doing so, EU EIP activity 2 on monitoring and dissemination will be involved because of the pivotal role in cross-corridor cooperation.

- The report is further shared with the C-Roads Platform in order to collaborate in a logical and structured way and to cross-fertilise the harmonisation work on the initial C-ITS services.

In about two years time, this EU EIP activity on C-ITS services will invite to a follow-up workshop. The focus of this workshop is planned on results validation and recommendations concerning continued roll-out of C-ITS.

5. References

Berndt, S. et al., EIP+ C-ITS deployment preparation for road authorities and operators, Deliverable 2 of EIP+ Sub-Activity 4.1, 2016a, www.its-platform.eu.

Berndt, S. et al., EIP+ White Paper on Cooperative ITS Services, Deliverable 1 of EIP+ Sub-Activity 4.1, 2016b, www.its-platform.eu.

CODECS 2017. CODECS project web site. Cited 11.12.2017. http://www.codecs-project.eu/