D1.1 City status and requirements for C-ITS deployment

WP1 – City status and requirements

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Cooperative ITS for Mobility in European Cities

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES


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1. Introduction

1.1 Background

There have been numerous research and development projects within the area of ITS and C-ITS. They have mostly been focusing on the technical issues, and have shown that the technical solutions for ITS/C-ITS are working. However, the contribution from these technical solutions to the planning of urban transport policies, and the implementation of these policies, has not yet been proven. Deployment of C-ITS must be rooted in these policies, and it is therefore important that the requirements, possibilities and barriers of those stakeholders being responsible for developing these policies is heard. It is also important that the understanding of the C-ITS technology, its potential and its limitations are known by the cities.

1.2 Objectives and ambition

The objective of work package 1 in CIMEC is to identify the main transport challenges faced by the cities, the plans and strategies in place to deploy C-ITS and the possible barriers against doing so. Both internal and external conditions are addressed.

The ambition of this deliverable is to present the *city perspectives* on C-ITS, both as an enabling technology and also enablers and obstacles when it comes to deploying the technology. These perspectives are captured through surveys and workshops described in chapter 2. The input from the cities is valuable as it is provided outside any possible technical boundaries, and it is provided with the language of the cities, and not by means of a technical language. The document is presenting the understanding of C-ITS as the cities see it, this includes how C-ITS can be an enabling technology, but also where the potential of C-ITS is not recognised.

1.2.1 Structure of this document

The findings from the workshops and surveys are presented in the following sections in this deliverable:

- Transport related challenges, strategies, plans and use of ITS/C-ITS (chapter 3)
- Activity areas for C-ITS (chapter 4)
- Use Cases for C-ITS (chapter 5)
- Barriers and requirements (chapter 6)

This work package provides input and information to WP3 and represents part of the basis upon which roadmaps for facilitating the deployment of C-ITS will be drawn.

1.3 Some terms used in this document

1.3.1 ITS and C-ITS

In the CIMEC WP1 surveys, the following text has been used to describe ITS and C-ITS to the participants, who may not be familiar with these terms:

«Intelligent transport systems (ITS) are transport systems where information and communication technologies have been applied to make the transport system safer, more efficient, more reliable, more comfortable and more sustainable. The ICT systems enabling road hazard warnings and information on alternative routes are typical examples on how ICT has been applied to make the transport system safer, more efficient and more reliable.

A further development of the different ICT systems which together make the backbone of ITS, has led to the term Cooperative Intelligent Transport Systems (C-ITS). The different ICT systems are related to the vehicle, the roadside equipment (e.g. light signals), the equipment carried by the transport service user (e.g. a smartphone) and to the central equipment (e.g. a traffic monitoring and controlling central). In a cooperative system, the different ICT systems exchange data/information in real time. This improves the ITS service beyond the scope of the stand-alone system, and this is the core idea behind C-ITS. »

1.3.2 Use cases

Both the surveys and the workshops came up with several challenges and activity areas, in which the use of C-ITS technology and/or a different organisation and better cooperation between stakeholders and organisations were foreseen to be tools to improvement.

The term *use case* in this deliverable

- describes an ICT service,
- includes the use of C-ITS as technology to run the service,
- includes the city as at least one involved part in running the service and
- the benefits of performing the use case should be describable.

CIMEC does also cooperate with the CODECS project, and the use cases from CODES are brought into the discussion in CIMEC. Use cases from other projects and activities related to ITS/C-ITS are also presented as part of the context.

The use cases from other projects and activities do not necessary fulfil the CIMEC requirements to a use case.

2. Method for information gathering

2.1 Data and information collection instruments

The activities in this work package have been concentrated around two approaches for collecting information: on-line surveys and stakeholder workshops.

2.1.1 Online surveys

Two online surveys have been distributed to local stakeholders in the CIMEC partner cities and representatives of cities within European regions respectively. The surveys were available in English, German, Spanish and Norwegian. Both surveys were distributed as an open link, implying that it has not been possible to identify response rates or send direct reminders to the invited respondents.

Responses from the surveys have been used as input to and a starting point for workshop discussions, and to supplement/broaden the topics identified through the workshops.

The surveys have also been used for identifying and getting contact details for possible participants in the WP2 Supplier survey. Each of the surveys have been documented in project memos (internal), as a basis for CIMEC D1.1.

2.1.2 Workshops

Each of the four CIMEC partner cities hosted two workshops (one local and one regional) during the first three months of 2016, eight in total:

1. The city workshop for Reading, January 13
2. The regional workshop for UK/Ireland, January 13
3. The city workshop for Kassel, February 1
4. The regional workshop for the German-speaking countries, February 2
5. The city workshop for Trondheim, February 16
6. The city workshop for Bilbao, February 18
7. The regional workshop for Spain/France, February 19
8. The regional workshop for the Nordic area, March 10

The workshops were mainly held in the local language. The duration of each of the workshops was ½ -1 day. Each of the workshops have been documented in project memos (internal), as a basis for CIMEC D1.1.

The city workshops and the regional workshops were all planned as a cooperation between WP1 and the local partners. The practical arrangements were the responsibilities of the local partners. The content of the workshops was a shared responsibility between the local partners and WP1. The results

from the on-line survey A were sorted according the cities and the regions, and used as input to the planning of the workshops.

2.2 Scope and target groups

Different stakeholders have different requirements and different viewpoints on the uptake of C-ITS. The CIMEC project has addressed several types of stakeholders.

- The regional survey and the regional workshops addressed the stakeholders mainly being into traffic management. These stakeholders are responsible for planning and management of the road network, including decisions regarding the use of different technologies, C-ITS included.
- The local workshops, and the follow-up survey to these, did address a wider range of stakeholders. Traffic management was invited to these workshops as well, but also police, fire brigades, city planners, public transport companies, freight and logistics services providers as well as users of the road network.

An overview on participation in the CIMEC WP1 surveys and workshops by city/region is included in table 1.

Table 1: WP1 Surveys and workshops; participation by city/region

	READING / UK CITIES	KASSEL / GERMAN SPEAKING CITIES	TRONDHEIM / NORDIC CITIES	BILBAO / SPANISH & FRENCH + OTHER CITIES	SUM
LOCAL STAKEHOLDERS:					
Workshop:					
Stakeholders	12	21	10	16	59
Additional CIMEC partners	*6*	*8*	*3*	*5*	*22*
Survey B:	2	6	4	5	17
REGIONAL STAKEHOLDERS:					
Workshop:					
Stakeholders/city representatives	12	28	5	4	49
Additional CIMEC partners	*6*	*8*	*3*	*5*	*22*
Survey A:	10	26	9	13	58

2.2.1 Local city workshops and survey

The purpose of the local workshops and the accompanying survey was to get a fuller understanding of each of the CIMEC partner cities' complex needs and requirements, as well as an overview of how familiar different types of stakeholders are with cooperative ITS systems (C-ITS) and the role such systems can play in cities.

The local city workshops were targeting a wide range of stakeholders either influencing the traffic in the city, or being influenced by the traffic. Traffic managers, emergency services, parking companies, distribution companies and public transport companies were among the stakeholders. The participants were identified and recruited by the respective local CIMEC partners. A total of 59 local stakeholders participated in the four local city workshops.

Survey B was distributed to the participants in the local city workshops after the city workshops, and targeted the participants in the city workshops only. Out of the 59 local stakeholders taking part in the workshops, 17 (29 %) responded to this survey.

2.2.2 Regional workshops and survey

The purpose of the regional workshops and the accompanying survey was to explore the transport challenges and transport policies in cities, prevalence of ITS/C-ITS in strategic plans and policies, as well as investigating potential barriers towards greater use of ITS/C-ITS in a broader range of European cities.

The regional workshops were held with stakeholders in the traffic planning, ITS and management functions. Participants in the survey and workshops were recruited through the respective networks of the CIMEC partners representing multiplier organisations on European and national/regional level: POLIS, OpenTrafficSystems City Association (OCA) in the German speaking countries, the UTMC initiative in UK, MLC in Spain and neighbouring countries, NPRA in Nordic countries. As the survey and workshops primarily were intended for cities and persons which could be expected to have some knowledge and experience with ITS and C-ITS, invitations were not distributed via more general city networks. The recruitment process was not aiming at getting a representative sample with respect to city "ITS maturity", but rather to get a picture of the status for cities which had already some engagement in utilizing ITS/C-ITS. A total of 49 city representatives took part in the four regional workshops.

Survey A was distributed in advance of the regional workshops, and provided input to the planning and accomplishment of the workshop. A total of 58 persons responded to the survey, representing 53 unique European cities/local authorities.

3. Transport related challenges, strategies, plans and use of ITS/C-ITS

In the WP1 surveys and the workshops, participants were asked to describe the situation in their cities with regard to transport related challenges, strategies and plans, and how/to what degree ITS/C-ITS is included. The survey responses based on pre-defined categories are presented on an overall level, with comments on regional and city size differences. Additional text responses with elaboration of the responses are grouped in categories under each topic. The full text of these responses is included in Appendix 3.

3.1 Transport related challenges

Participants in Survey A were asked to state what they consider the three most prominent mobility/transport challenges in their city, based on a list of pre-defined categories (Figure 1). The responses indicate that *congestion* and *air pollution* are considered to be the most prominent transport related challenges in European cities, with *traffic safety* and *quality of public transport* are the "runners up".

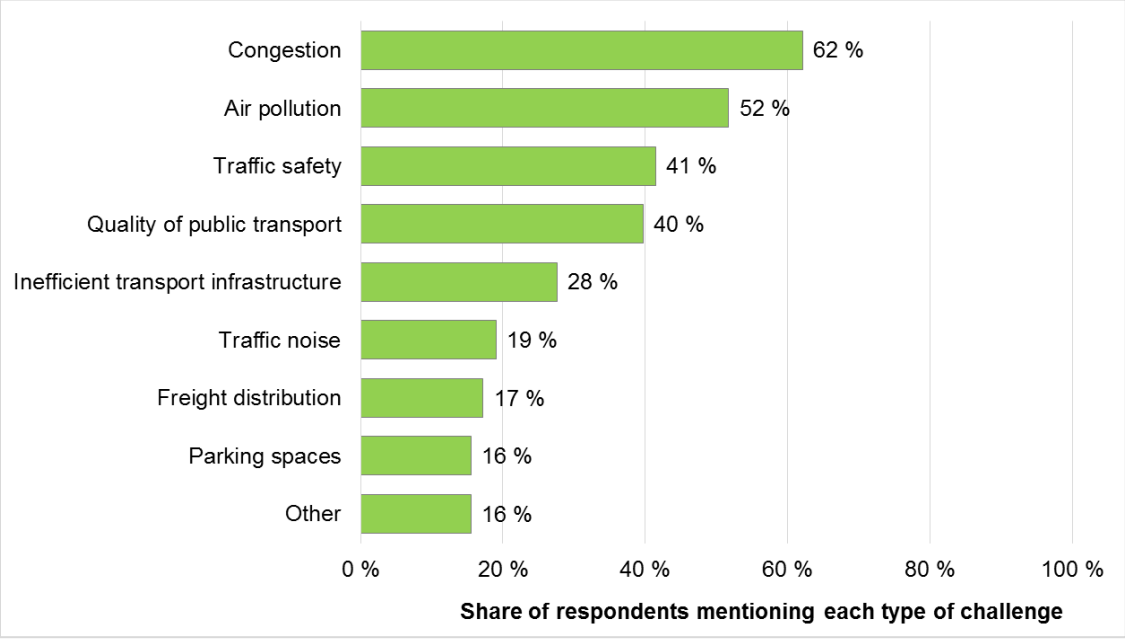

Figure 1: Three most prominent mobility/transport challenges in the cities (Survey A, Q6, N=58)

3.1.1 Transport related challenges by region

The survey responses indicate some differences between the regions, but without any clear pattern. Traffic congestion is reported to be a more prominent challenge in cities in the English-speaking region than in the other regions. Similarly, freight distribution seems to be considered more of a challenge in the Nordic cities.

3.1.2 Transport related challenges by city size

The most prominent challenge (congestion) appear to be equally important independent of city size, and the same is the case for the less prominent challenges related to insufficient transport infrastructure. For the "medium sized" cities, with a population of 200-499 000 inhabitants, Traffic safety and Quality of public transport are reported to be the most prominent transport related challenges.

3.1.3 Elaboration of challenges

The Survey A respondents were invited to elaborate further on the challenges their cities are facing. The topics mentioned have been grouped into categories, as shown in Table 2. Issues related to achieving a modal shift is on the top of this list. In addition to the issues also included in the pre-defines categories, some additional aspects were mentioned, such as lack of staff, challenges related to historic city centres, and how to manage and prioritise access to and use of limited space.

Table 2: Issues included in elaboration of transport related challenges (Survey A)

ISSUES INCLUDED IN ELABORATION OF TRANSPORT RELATED CHALLENGES (Q7, N=45)
▪ How to encourage to and obtain modal shift (21) ▪ Traffic levels/Congestion/Time loss (16) ▪ Pollution (12) ▪ Freight (8) ▪ Commuters and management of rush hour traffic (7) ▪ Limited available space, and how to prioritise the use (6) ▪ Decaying infrastructure (5) ▪ Parking (5) ▪ Funding/resources (5) ▪ Lack of adequate staff (4) ▪ Historic settings providing extra challenges (3) ▪ Priority/access control (2) ▪ Compatibility of technical systems (1)

This elaboration on the cities' transport related challenges also includes comments which have be used to identify/form the basis for possible use cases for C-ITS (Table 5).

The transport related challenges identified in the survey were used as a starting point for the workshop discussions. Through these discussion, additional challenges came up, such as lack of coordination of

prioritisation of measures and resources, due to responsibility for different parts of the infrastructure being divided on different geographical administrations.

3.2 Transport policies and use of ITS/C-ITS

Aiming at exploring to what degree European cities use ITS/C-ITS to handle the challenges presented above, the survey A participants were asked to identify the three most prominent categories of policy/strategy measures used by their city, and whether these measures supporting this policy include the use of ITS/C-ITS. The survey included five pre-defined policy categories as presented in Table 3. These policy categories and examples of measures are based on the structure used in a review of Sustainable Urban Transport Plans (SUTP) by Wolfram et al (2005), and adapted to the ITS/C-ITS focus of CIMEC.

Table 3: Categories of policies and measures included in survey

POLICY/STRATEGY CATEGORY	EXAMPLES OF SUPPORTING MEASURES
Enhancing modal shift by "Push" measures	▪ Road User Charging ▪ Access restrictions ▪ Clean Zones ▪ Parking restrictions
Enhancing modal shift by "Pull" measures	▪ Promotion of public transport ▪ Car sharing or Walking and cycling ▪ Mobility plans and Awareness raising ▪ Interconnectivity
Improving transport efficiency	▪ Road speed regulation ▪ Freight transport management and logistics
Improving traffic safety	▪ Road design and regulation ▪ Safer vehicles ▪ Safer user behaviour
Developing clean and silent transport systems	▪ Targeted noise reduction measures ▪ Alternative fuels and retrofitting for captive fleets ▪ Access restrictions based

Figure 2 presents the prevalence of these policy categories. *Pull measures for enhancing modal* shift is by far the most dominant category. Among the *other* strategies listed, are innovative road surfaces and speed limits to reduce noise, and use of C-ITS and new technologies to improve transport efficiency.

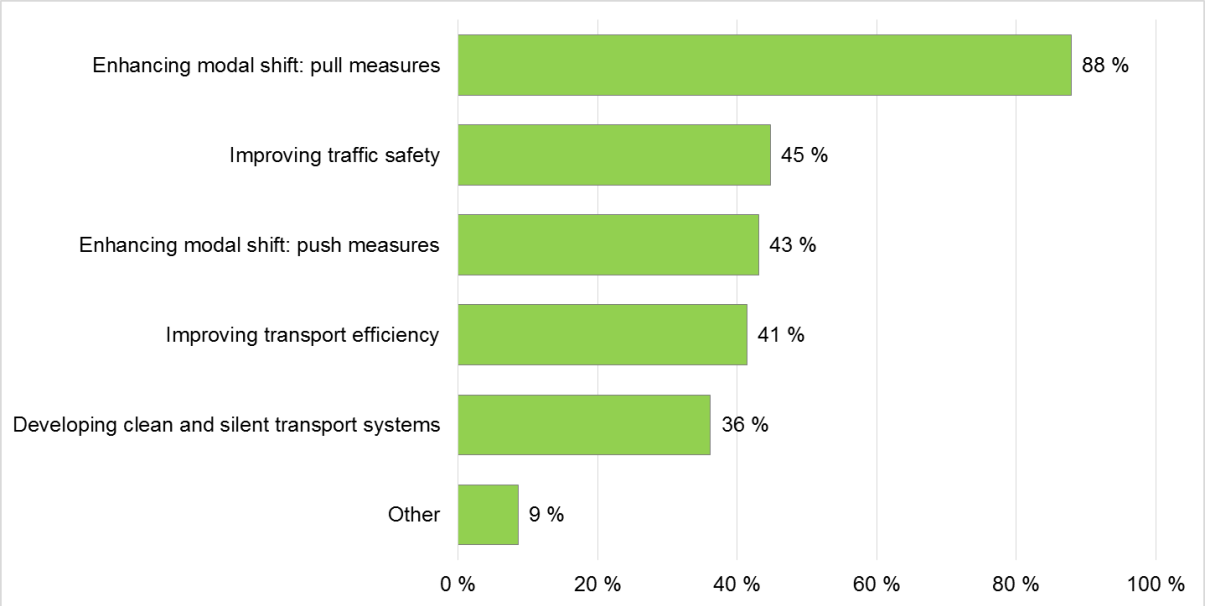

Figure 2: Prevalence of policy categories for handling transport challenges in European cities (N=58)

3.2.1 Transport policies by region

The results indicate some possible regional variations: The Nordic cities report a higher prevalence of push-measures than cities in the other regions, while responses from the English-speaking indicate a relatively higher prevalence of measures to improve traffic safety and transport efficiency.

3.2.2 Transport policies by city size

The responses show that the prevalence of pull measures tends to be at a high level, regardless of city size, whereas there are indications that prevalence of policies for developing clean and silent transport systems increases with increasing city size. This result reflects the problems with congestions and air pollutions reported by the largest cities.

3.3 Prevalence of ITS/C-ITS applications in policy measures

In order to examine the current role of ITS/C-ITS in tackling transport challenges, the respondents were asked to indicate whether ITS/C-ITS applications were explicitly included in measures supporting each of the reported categories of policy, and if so; at what stage in the process towards full implementation. The following sections present responses regarding measures supporting the different policy categories, and the use of ITS/C-ITS for these measures. The presentation of results is based on all responses, and take into account whether or not the policy category in question is included among the three most prominent strategies in the city, and whether the pre-defined measures for this policy category is included in the strategy and/or ITS/C-ITS is considered relevant for the measure in question.

In this range of questions, there was made no distinction between ITS and C-ITS. The accompanying free text description of the operational applications, indicate that these are mostly based on conventional ITS, whereas the applications under planning include C-ITS to a larger degree. The text responses also show that the respondents have counted in demonstrations and test activities when reporting on operational applications. *When reading the following text and graphs, therefore please note that the response category "ITS/C-ITS applications are operational" may include tests and demonstrations of applications in addition to any full scale implementations of such applications.*

3.3.1 Prevalence of ITS/C-ITS applications in pull measures supporting modal shift

Figure 3 shows the level of inclusion of ITS/C-ITS applications in the various pull measures supporting strategy for modal shift. Use of ITS/C-ITS seems to have progressed the most in Promoting public transport, where nearly half of the respondents state that their city have operational applications. One out of four cities also claim that they have operational ITS/C-ITS applications for promotion of walking and cycling.

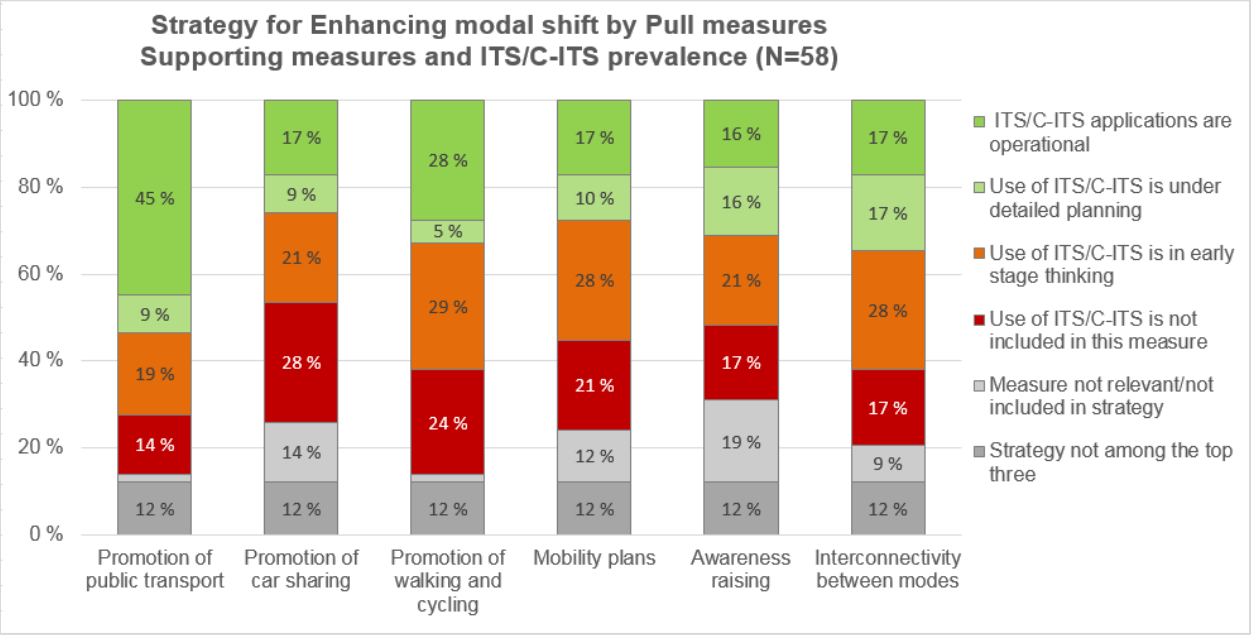

Figure 3: Use of ITS/C-ITS applications in pull measures supporting strategy for modal shift

There are no clear patterns indicating that prevalence of operational ITS/C-ITS applications within this range of measures vary with city size. The results however indicate that the larger cities (< 1,000k inhabitants) to a larger degree has started thinking about including ITS/C-ITS applications in their pull measures, e.g. for promoting public transport and walking/cycling, for mobility plans and for raising awareness.

The text responses describing the operational applications *promoting public transport* include bus and tram priority at intersections, real time information for bus, and travels planners for bus, as well as coordination of/cooperation between bus and taxi services. Travel planners on apps and web are also operational for *pedestrians*, as are adaptive timing plans for traffic signals oriented towards shortened pedestrian waiting times at crossings.

3.3.2 Prevalence of ITS/C-ITS in measures for improving safety

Nearly half of the respondents report that Improving safety is among the top three transport policies in their city. The majority of these strategies include measures for Safer user behaviour, and one third of the cities have ITS/C-ITS applications operational or under detailed planning as part of these measures (Figure 4). ITS/C-ITS applications are also to a large degree included in measures regarding road design and regulation.

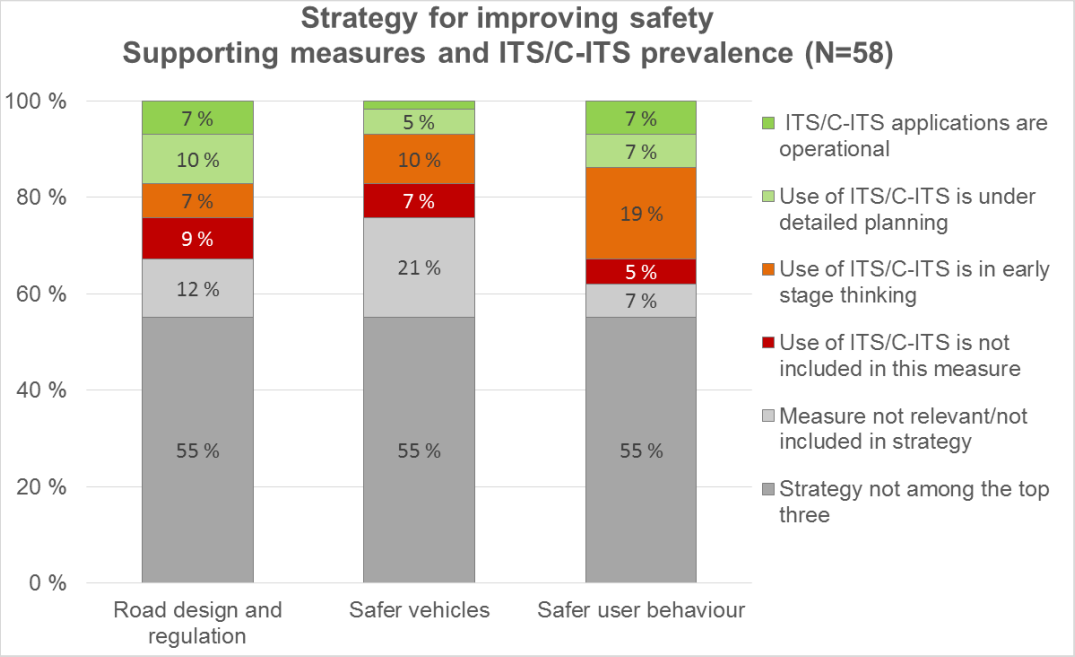

Figure 4: Use of ITS/C-ITS in measures supporting strategy for improving safety

The text responses describing the operational applications for improving safety include the use of Variable message signs (VMS) to promote highway safety standards.

3.3.3 Prevalence of ITS/C-ITS in push measures supporting modal shift

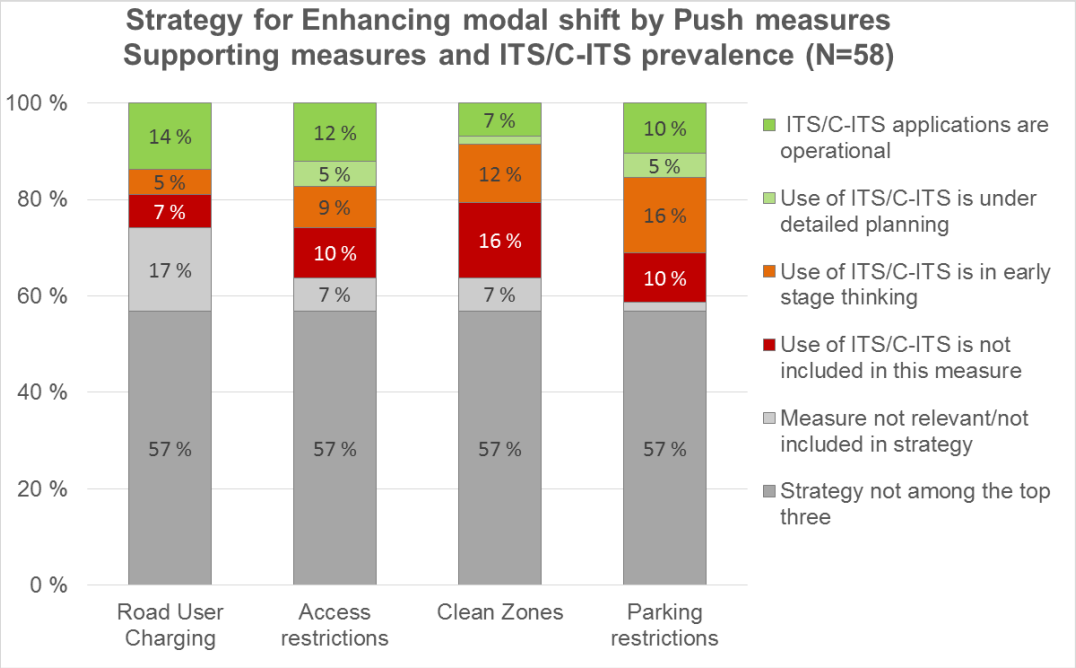

Figure 5: Use of ITS/C-ITS in measures supporting strategy for modal chift by push measures

Out of the three most reported measure categories, push measures seem to have the greatest variation in use. For instance, Figure 5 shows that road user charging is not included or not even considered relevant to a large proportion of the respondents from cities including push measures among their policies, but at the same time, a nearly as large share report that ITS/C-ITS applications for road user charging are operational. This indicates a divide in use of that particular measure. The divide does not appear to relate to city size. The results however show that the group which does not use ITS for road user charging or considers is irrelevant is highly dominated by German-speaking cities. Conversely, Nordic cities dominate the group reporting that ITS applications related to road user charging are operational.

Other than road user charging, access restrictions appear to be the policy measure where use of ITS/C-ITS is most prominent. One Nordic city reports to have operational application for monitoring and controlling access to a parking garage just for electric cars, and to be working on a pilot with sensors for monitoring and controlling the entire set of parking regulations at street level in spring 2016. They have also started thinking about using OBUs for access control for residential parking in low emission zones.

3.3.4 Prevalence of ITS/C-ITS in measures for improving transport efficiency

Operational ITS/C-ITS applications for improving transport efficiency are mainly included in speed regulation measures (Figure 6). One third of the cities applying this type of measures, report that supporting ITS/C-ITS applications are operational.

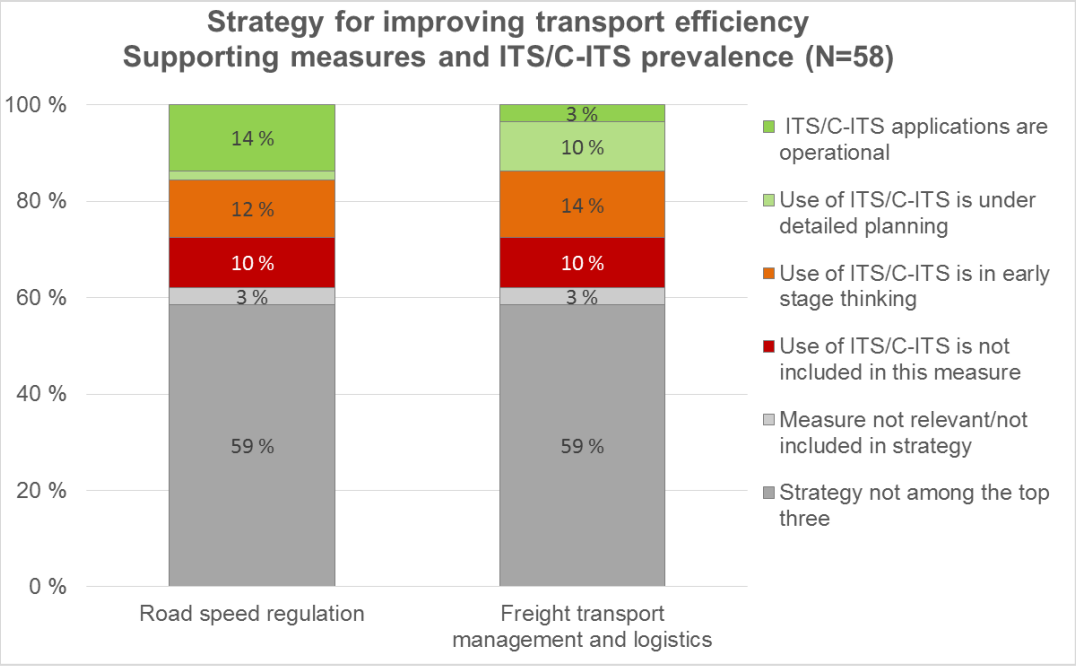

Figure 6: Use of ITS/C-ITS in measures supporting strategy for improving transport efficiency

Operational ITS/C-ITS applications supporting Road speed regulation measures are reported by one in three respondents from both the Nordic and the English-speaking region, and by none from the German-speaking cities. There are also no reports of operational applications supporting measures for Freight transport management and logistics from the respondents representing German-speaking cities. There is no clear finding of a pattern of uptake of applications within this policy-area depending on city size.

The text responses describing the operational applications supporting *improved transport efficiency* include the use of Urban Traffic Control (UTC) to identify traffic issues and automatically implement system activated plans to alleviate local network pressures. VMSs are used to provide advanced information regarding events that may impact upon traffic congestion levels. One city also reports VMS being upgraded to a more user definable format permitting more appropriate signage and notifications.

3.3.5 Prevalence of ITS/C-ITS in developing clean and silent transport systems

None of the English-speaking respondents did include strategies for developing clean and silent transport systems among the top three strategies for their city, and consequently the survey gives no information about measures and use of ITS-applications within this field for the English-speaking cities.

ITS/C-ITS applications as a tool for developing clean and silent transport systems are mainly related to Hybrid and electric vehicles, and in the Nordic and "Other" countries.

None of the smaller cities (with up to 200 000 inhabitants) are reported to have any applications operational or under planning within this policy area. All reports of operational applications are from cities of 500 000 inhabitants or more.

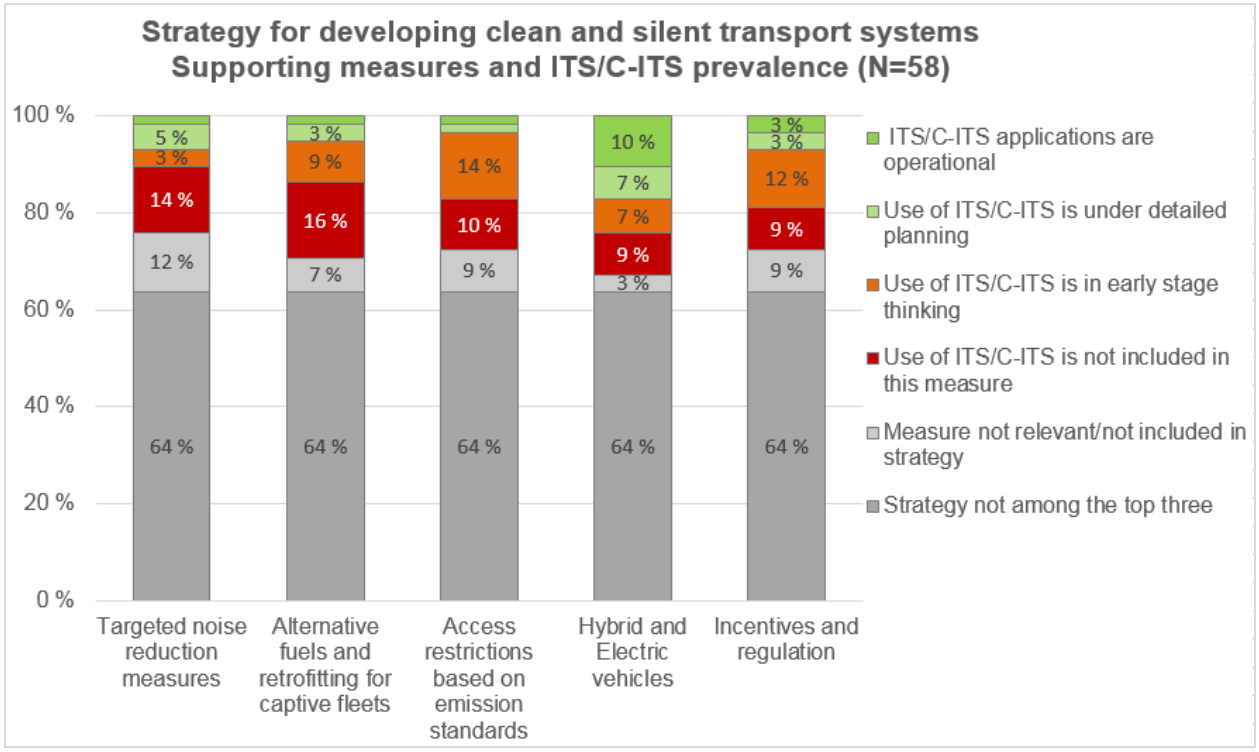

Figure 7: Use of ITS/C-ITS in measures supporting strategy for developing clean and silent transport systems (N=21)

3.4 Strategy for greater use of ITS/C-ITS

In total, one out for four respondents in Survey A states that their city already have a strategy for promoting and increasing the use of ITS/C-ITS, and an additional four out of ten are working on such a strategy. One in three neither have nor do work with a strategy for greater use of ITS/C-ITS.

3.4.1 Prevalence of strategy by city size

The responses give indications of a pattern with respect to city size: the share of cities not working with a strategy, decreases with increasing city size. On the other hand, the share of cities which already have a strategy is highest among the smallest cities (Figure 8).

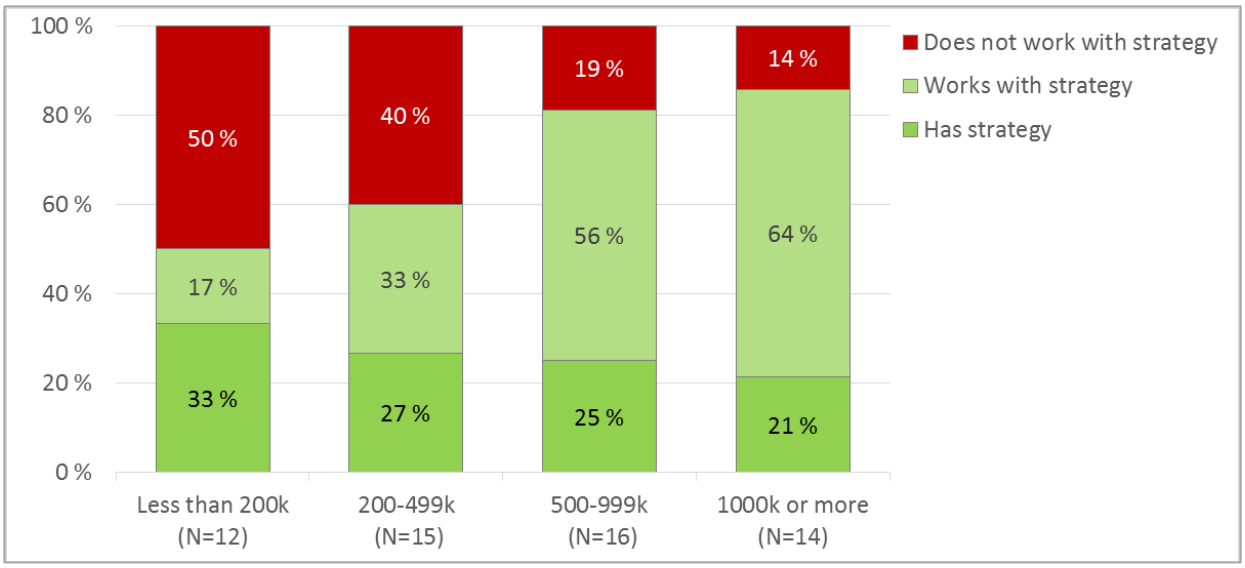

Figure 8: Prevalence of strategy for (greater) use of ITS/C-ITS, by city size (population)

3.4.2 Prevalence of strategy by region

There are also indications of differences between the regions (Figure 9). The share of cities not working with a strategy for ITS/C-ITS is lowest among the English-speaking cities, and highest among the German-speaking. The German-speaking cities also have the lowest share of cities which already have a strategy.

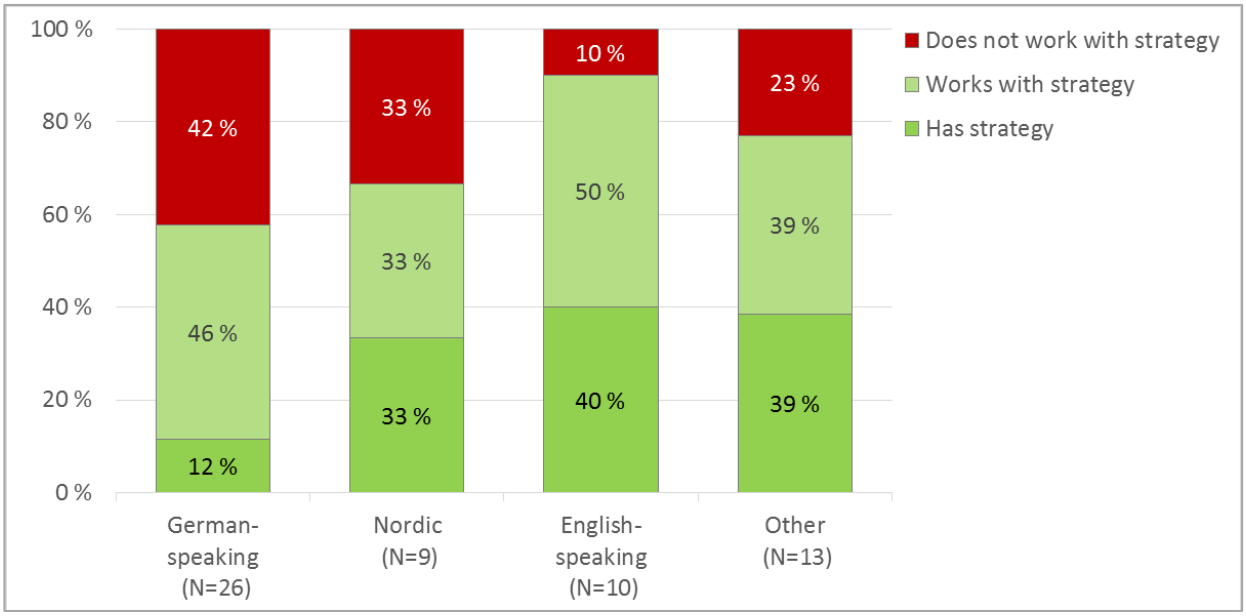

Figure 9: Prevalence of strategy for (greater) use of ITS/C-ITS, by region

3.4.3 Strategy elements

The respondents stating that their city already has or is working on a strategy for ITS/C-ITS, were asked about what topics are included in this strategy. The summary of responses, with share of the plans including each of a pre-defined list of topics, is shown in Figure 10.

Data management is part of nearly all the plans, with *Strategic goals* as a runner-up. Few of the plans include *Commercial development*.

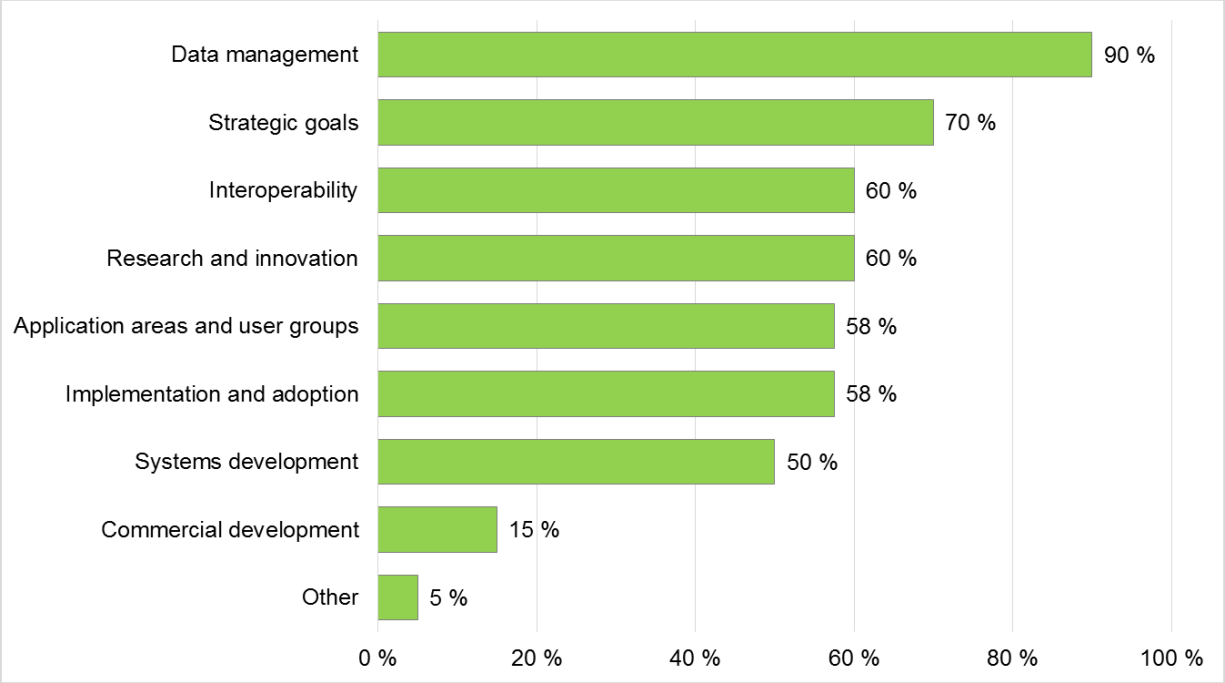

Figure 10: Topics included in strategies for promoting and increasing use of ITS/C-ITS (N=40).

3.4.4 Reasons for lack of strategy for ITS/C-ITS

Respondents that stated their city does not have a strategy for ITS/C-ITS nor is working on such a strategy, provided reasons for not doing so. Their reasons are presented in Figure 11. The figure shows that not having sufficient personnel with ITS/C-ITS competence and sufficient financial resources are most prominent.

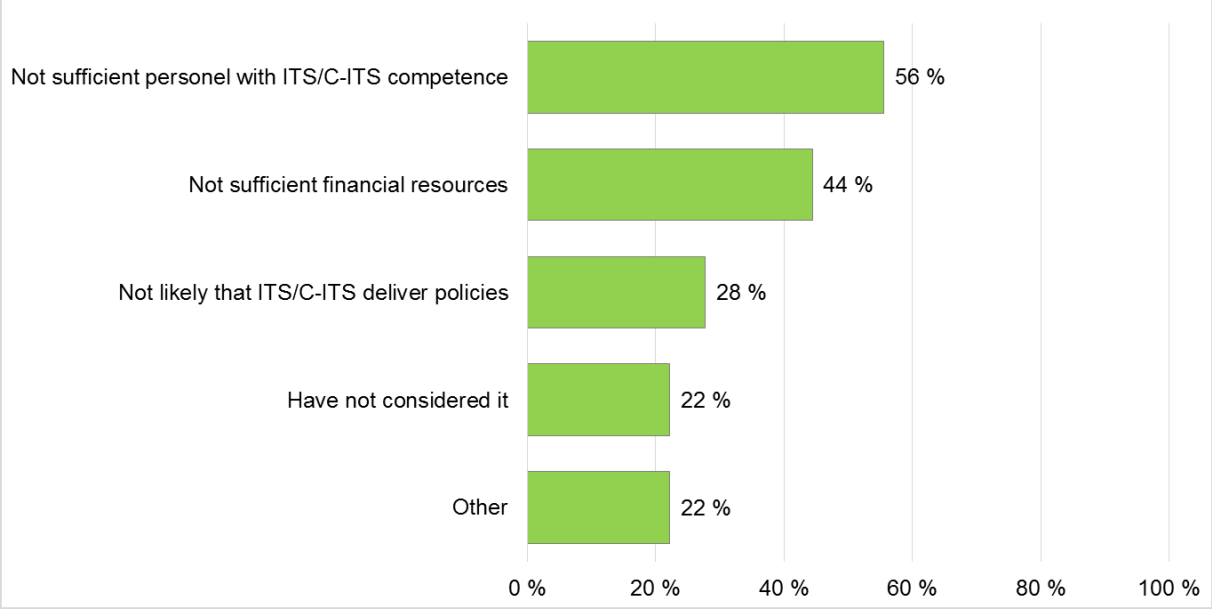

Figure 11: Reasons for not having/working with strategy for promoting and increasing use of ITS/C-ITS (N=18).

Somewhat surprisingly, one in three do not consider it likely that ITS/C-ITS will help them deliver their policies. These respondents tend to be less involved with ITS/C-ITS in their daily work. In total 19 % report that they have not considered developing a strategy for ITS/C-ITS. All respondents who state they have not considered a strategy, come from cities with less than 500,000 inhabitants.

3.5 Knowledge of C-ITS in own organisation

The respondents were asked to describe the overall knowledge of C-ITS in the different parts of *their own organisation*. The responses describing level of knowledge have been converted into an average score between 0 and 3, with 0 = "No knowledge" and 3 = "Extensive knowledge". The scores shown in Figure 12 indicate that the level of knowledge about C-ITS is assessed to be highest among those closest to the day-to day running of the transport systems. A lower level of knowledge about C-ITS among the staff responsible for making and implementing transport policies and strategies may be a barrier towards increased deployment of C-ITS in cities.

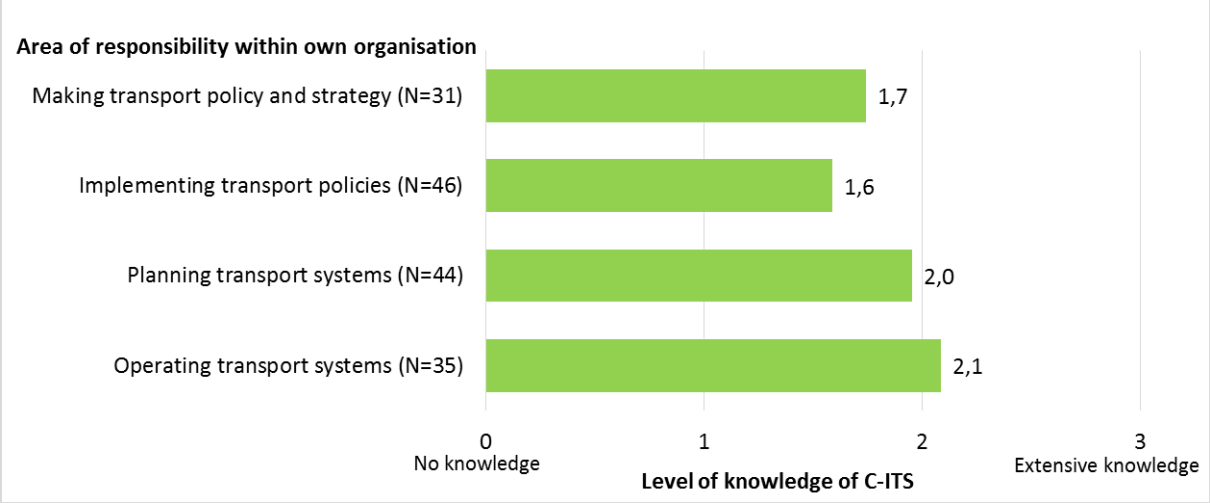

Figure 12: Average score of knowledge of C-ITS in relevant area of responsibility within own organisation

3.5.1 Level of C-ITS knowledge by city size

The number of responses per city size category is limited, and there are no significant differences in average scores of knowledge of C-ITS between cities of different sizes.

3.5.2 Level of C-ITS knowledge by region

The most prominent difference in average scores of knowledge of C-ITS between the regions, is the *German* score for the personnel responsible for *Making transport policy and strategy*, which is lower than for the other regions.

3.6 Experience with use of C-ITS - Use level

In order to document current experiences with use of C-ITS, the survey contained a set of questions designed to identify the cities' "use level" for C-ITS. The questions have been adapted from Anderson's scale for levels of use of technology (as operationalised in Straub 2009). The scale is a tool for identifying the level of use which according to the respondents describe C-ITS in their city. The scale as originally presented consists of seven use levels: from none-use via orientation, preparation, implementation, operation, integration and renewal. None of the original levels describe, however, the substantial share of respondents in this survey who state to be intent on using C-ITS but are not currently working actively towards use. Thus, an additional level – passive – has been included. The eight levels of use applied in this context are described in Table 4, with labels slightly modified compared to Straub 2009.

Table 4: Levels of use of C-ITS

USE LEVEL	DESCRIPTION OF USE LEVEL
0 No intention	Does not use and has no intention of using C-ITS applications
1 Passive	Has intention of using C-ITS applications but not engaged in any activity
2 Orientating	Seeks information about C-ITS applications, but has not determined whether to take it into use
3 Preparing	Is currently preparing implementation of C-ITS application
4 Implementing	Has started implementation but not ready for launch
5 Operating	Has successfully implemented one or more C-ITS applications
6 Integrating	Discusses experiences with implementing C-ITS applications with other cities
7 Renewing	Is modifying/extending implemented C-ITS applications

In total 56 % of the respondents report that their cities are using C-ITS applications today, and of these the majority are active in modifying and/or extending the implemented applications. The figure shows the sample to be fairly divided: whereas nearly half of the respondents consider their city to be at the highest use level (modifying/extending implemented C-ITS application), one in four have no intention of using C-ITS or is not undertaking any activity to pursue use of C-ITS. *When interpreting these responses, the reader should bear in mind the findings described in section 3.3, where the text responses indicated that the respondents have counted in demonstrations and test activities when reporting on operational applications ITS/C-ITS applications. The same may be the case for the questions regarding C-ITS specifically.*

3.6.1 Use level by city size

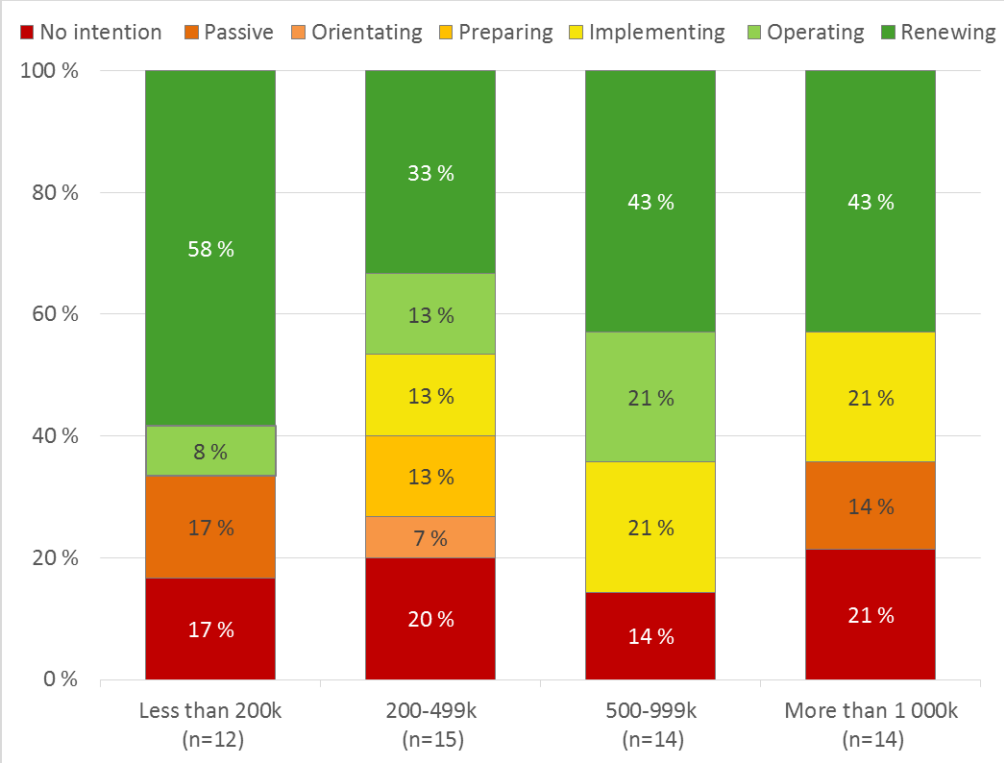

Figure 13: Reported level of use of C-ITS applications in European cities, by city size (population)

Figure 13 shows the reported use levels in cities of different sizes. The results indicate that the smallest cities have come furthest in using C-ITS: More than half of the respondents from these cities report their city to be at the highest use level. Among the smallest cities, there is a tendency that the cities with less than 100k inhabitants are less active than the larger cities within this group.

3.6.2 Use level by region

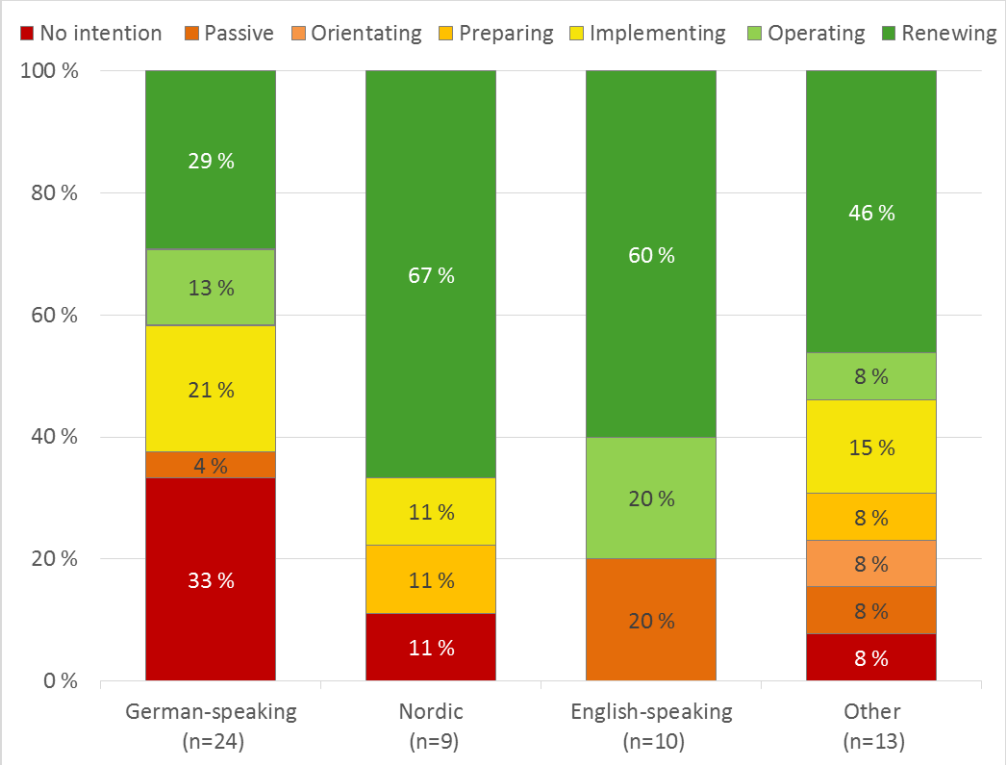

Figure 14: Reported level of use of C-ITS applications in European cities, by region

The reported use levels are highest among the respondents from the Nordic and English speaking regions, and lowest from German-speaking region - see Figure 14.

The proportion of cities reported to have *no intention* to engage in the use of C-ITS is particularly high for the German-speaking region. The cities in this region constitute nearly half of the total sample, and have been to a large degree recruited through the OCA network. The member cities in this network may be more diverse in their relation to ITS than the average respondents to the CIMEC city survey - or the German cities may actually have a lower degree of interest in C-ITS. The average reported use level for cities in the German speaking region is does not vary much by city size, indicating that the total score for the cities in the German-speaking region is not much affected by any skewness in city size distribution.

3.6.3 C-ITS Use level by level of knowledge of C-ITS

The information available from the CIMEC City survey supports an intuitive assumption regarding the relation between knowledge of and use of C-ITS in the cities: the higher the level of knowledge, the higher average score on use level. The survey does not give any information about which aspect is the dependent and which is independent, but there are clear indications of a positive relation between level of use of C-ITS applications in the cities, and the assessed level of knowledge of C-ITS among staff within different areas of responsibility in the cities.

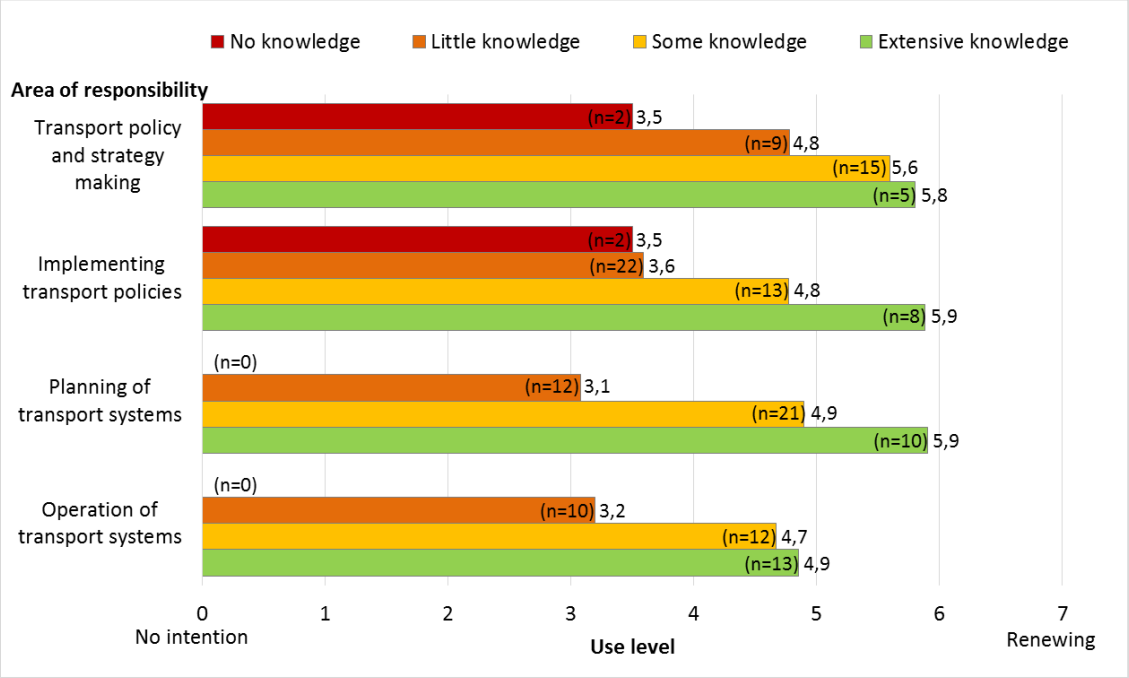

Figure 15: Average reported level of use of C-ITS applications in European cities, by assessed level of knowledge of C-ITS among staff within different areas of responsibility in the cities

3.6.4 Elaboration of C-ITS applications

The Survey A participants were asked to describe in more detail the C-ITS applications in question, whether operational or at some level of planning/preparation. The following gives an overview of the applications by region and status and provisory grouping by topic, with excerpts of the description given by the respondents. The full text is given in Appendix 3. The same type of application may be listed under both operational and planned applications, as the responses come from cities with varying maturity with respect to C-ITS. The C-ITS activity areas presented in chapter 4 and the derived C-ITS use cases presented in chapter 5 include most of the applications described in the following.

German-speaking region:

Operational:

- Data management/data exchange: «MDM (mobility data market)»; «DATEX II»; «Link between road works data and public transport data via traffic management»; «Traffic volume and traffic situation data from urban traffic control system and urban parking guidance system provide data and decision basis for the incident strategies on the Federal Highway network (dWiSta) »
- Traffic lights/priority at signals: «UR: BAN switching time prognosis (SPaT/MAP) via MDM»; «Public transport Priority widely in use»

Ambitions/in proposal/preparation/demonstration:

- Data management/data exchange: «MDM (mobility data market)»; «used for quality management»
- Traffic lights/priority at signals: «Wizard»; «Intelligent traffic actuated signal controllers along event axes ("motion", SIEMENS) »; «Priority circuit for emergency vehicles»; «Smart lighting»
- Public transport: «PT 4.0 C-ITS for public transport in preparation phase»; «Public transport acceleration»
- Real time information/travel planners: «Accessibility / blind support»; «conceptual planning of use cases for vulnerable road users»; «Mobile app for use in proposal phase»

English-speaking region:

Operational:

- Data management/data exchange: «Use an open data platform, utilising RTIG XML, DATEX and UTMC standards to share live travel and network status data and drive a range of public facing information dissemination systems, (on-street, web and mobile)»; «UTMC systems linked to neighbouring authorities»; «Running a UTMC system and separate VMS, JT, AQM systems but slowly trying to integrate them together via a Common Database»

- Traffic lights/priority at signals: «Public transport systems (bus, tram) centre-to-centre (and some locally operated) co-operation with the centralised traffic light system»; «Some limited bus priority»

Ambitions/in proposal/preparation/demonstration:

- Data management/data exchange: «'Open Data' access to relevant information sources is being developed»; «Developing links with CRM systems, initially to exchange car parking data and allow for customer focussed car parking provision»

Nordic region:

Operational:

- Data management/data exchange: «Newly developed map-based system for recording roadworks (StartUp) which transfer data into traffic management centre via DATEX II».
- Traffic lights/priority at signals: «active signal priority for public transport»
- Public transport: «Bus Priority works between the city and transit agency, now developed as one wireless system based on GPS and Rachel (tetra) »
- Real time information/travel planners: «Travelling Information»; «Real-time information for bus and public transport priorities use cooperative elements where the bus itself identifies and requested priority and de-registering the need after passage of the stop line»; «and real-time information system»

Ambitions/in proposal/preparation/demonstration:

- Traffic lights/priority at signals: «Want to do test where real time detection in the tunnel can communicate with the Traffic signals in the city centre in thus give a better flow»
- Data management/data exchange: «In the middle of a tender with surveillance and maintenance of traffic signals and as part of that a request is that all signals are upgraded to an open protocol. We hope that this will provide us with many more opportunities for C-ITS in the future»; «testing system connected traffic signals for the long term to be able to monitor and control these from traffic management centre»
- «The city cooperates with Volvo on Drive-Me project which is self-driving cars that will go on a test stretch around the city. The project ElectriCity used GPS controlling what drive and what speed electric and hybrid buses should use»

Spain/France/Other European countries:

Operational:

- Data management/data exchange: «All the available information it is offered to the developers in Open Data»
- Traffic lights/priority at signals: «Energy Efficient Intersection Services (priority at traffic lights and time to green/speed advice) in operational use for transport company and emergency services»; «GERTRUDE for traffic light management»; «Traffic signal priority for fire service vehicles»
- Real time information/travel planners: «FUTÁR system, a dynamic traffic management and passenger information system. All vehicle in the PT fleet are equipped with satellite based tracking devices which enables the transport operators in retrieving real-time data about the position of the vehicle and possible disruptions on PT lines. This facilitates the real-time journey planning and reduction of travel times for passengers. FUTÁR system manages 30 signalised intersections in Budapest, where PT vehicles are automatically prioritised. The extension of the traffic management system is expected in the future»; «Public transport information is used to inform users about waiting times and combinations of routes. They also inform about any kind of parking slot availability, some of them with real time information. Traffic congestion data is also available»
- «Traffic radar system. Traffic monitoring cameras»

Ambitions/in proposal/preparation/demonstration:

- Freight: «working on a mobile apps and sensors-based pilot to interact with the freight distributor in the detection of the occupancy of the parking slots to inform the user about the availability of these parking slots in real time»
- «The trials carried out under the COMPASS4D project need to be extended. C-ITS is needed to help limiting the use of private vehicles in the city centre, decongesting traffic and reducing its impact, while facilitating modal shift towards the structuring public transport lines (P&R) and implementation of parking policy. A link-up with the SCOOP@F pilot site on the bypass is a determining factor»
- «We want to use C-ITS to promote - bicycles (to provide information about time to green/ time to red of traffic lights on bicycle routes), - public transport (preconditioned priority at traffic lights, based on full/ empty vehicle, timetable) - air-pollution (green time/ waiting time traffic lights based on actual values air pollution), - emergency transport (full priority at traffic lights) »

3.7 Experience with issues related to use of ITS/C-ITS

The respondents were asked about the experience with a range of issues related to use of ITS/C-ITS applications in general in their city, and to what degree these issues were a problem (Figure 16).

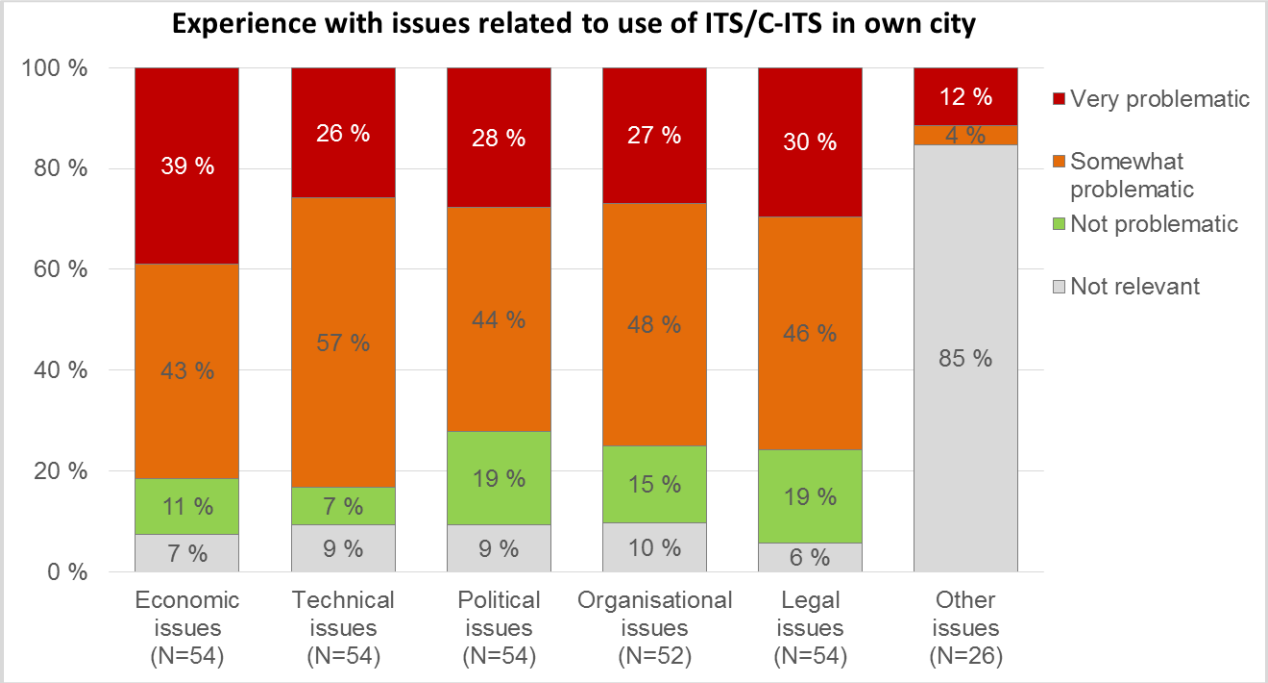

Figure 16: Severity of issues experienced with use of ITS/C-ITS in own city

The majorities of the cities experience problems regarding all types of aspects concerning the use of ITS/C-ITS. The results give indications of a few but not prominent differences between the categories of issues. The Economic issues may be slightly more severe than the rest, and also the technical issues are being experienced as somewhat more challenging than the remaining issues.

3.7.1 Experience with use of ITS/C-ITS by city size

There are no clear signs of systematic differences in responses relating to city size.

3.7.2 Experience with use of ITS/C-ITS by region

There are clear indications that respondent from the German-speaking region tend to assess the issues as more problematic than respondents from other regions. Whether this is due to the problems actually being more severe, or a result of scale-issues, is not clear.

4. Activity areas from the online surveys and the local and regional workshops

4.1 CIMEC activity areas and C-ITS use cases

This section of the deliverable presents all the areas in focus from the local and regional workshops as well as from the survey A.

The participants in the different workshops and the surveys used different terms, and the level of details varied. The activity areas described by the cities contributing to CIMEC WP1 activities, quoted/extracted in Table 5, have been analysed and grouped into the following categories of activity areas, of which some are overlapping, but of different character:

- *Multimodal traffic and transport management*
- *Information exchange*
- Individual traffic management
- In-vehicle signalling
- Management of urban freight
- Management of electric vehicles
- Management of traffic lights
- Parking management
- Incident management
- Air pollution
- Support for vulnerable road users
- Car sharing
- Autonomous driving

This grouping is used in Table 5, where the activity areas identified are presented by city/region. The two first categories hold activity area descriptions which are fairly general: The first in terms of how technology can contribute in general, and the second with focuses on the exchange of information, but not necessarily for specific C-ITS applications. Hence, there are no CIMEC C-ITS use cases identified in these two categories. The following series of categories hold activity area descriptions which are more specific, and in practice will support the more general activity areas described in the two first categories. As all activity areas involving specific applications for public transport involve traffic lights management, public transport application is not a separate category, but included in the Cooperative management of traffic lights-category.

Activity areas identified through Survey A are denoted (SA) in the table. Some of the activity areas are printed in bold and marked **UC*n***. These comply with the requirements for C-ITS use cases applied in CIMEC. These requirements and C-ITS use cases are presented in more detail the next chapter. The number *n* refers to the Use case number the activity area corresponds to.

Table 5: Summary of the CIMEC activity areas and C-ITS use cases

CATEGORY	BENEFICIARIES	READING/UK	KASSEL/GERMANY	NORDIC CITIES	SPAIN/FRANCE
Multimodal traffic and transport management	*General public*		Mode and route choice guidance (SA)		Identification and management of transport needs
		Drivers to set in their ways to use ring road rather than drive through the centre at peak times (SA)	Lack of beltway for hinterland traffic (SA)	Through-traffic using city centre (SA)	
					Taxi availability at taxi stands
	All road users	Increase the efficiency in the traffic	Traffic management for all road users		
			Commuter management (SA)		
	Public transport		Possibility for applications in the public transport area (SA)		
	Traffic management operator	Management of road work	Road work management (SA)		
			Detection of traffic flow		

(Table 5 continues on the next page)

CATEGORY	BENEFICIARIES	READING/UK	KASSEL/GERMANY	NORDIC CITIES	SPAIN/FRANCE
Information exchange	*General public*	Use of smart phones for information exchange	Intelligent data platform		Big data management to identify transport on demand
					Congestion information exchange for traffic diversion
	All road users		Data exchange for all road users	Multi modal traffic information	
	Public transport users		Strengthen the traffic information of public transport		Real time information about diversions and any kind of incidences
			On time public transport information		
			Prognosing resident time of public transport at the stop station		
	Traffic management operator		Data exchange between different traffic management operators		
			Provide extensive data for road operator		
			Vehicle-infrastructure communication		
			Exchanging strategies between urban environment + inter-urban environment		
			Standardised geo-information		

(Table 5 continues on the next page)

CATEGORY	BENEFICIARIES	READING/UK	KASSEL/GERMANY	NORDIC CITIES	SPAIN/FRANCE
Individual traffic management	*All road users*		**Individual routing of vehicles (UC1)**		Congestion, events and incident on-board information for diversion advices.
			Cooperative routing (UC1)		
			Navi (UC1)		
			Intelligent routing (UC1)		
			Hazardious warnings of tunnels (UC1)		
			Routing information for through traffic (UC1)		
			Routing through the city (UC1)		
			Scenario-based traffic management		
			Strategic routing		
In-vehicle signalling	*All drivers*		**Virtual signage (UC2)**		
			Switching states of dynamic road signs to individual transport (UC2)		
Management of urban freight	*Urban distribution*	Distribution cars management in city centre	Integrated traffic management centre	**Management of loading and unloading areas for distribution vehicles (UC3)**	**Loading and unloading slots management at real time (UC3)**
	Long-haul vehicles		Optimisation of heavy-vehicles flow		
			HGV traffic to/from the harbour (SA)		
	All freight vehicles			Include commercial vehicles in the bus priority system (SA)	
			Routing of heavy goods vehicle	**HGVs with dangerous goods (ADR) in tunnels (UC4)** (SA)	
Management of electric vehicles	*Electric/hybrid vehicles*		Support the use of electric driven vehicles in cities	Use of hybrid vehicles	
				Regulation of access to "free" lanes for electric vehicles (UC5)	

(Table 5 continues on the next page)

CATEGORY	BENEFICIARIES	READING/UK	KASSEL/GERMANY	NORDIC CITIES	SPAIN/FRANCE
Management of traffic lights	*Emergency vehicles*	**Green lights for police and emergency vehicles (UC6)**	**Responsiveness of traffic lights to emergency vehicles (UC6)**		**Traffic signal priority for fire service vehicles (UC6)** (SA)
	All road users		**Optimisation of traffic lights (UC7)**		Green time/ waiting time traffic lights based on actual values air pollution (SA)
			Display red and green signal in the vehicle (GLOSA) (UC7)		
			Communication vehicle/traffic light		
			Green time to individual vehicle (UC7)		
			Virtual green wave (UC7)		
	Public transport vehicles	Public transport systems co-operation with the centralised traffic light system (SA)	UR:BAN switching time prognosis (SPaT/MAP) via MDM (SA)	**More effective traffic lights assistance for public transport vehicles (UC8)**	**Bus priority at intersections (UC8)**
			Public transport Priority (SA)		
	Vulnerable road users		**Green waves for cyclists (UC9)**		Provide information about time to green/ time to red of traffic lights on bicycle routes (SA)
Parking management	*Passenger cars*	Exchange car parking data and allow for customer focussed car parking provision (SA)	**Inner-city parking management (SA) (UC10)**	**Access control for residential parking in low emission zones (UC10)** (SA)	**Parking management (UC10)**
			Parking guidance system		
			Direction sign information of parking lots		
Incident management	*General public*		**Incident management (UC11)**	**Emergency warnings (UC12)**	**Incident management and information provision (UC11)**
			Warning of dangerous incidents (UC11)		

(Table 5 continues on the next page)

CATEGORY	BENEFICIARIES	READING/UK	KASSEL/GERMANY	NORDIC CITIES	SPAIN/FRANCE
Air pollution	*General public*			**Poor air quality (NOX) on single days (SA) (UC13)**	
		Reduce air pollution in the cities		Pay as you pollute	
Support for vulnerable road users	*School children*	School travelling management	Availability of requesting green traffic light by young students		**Speed management when children are getting into/leaving schools (UC14)**
	Vulnerable road users	Safety for vulnerable road users	Acoustics user guidance for blind users		
			Enabling technologies for blind people		
		Encourage/ensure that short trips are taken by walking and cycling to the greatest degree (SA)	Safe and attractive pedestrian and bicycle traffic (SA)		
			Transponder technology at traffic lights (UC15)		
			Smartphone positioning for traffic light controlling		
			Cycling detection via smartphone		
			Detection of pedestrians and cyclists in the blind spots		
			Warning of pedestrians between vehicles		
Car sharing				Car pooling	Car pooling
Autonomous driving	*General public (?)*		Support autonomous driving		

As mentioned above, the first category of activity areas in the table is at an overall traffic management level: *Multimodal traffic and transport management*. Since ITS traditionally has been linked to the functions of managing the road traffic, there is no surprise that these areas for traffic management have come up. They do not, however, as presented and discussed in the WP1 work, propose any new functions based on the cooperative aspect.

4.2 Activity areas not presented as C-ITS use cases in CIMEC

The activity areas which do not comply with the requirements for C-ITS use cases applied in CIMEC, are presented in Table 6. There are four main groups of reasons for not classifying an activity area as described by the city representatives as a CIMEC C-ITS use case:

a. The activity area is outside the responsibility of the municipality authorities

   This is the case for e.g. autonomous driving where the authorities in the municipality have no clear role in deployment as this is technology deployed by car manufacturers/commercial service providers. The issue was discussed at the workshops as it for sure will have an impact on the city traffic when it becomes a reality.

b. The activity area is by nature too overall, or political, to serve as a use case

   Several of the areas discussed at the local and regional workshops are of great importance for the management of the city traffic. They are, however, on a very high level, some of them could be considered as strategic or political goals and hence, cannot serve as uses cases for C-ITS deployment. The discussions in the workshop were not detailed enough as basis for specific ICT services. Some issues discussed under these areas are selected as use cases.

c. The activity area is at a technical level but does not include any cooperative technology related to the communication with the road users themselves

   C-ITS is by definition technology supporting and involving communication with the road users in the traffic. Some of the activity areas discussed are at a technical level, but they do include other forms of communication. These are not presented as CIMEC uses cases.

d. The activity area is partly included/represented in a use case, but is not qualified to be a separate use case.

This document has the objective of presenting the current understanding and the current status with respect to the possibilities to deploy C-ITS services in cities. This understanding and this status are to be seen from the cities' point of view. The C-ITS use cases presented are reflecting this viewpoint, and do not necessary reflect any technical expert's viewpoint on the capabilities and the limitations of the C-ITS technology.

Table 6: Activity areas not presented as C-ITS use cases in CIMEC

CATEGORY/ACTIVITY AREA	OUTSIDE MUNICIPALITY AUTHORITY	TOO OVERALL / POLITICAL UNDERSTANDING	DOES NOT INCLUDE C-ITS USED TO COMMUNICATE	PARTLY INCLUDED IN A CIMEC C-ITS USE CASE
Multimodal traffic and transport management		X	X	(X)
Information exchange		X	(X)	(X)
Congestion, events and incident on-board information for diversion advices			X	
Strategic routing		X		X
Distribution cars management in city centre	X	X		X
Integrated traffic management centre		X		X
Optimisation of heavy-vehicles flow		X		X
HGV traffic to/from the harbour			X	X
Include commercial vehicles in the bus priority system		X		
Routing of heavy goods vehicle				X
Support the use of electric driven vehicles in cities		X		X
Use of hybrid vehicles		X		X
Green time/waiting time traffic lights based on actual values air pollution		X		X
Communication vehicle/traffic light		X		X
Public transport systems co-operate with the centralised traffic light system		X		
UR:BAN switching time prognosis (SPaT/MAP) via MDM		(X)	X	
Parking guidance system				X
Direction sign information of parking lots			X	
Reduce air pollution in the cities		X		X
Pay as you pollute		X		X
School travelling management		X	X	
Availability of requesting green light by young student		X	X	
Safety for vulnerable road users		X		X
Acoustics user guidance for blind users				X

(Table 6 continues on the next page)

CATEGORY/ACTIVITY AREA	OUTSIDE MUNICIPALITY AUTHORITY	TOO OVERALL / POLITICAL UNDERSTANDING	DOES NOT INCLUDE C-ITS USED TO COMMUNICATE	PARTLY INCLUDED IN A CIMEC C-ITS USE CASE
Enabling technologies for blind people	X	X		X
Encourage/ensure that short trips are taken by walking and cycling to the greatest degree		X	X	
Safe and attractive pedestrian and bicycle traffic		X		
Smartphone positioning for traffic light controlling		X		X
Cycle detection via smartphone		X		
Detection of pedestrians and cyclist in the blind zone	X			
Warning of pedestrians between vehicles	X			
Car sharing	X			
Autonomous driving	X		X	

The list of activity areas not classified as CIMEC C-ITS use cases include areas which are outside the (formal) responsibility of the city, or the municipality. Uses cases for ICT services in these areas will most likely not include the municipality as a formal partner. The city can be involved possessing another role than being the city authority, e.g. as a customer of the taxi service.

Automatic driving as such was not listed as an activity area itself, as opposite to autonomous driving, however, several of the use cases cover some aspects of automatic driving.

In the group of activity areas not including cooperative technology used to communicate with the road users, there are several areas including cooperation between organisations, and their systems and services, but not including the road users themselves.

Multimodal traffic and transport management will benefit from a better cooperation between the logistics services management, the public transport services management and the traffic management function. Such an improved cooperation will in the near future be based on use of ICT. The *transport* management function will be covered by the freight or passenger transport companies, and communication with the drivers and vehicles is done from them with the transport, and not the traffic, in focus.

5. CIMEC C-ITS use cases

All the CIMEC C-ITS use cases are based on the activity areas summarised in Table 5. All the activity areas were tested against the following requirements to be considered a CIMEC C-ITS use case:

1. The use case must describe a near future ICT service
2. The use case must include the use of C-ITS technology to run the service
3. The use case must include the city as at least one involved part in running the service
4. The benefits of performing the use case should be describable

This process has resulted in the following fifteen CIMEC C-ITS Use-cases:

UC1: Perform individual routing of vehicles
UC2: In-vehicle signalling
UC3: Management of loading and unloading areas for distribution vehicles
UC4: Control the access of heavy goods vehicles with dangerous goods to tunnels
UC5: Regulation of access to free lanes for electrical vehicles
UC6: Give green lights for police and emergency vehicles
UC7: Traffic light management
UC8: Give green lights for public transport vehicles
UC9: Green waves for cyclists
UC10: Parking management
UC11: Inform about incidents in the road network and control access to these areas
UC12: Inform about emergencies in the road network and control access to these areas
UC13: Control access to given roads for not emission-free cars on days with poor air quality
UC14: Enforcement of the speed of vehicles running close to schools and kindergartens when children are coming or leaving the areas
UC15: Transponder technology for vulnerable road users

In the following section, these use cases are described with the activity area(s) included and the category supported (as presented in Table 5), the information that has to be collected from the vehicle/road user in order to fulfil the use case, the information that has to be provided to the vehicle/road user to fulfil the use case, and the cities' perspective on potential and requirements related to use of C-ITS in the use case.

5.1 Description of CIMEC C-ITS use cases

Table 7: Description of CIMEC C-ITS use case 1 - Perform individual routing of vehicles

USE CASE NAME	UC1: PERFORM INDIVIDUAL ROUTING OF VEHICLES
Activity areas	▪ Individual routing of vehicles ▪ Cooperative routing ▪ Navi ▪ Intelligent routing ▪ Hazardious warning of tunnels ▪ Routing information for through traffic ▪ Routing through the city
Supported category	Individual traffic management
Information collected from the vehicle	Location, speed, direction, type, destination
Information provided to the vehicle	Route, driving advice
City perspective on use of C-ITS	Implementing this use case will require that the traffic management functions of the city will be changed so that they are able to manage information about individual vehicles. The C-ITS perspective will include implementation of communication functions supporting communication with individual vehicles. The cities will benefit from this use case by having the possibilities to separate different types of vehicles in the traffic, and by being able to give priorities and restrictions based on the vehicle characteristics, the time of day, the type of passenger or goods on-board and based on the transportation task being performed by the vehicle.

Table 8: Description of CIMEC C-ITS use case 2 – In-vehicle signalling

USE CASE NAME	UC2: IN-VEHICLE SIGNALLING
Activity areas	▪ Virtual signage ▪ Switching states of dynamic road signs to individual transport
Supported category	In-vehicle signalling
Information collected from the vehicle	Location, speed, direction, vehicle characteristics, destination
Information provided to the vehicle	Status of traffic signals
City perspective on use of C-ITS	Implementing this use case will make it easier to dynamically change the road regulation.

Table 9: Description of CIMEC C-ITS use case 3 - Management of loading and unloading areas for distribution vehicles

USE CASE NAME	UC3: MANAGEMENT OF LOADING AND UNLOADING AREAS FOR DISTRIBUTION VEHICLES
Activity areas	▪ Management of loading and unloading areas for distribution vehicles ▪ Loading and unloading slots management at real time
Supported category	Management of urban freight
Information collected from the vehicle	Location, speed, direction, wanted areas to use
Information provided to the vehicle	Free loading/unloading area close by
City perspective on use of C-ITS	By implementing this use case the city could reduce the mileage for distribution cars running in the city looking for a free area to use for loading and/or unloading, thus contributing to improved air quality, traffic efficiency and reduced traffic nuisance.

Table 10: Description of CIMEC C-ITS use case 4 - Control the access of heavy goods vehicles with dangerous goods to tunnels

USE CASE NAME	UC4: CONTROL THE ACCESS OF HEAVY GOODS VEHICLES WITH DANGEROUS GOODS TO TUNNELS
Activity area	▪ HGVs with dangerous goods in tunnels
Supported category	Management of urban freight
Information collected from the vehicle	Location, speed, direction, vehicle characteristics, type of goods, destination
Information provided to the vehicle	Drive/stop in front of tunnel
City perspective on use of C-ITS	Implementing this use case will increase the safety of the traffic in tunnels as the traffic management function will be able to stop certain goods from being brought into the tunnels under given circumstances. Implementing this use case will require that the traffic management functions will be changed to be able to identify and manage individual vehicles in the traffic.

Table 11: Description of CIMEC C-ITS use case 5 - Regulation of access to free lanes for electrical vehicles

USE CASE NAME	UC5: REGULATION OF ACCESS TO FREE LANES FOR ELECTRICAL VEHICLES
Activity area	▪ Regulation of access to free lanes for electrical vehicles
Supported category	Management of electric vehicles
Information collected from the vehicle	Location, speed, direction, destination, vehicle characteristics
Information provided to the vehicle	Advice on use of lanes
City perspective on use of C-ITS	By dynamically changing which vehicles being allowed to use “free” lanes the city can ensure that these lanes are reserved for e.g. public transport in rush hours and that these lanes can be utilised for other types of vehicles outside the rush hours. The type of vehicle can in principle be other than electric vehicles. Implementing this use case will require for most cities that the legislation needs to change too.

Table 12: Description of CIMEC C-ITS use case 6 - Give green lights for police and emergency vehicles

USE CASE NAME	UC6: GIVE GREEN LIGHTS FOR POLICE AND EMERGENCY VEHICLES
Activity areas	▪ Green lights for police and emergency vehicles ▪ Responsiveness of traffic lights to emergency vehicles ▪ Traffic signal priority for fire services
Supported category	Management of traffic lights
Information collected from the vehicle	Location, speed, direction, destination (?), vehicle characteristics
Information provided to the vehicle	Green lights ahead ok/not ok
City perspective on use of C-ITS	Implementing this use case will increase the safety in the traffic during emergency driving.

Table 13: Description of CIMEC C-ITS use case 7 – Traffic light management

USE CASE NAME	UC7: TRAFFIC LIGHT MANAGEMENT
Activity areas	▪ Optimisation of traffic lights ▪ Display red and green signal in the vehicle (GLOSA) ▪ Green time to individual vehicle ▪ Virtual green wave
Supported category	Management of traffic lights
Information collected from the vehicle	Location, speed, direction, destination (?), vehicle characteristics
Information provided to the vehicle	Optimal speed to achieve green light in traffic lights ahead, time left before light changes
City perspective on use of C-ITS	Implementing this use case will increase the efficiency of the traffic, giving fewer stops and starts during driving, and hence, also reducing the use of fuel for (heavier) vehicles and reducing air quality and noise problems.

Table 14: Description of CIMEC C-ITS use case 8 - Give green lights for public transport vehicles

USE CASE NAME	UC8: GIVE GREEN LIGHTS FOR PUBLIC TRANSPORT VEHICLES
Activity areas	▪ More effective traffic lights assistance for public transport vehicles ▪ Public transport preferences at intersections
Supported category	Management of traffic lights
Information collected from the vehicle	Location, speed, direction, destination (?), vehicle characteristics
Information provided to the vehicle	Green lights ahead ok/not ok
City perspective on use of C-ITS	Implementing this use case will increase the efficiency and punctuation for public transport vehicles

Table 15: Description of CIMEC C-ITS use case 9 – Green waves for cyclists

USE CASE NAME	UC9: GREEN WAVES FOR CYCLISTS
Activity area	▪ Green waves for cyclists
Supported category	Management of traffic lights
Information collected from the cyclist	Position, speed
Information provided to the cyclist	Green lights ahead
City perspective on use of C-ITS	Implementing this use case will make it more attractive to travel in the city by bike

Table 16: Description of CIMEC C-ITS use case 10 - Parking management

USE CASE NAME	UC10: PARKING MANAGEMENT
Activity areas	▪ Inner-city parking management ▪ Access control for residential parking in low emission zones ▪ Parking management
Supported category	Parking management
Information collected from the vehicle	Location, speed, destination, vehicle characteristics, expected parking time,
Information provided to the vehicle	Parking permissions and limitations
City perspective on use of C-ITS	Implementing this use case will reduce the mileage and number of vehicles running in the city looking for a vacant parking space, and provide a tool to manage access to specific parking areas. It will allow for a better utilisation of the parking spaces in the city, and the payment for using the parking spaces can be dynamically, based on time of day, vehicle characteristics etc.

Table 17: Description of CIMEC C-ITS use case 11 - Inform about incidents in the road network and control access to these areas

USE CASE NAME	UC11: INFORM ABOUT INCIDENTS IN THE ROAD NETWORK AND CONTROL ACCESS TO THESE AREAS
Activity areas	▪ Incident management ▪ Incident management and information provision
Supported category	Incident management
Information collected from the vehicle	Location, speed, direction, destination (?), vehicle characteristics
Information provided to the vehicle	Location of the incident, possible re-routing alternatives
City perspective on use of C-ITS	Implementing this use case will increase the efficiency and safety in the traffic during incidents in the roads.

Table 18: Description of CIMEC C-ITS use case 12 - Inform about emergencies in the road network and control access to these areas

USE CASE NAME	UC12: INFORM ABOUT EMERGENCIES IN THE ROAD NETWORK AND CONTROL ACCESS TO THESE AREAS
Activity area	▪ Emergency warnings
Supported category	Incident management
Information collected from the vehicle	Location, direction
Information provided to the vehicle	Location of emergency, possible re-routing alternatives
City perspective on use of C-ITS	By implementing this use case the city could improve the reassurance of the city traffic in case of emergencies. It could also support the efficiency of the city traffic during an emergency situation as vehicles close by could be redirected during the situation.

Table 19: Description of CIMEC C-ITS use case 13 - Control access to given roads for not emission-free cars on days with poor air quality

USE CASE NAME	UC13: CONTROL ACCESS TO GIVEN ROADS FOR NOT EMISSION-FREE CARS ON DAYS WITH POOR AIR QUALITY
Activity area	▪ Poor air quality (NOX) on single days
Supported category	Air pollution
Information collected from the vehicle	Location, destination, vehicle characteristics
Information provided to the vehicle	Level of NOX in sections ahead, possible restrictions to be put on the vehicle when approaching.
City perspective on use of C-ITS	Implementing this use case allows the city to reduce the traffic on given days. This can be done by denying certain types of vehicles access to (parts of) the city, or by closing parts of the city completely for traffic. By doing so, the city can actively work to reduce further emission.

Table 20: Description of CIMEC C-ITS use case 14 - Enforcement of the speed of vehicles running close to schools and kindergartens when children are coming or leaving the areas

USE CASE NAME	UC14: ENFORCEMENT OF THE SPEED OF VEHICLES RUNNING CLOSE TO SCHOOLS AND KINDERGARTENS WHEN CHILDREN ARE COMING OR LEAVING THE AREAS
Activity area	▪ Speed management when children are getting into/leaving schools
Supported category	Support for vulnerable road users
Information collected from the vehicle	Location, speed, destination
Information provided to the vehicle	Speed limit starts + Speed limit ends
City perspective on use of C-ITS	By implementing this use case the city will increase the safety for the school children. This could indirectly support walking or bicycling of the children when they travel to and from the school.

Table 21: Description of CIMEC C-ITS use case 15 - Transponder technology for vulnerable road users

USE CASE NAME	UC15: TRANSPONDER TECHNOLOGY FOR VULNERABLE ROAD USERS
Activity area	▪ Transponder technology at traffic lights
Supported category	Support for vulnerable road users
Information collected from the person	Location, speed, destination
Information provided to the person	Status for traffic lights
City perspective on use of C-ITS	By implementing this use case the city will make it more attractive to walk/cycle in the city.

5.2 Use cases from other related EU projects

The work in the CIMEC project has been aligned with other projects working in the area of C-ITS and C-ITS deployment, this includes both completed and on-going projects.

The CODECS project[1] and the VRUITS project[2] have defined uses cases related to C-ITS within the areas of vulnerable road users and public transport. The CODECS project has use cases within both these areas, while VRUITS has been focusing on vulnerable road users. Table 22 shows the use cases from CODECS (so far) and VRUITS linked to the two categories of activity areas.

There are a few examples where the CIMEC use cases can be directly linked to any of the CODES or VRUITS use cases, e.g. Public transport priority at traffic lights. The list of use cases in the table shows that CIMEC has come up with some use cases for C-ITS in urban road traffic that have not been addressed by the other projects, and vice versa.

It is clear that the uses cases covering vulnerable users should be paid attention to. This will have to cause a discussion on the *personal ITS station* from the ETSI definition, and also the use of the smart phone as a means for ITS services.

[1] www.codecs-project.eu
[2] www.vruits.eu

Table 22: Summary of C-ITS use cases from other, related projects

ACTIVITY AREA	CODECS USE CASE	VRUITS USE CASE
Support for vulnerable road users	Animals	Pedestrian crossing the road at mid-block, occluded or not by parked car
	Pedestrians crossing in front of bus/tram	Support pedestrians at intersections to increase comfort and remove obstacles/ barriers
	Bus situation awareness of passengers with special needs	Vehicle on a crossroad, pedal cyclist crossing the road from the right or from the left
	Virtual pedestrian road crossing	Making cycling from location A to location B easier
	Bike lane change and unusual crossing	PTW[3] urban junction accidents with cars
	Bicycle priority	Urban single motorcycle accidents on straight roads
	Bike sharing	
Public transport	Bus/tram, stopping, starting, turning	
	Tram warning	
	Tram interlock control	
	Localisation	
	Use of C-ITS to promote intermodal transport	
	Special needs passenger indication at stops	
	Stop request	
	Fleet management	
	Vehicle management at garage	
	Urban rail	
	Priority at traffic lights	

[3] Powered two-wheeler

6. Barriers against deployment of C-ITS and how to overcome them

6.1 Barriers

This section of the deliverable presents a summary of the barriers that were identified by means of both the survey A as well as in the workshops.

The discussions on barriers, and how to overcome the barriers, were open discussions in all the workshops. The bullets points in this chapter reflect the statements from these discussions.

The respondents of survey A were asked about their experiences with issues typically considered critical for facilitating use and implementation of technology, identifying the three most prominent among a set of pre-defined categories of barriers (see Table 23 and Figure 17).

Table 23: Issues considered critical for use and implementation of technology

BARRIER CATEGORY	EXAMPLES
Technical issues	maturity, interoperability, standardisation, HMI, security, maintenance, privacy, validation
Economic issues	cost-benefit, investments and operations costs, business models
Legal issues	legal system, risks, liabilities
Political issues	political prioritisation, decision making processes, knowledge and awareness, support in public opinion, distribution of responsibility, governance and policies
Organisational issues	organisational architecture, stakeholder involvement, cooperation)
Other issues	

Economic and technical issues stand out as main barriers to more than half of the respondents. When describing the "Other" types of barriers, respondents have mentioned *market-related issues*: that the market for C-ITS is not for the local authorities to control, and that there is a lack of market uptake and large scale deployment - stating that there is a need for more users and more cities to involve.

The responses from survey A were analysed with respect to barriers by city size and barriers by region. There are no clear indications of systematic differences relating to city size, but when it comes to legal issues it looks like the larger cities are more concerned than the smaller cities.

The technical issues are not considered as important by the Nordic cities as for the other cities. This may be caused by the fact that this region is more mature when it comes to implementation and deployment of technology. The Nordic cites do consider the political issues more than cities in the other regions. This may be because they pay less attention to e.g. technical issues.

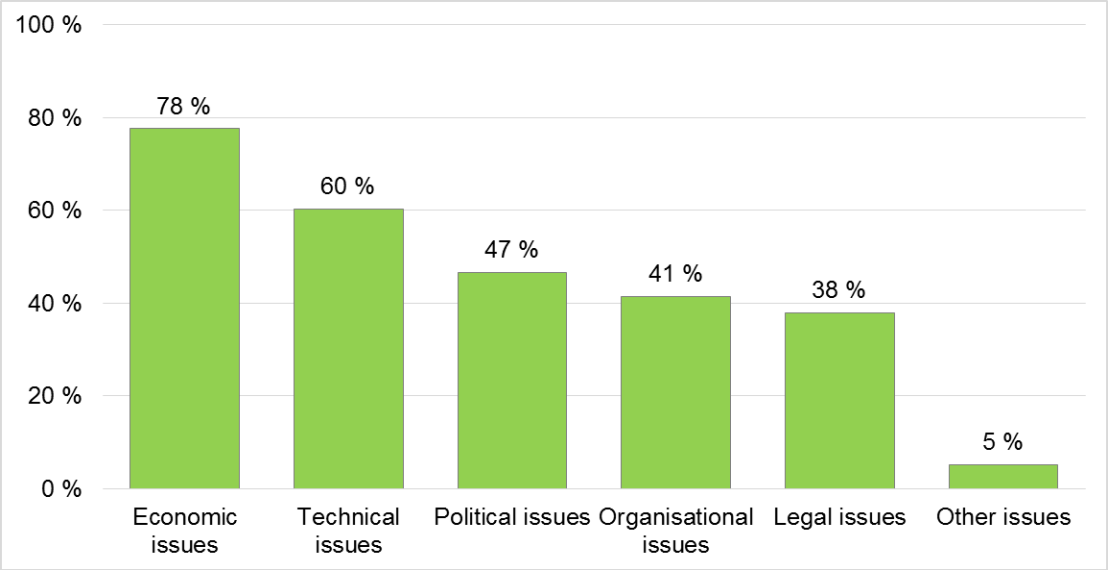

Figure 17: Issues considered main barriers towards (greater) use of C-ITS in European cities (N=58). Max 3 per respondent.

The pre-defined categories of barriers were also used as "containers" for the discussions in the workshops, where the participants could break down and elaborate on the categories.

6.1.1 Technical barriers

The following barriers related to technical issues were resulting from survey A, the local workshops and the regional workshops:

Reading and the UK cities

- Integration of existing solutions
- Reliability of equipment in the road network

Kassel and the German-speaking cities

- Missing standards
- Interoperability
- Data quality, including "up-to-date-ness"
- Limited capability of the cellular system
- Limited capability of the positioning system
- Standardisation with regard to geo-fencing
- Data protection

Trondheim and the Nordic cities

- No coordination of data
- Lack of standards

Bilbao and Spain/France

- Standardisation

Technical barriers were mentioned as one of the "top three" types of barriers by 60 % of the respondents in survey A.

The most important issue of the technical barriers is standardisation, this includes also interoperability and coordination of data. The observation is that the cities are concerned about standardisation both in general and for specific issues.

6.1.2 Economic barriers

The following barriers related to economic issues were resulting from survey A, the local workshops and the regional workshops:

Reading and the UK cities

- Cost by one actor, benefit by another actor
- Lack of models for cost-benefit calculations
- The *actual* cost of a C-ITS solution is never known

Kassel and the German-speaking cities

- Sustainability of the solution
- Resource limitations
- Release of available funds
- Costs Quality of predictions model

Trondheim and the Nordic cities

- Budgets

Bilbao and Spain/France

- High cost of installed devices
- Maintenance costs

Economic barriers were mentioned as one of the "top three" types of barriers by 78 % of the respondents in survey A and is the group of barriers most respondents put as most important.

There are two main concerns being raised for these issues; the missing knowledge of the costs of solutions and equipment needed for C-ITS and the lack of models, and numbers, for cost-benefit analysis.

The costs of the solutions and equipment include both investments costs and maintenance costs.

6.1.3 Legal barriers

The following barriers related to legal issues were resulting from survey A, the local workshops and the regional workshops:

Reading and the UK cities

- Lack of a framework for C-ITS regulations
- C-ITS as the “selling point” for the political level

Kassel and the German-speaking cities

- Missing legal framework
- Data protection (privacy)

Trondheim and the Nordic cities

- Privacy

Legal barriers were mentioned as one of the "top three" types of barriers by 38 % of the respondents in survey A.

Privacy is one main concern, this is understandable as C-ITS solutions include opportunities for tracking of both the vehicles themselves, but also to a certain degree the drivers and the passengers.

C-ITS is a new technology, and the cities ask for a legal framework for regulation of use of C-ITS in city solutions. It is not stated explicitly that these frameworks should be (over-) national, but this is most likely what the cities ask for.

6.1.4 Political barriers

The following barriers related to political issues were resulting from survey A, the local workshops and the regional workshops:

Reading and the UK cities

- Why spend time on C-ITS in a city?
- What is the value of C-ITS deployment?
- Demonstration of the positive and negative impacts is missing

Kassel and the German-speaking cities

- Political strategy
- Little authority to make a difference

Trondheim and the Nordic cities

- Election systems => short time thinking
- No political vision
- Budgets
- Political decisions process
- Different levels of authorities
- Conservative attitude
- No common arena for ITS
- Lack of national coordination

Bilbao and Spain/France

- High cost/benefit ratio

Political barriers were mentioned as one of the "top three" types of barriers by 47 % of the respondents in survey A.

These barriers are to a great extent local ones. They present barriers that the local authorities must work on to overcome, and also (over-) national limitations and regulations that the local authorities have to relate to.

There were no politicians participating at the workshops. The administrative and practical people at the workshops were asking for a better understanding of C-ITS by the political management level in the cities, combined with more predictable working conditions, or practical framework, for themselves to work in.

6.1.5 Organisational barriers

The following barriers related to organisational issues were resulting from survey A, the local workshops and the regional workshops:

Reading and the UK cities

- Lack of standards

Kassel and the German-speaking cities

- Concrete requirements engineering approach

- Adaption of administrative and internal processes
- Resource limitations
- Technical expertise
- Cooperation and coordination with different actors and stakeholders
- Quality control and quality management
- Data geometry
- Adjusted planning methods for C-ITS

Trondheim and the Nordic cities

- Low local competence
- Workload, no time for learning
- No cooperation between actors

Bilbao and Spain/France

- No coordination between departments
- Lack of coordination between public departments

Organisational barriers were mentioned as one of the "top three" types of barriers by 41 % of the respondents in survey A. These includes a missing approach to C-ITS implementation and deployment and the lack of coordination between different actors in a city having an interest in traffic management and C-ITS deployment.

6.2 How to overcome barriers?

This section presents and discusses the different measures for overcoming the barriers. The measures are taken from both survey A, the local workshops and the regional workshops.

6.2.1 Standardisation

The lack of standards and interoperability is a situation where the cities will be more comfortable delaying a C-ITS implementation and deployment rather than working on solutions that in the future turn out to be “wrong” according to possible future standards.

Standards are needed for several areas. This includes the physical layer, the communication level must be standardised, this counts for both fixed and mobile communication, and for the combined used of these.

The information level needs standards; what information needs to be exchanged, and what is the structure and meaning of the information.

The physical equipment needs more standards. The cities are not concerned with the topic of standardisation on board the vehicles, but for the road side equipment.

6.2.2 Show the value of the C-ITS solutions

One main barrier for uptake of C-ITS solutions is that the value of deploying such a solution is difficult to present to the decision makers in the city. This is due to lack of models showing the total costs of the solutions, including the purchase and maintenance of the necessary software and equipment. There is also a lack of models showing the value of having a well-functioning C-ITS solution running in a city.

Most of the respondents in survey A suggested demonstration and evaluation of applications as the most important action to overcome the barriers against C-ITS deployment.

In the cases where there are cost benefit models applied, the ratio for the cost over the benefit is so high that the city will not deploy the solution.

There is a need to document the full cost of given C-ITS solutions as well as the value of the benefit of deploying the solutions. The CIMEC use cases can represent the first set of C-ITS solutions with a cost and a benefit linked to them.

There is also a need to develop good cost benefit models that are trustworthy at the political level where decisions are to be taken.

6.2.3 Political and policy measures

The national political government should establish a legal framework regulation the use of C-ITS technology and C-ITS solutions. The national frameworks should preferably be based on an over-national framework, such as directives from the European Union. The respondents in survey A propose that priority and support from the political level is important to overcome barriers.

6.2.4 Financial and economic measures

More resources are needed to speed up C-ITS deployment in the cities. These resources are in the first hand financial resources, which in turn must be transferred into knowledge and persons with time and skills for actually working with the C-ITS deployment. There must also be resources available for transfer of knowledge and skills to others in the cities.

6.2.5 Measures for cooperative technology

The development of standards for urban C-ITS is a necessity to enable deployment in cities. The cities are asking for “plug and play” solutions. These requires that the underlying infrastructure is available,

based on well-known standards. Such plug and play solutions require standard interfaces for information and functions, and hence, there is a need for standardisation of these levels.

The C-ITS solutions, as seen from the city perspective, must be interoperable with the equipment and the software on board the vehicles, this includes private cars, trucks, distribution cars, public transport vehicles and emergency vehicles.

The C-ITS solutions must also be interoperable with the back-office systems, both systems for traffic management as well as legacy systems and ERP solutions.

The life cycle of C-ITS equipment and solutions must be given attention. It is not enough to have models and calculations covering the investments only as the decision makers in most cases are used to work with infrastructure projects where the time horizon can be more than 20 years.

The abilities to actually install (more) equipment in the city streets must be given attention. The situation is often that the streets are filled with traffic signs, signal lights, variable messages signs etc. and that there simply may not be space left for more equipment.

6.2.6 Organisational measures

The different authorities in the cities should improve their cooperation to be able to work for common objectives when it comes to C-ITS deployment.

7. Lessons learned

The knowledge of ITS and C-ITS as technologies is low among the different stakeholders. The traffic managers are the stakeholders with the best knowledge about the technologies. ITS as technology is understood in a common way among the traffic managers as this technology has been available for several years, and there are several implementations both in cities and on highways around Europe. C-ITS is proposed as a standard by ETSI, however, the technological definitions are hard to understand for the city stakeholders. There is a need to increase the understanding of the *Communication* part of C-ITS, and how different ITS stations can be implemented.

There is a lack of understanding of what C-ITS as technology can offer to the cities. This is linked with no understanding of the costs and challenges of a deployment project. There are few good examples of positive or negative impact of a C-ITS deployment in a city.

The barriers, as perceived by the city stakeholders, are not technical ones. The organisation of the city responsibilities is causing challenges when trying to establish any kind of cooperation, also within traffic and transport. The best solutions include different stakeholders, like traffic management, public transport, parking management, emergency services and the regional/national public authorities. There are no ICT based cooperation between these with respect to traffic management and road network utilisation in cities today.

The legal frameworks are not supporting electronic cooperation between different actors in the cities. This is due to the responsibilities in the traffic, which currently is entirely the driver´s for the time being. The legislations in Europe are very strict on the privacy, and data linked to the movement of vehicles easily falls under the privacy issues.

The resource situation in the cities is causing barriers to deployment of C-ITS. This is with respect to both financial resources and human resources. A city has the full responsibility of many services of importance to the inhabitants, like kindergartens, schools, health care etc. The maintenance and utilisation of the road network is only a small part of the total responsibility, and hence, the focus and access to resources are in many cities´ cases limited.

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APPENDIX 1 SURVEY A – CITY SURVEY

Introduction
CIMEC is a city-focused project which will explore the role cooperative ITS systems (C-ITS) can play to support city authorities, both in managing their transport networks and the delivery of other transport-linked services. The purpose of this survey is to get insight into the current use of ITS/C-ITS applications in European cities. Thank you for your response!

Background
2) What city do you represent?
3) in country: (list of countries provided)
4) Would you please describe the responsibilities of your organisation? [multiple responses possible] ▪ Transport policy and strategy making ▪ Implementing transport policies ▪ Planning of transport systems ▪ Operation of transport systems ▪ ITS/C-ITS regulations and guidelines ▪ Other, please specify
5) To what degree are you yourself involved in planning/use of ITS/C-ITS in your daily work? ▪ Not at all ▪ Occasionally ▪ Often ▪ All the time

Transport challenges and transport policies/strategies
6) What do you consider the 3 most prominent mobility/transport challenges of your city? ▪ Congestion ▪ Air pollution ▪ Traffic noise ▪ Inefficient transport infrastructure ▪ Freight distribution ▪ Parking spaces ▪ Quality of public transport service ▪ Traffic safety ▪ Other, specify
7) Would you please, with a few sentences, elaborate on the challenges of your city?
8) Please state the (up to 3) most prominent transport policies/strategies of your city ▪ Enhancing modal shift by "Push" measures (e.g. Road User Charging, Access restrictions, Clean Zones and Parking restrictions) ▪ Enhancing modal shift by "Pull" measures (e.g. Promotion of public transport, Car sharing or Walking and cycling, Mobility plans and Awareness raising, Interconnectivity between modes) ▪ Improving transport efficiency (e.g. by Road speed regulation, Freight transport management and logistics) ▪ Improving safety (e.g. by Road design and regulation, Safer vehicles, Safer user behaviour) ▪ Developing clean and silent transport systems (e.g. by Targeted noise reduction measures, Alternative fuels and retrofitting for captive fleets, Access restrictions based on emission standards, Hybrid and Electric vehicles, Incentives and regulation) ▪ Other, please specify

Role of ITS/C-ITS in transport policies/strategies

[if 8= Enhancing modal shift by "Push" measures (e.g. Road User Charging, Access restrictions, Clean Zones and Parking restrictions)]

9) Are ITS/C-ITS applications explicitly included in measures supporting your strategy for Enhancing modal shift by "push" measures, and how far has the implementation of ITS/C-ITS come?

	Use of ITS/C-ITS is not included in this measure	Use of ITS/C-ITS is in early stage thinking	Use of ITS/C-ITS is under detailed planning	ITS/C-ITS applications are operational	Not relevant
Road User Charging					
Access restrictions					
Clean Zones					
Parking restrictions					
Other measures supporting this strategy					

[if 8= Enhancing modal shift by "Pull" measures (e.g. Promotion of public transport, Car sharing or Walking and cycling, Mobility plans and Awareness raising, Interconnectivity between modes)]

10) Are ITS/C-ITS applications explicitly included in measures supporting your strategy for Enhancing modal shift by "pull" measures, and how far has the implementation of ITS/C-ITS come?

	Use of ITS/C-ITS is not included in this measure	Use of ITS/C-ITS is in early stage thinking	Use of ITS/C-ITS is under detailed planning	ITS/C-ITS applications are operational	Not relevant
Promotion of public transport					
Promotion of car sharing					
Promotion of walking and cycling					
Mobility plans					
Awareness raising					
Interconnectivity between modes					
Other measures supporting this strategy					

[if 8= Improving transport efficiency (e.g. by Road speed regulation, Freight transport management and logistics)]

11) Are ITS/C-ITS applications explicitly included in measures supporting your strategy for Improving transport efficiency, and how far has the implementation of ITS/C-ITS come?

	Use of ITS/C-ITS is not included in this measure	Use of ITS/C-ITS is in early stage thinking	Use of ITS/C-ITS is under detailed planning	ITS/C-ITS applications are operational	Not relevant
Road speed regulation					
Freight transport management and logistics					
Other measures supporting this strategy					

[if 8= Improving safety (e.g. by Road design and regulation, Safer vehicles, Safer user behaviour)]

12) Are ITS/C-ITS applications explicitly included in measures supporting your strategy for Improving safety, and how far has the implementation of ITS/C-ITS come?

	Use of ITS/C-ITS is not included in this measure	Use of ITS/C-ITS is in early stage thinking	Use of ITS/C-ITS is under detailed planning	ITS/C-ITS applications are operational	Not relevant
Road design and regulation					
Safer vehicles					
Safer user behaviour					
Other measures supporting this strategy					

[if 8= Developing clean and silent transport systems (e.g. by Targeted noise reduction measures, Alternative fuels and retrofitting for captive fleets, Access restrictions based on emission standards, Hybrid and Electric vehicles, Incentives and regulation)]

13) Are ITS/C-ITS applications explicitly included in measures supporting your strategy for Developing clean and silent transport systems, and how far has the implementation of ITS/C-ITS come?

	Use of ITS/C-ITS is not included in this measure	Use of ITS/C-ITS is in early stage thinking	Use of ITS/C-ITS is under detailed planning	ITS/C-ITS applications are operational	Not relevant
Targeted noise reduction measures					
Alternative fuels and retrofitting for captive fleets					
Access restrictions based on emission standards					
Hybrid and Electric vehicles					
Incentives and regulation					
Other measures supporting this strategy					

[if 8= other]

In the question about your 3 most prominent transport policies/strategies, you stated that you have other(s) than the ones listed. Is ITS/C-ITS applications explicitly included in any of the measures supporting these additional strategies? If so:

14) Please describe these measures and how far the implementation of ITS/C-ITS has come for each measure. Please indicate the number of one of the following alternatives in brackets behind each measure: 1) ITS/C-ITS in early stage thinking, 2) ITS/C-ITS under detailed planning, 3) ITS/C-ITS systems operational

15) If you can elaborate further on any of your strategies/measures, and how ITS/C-ITS is included, please do so here.

Strategy for use of ITS/C-ITS	
16)	Does your city actively work with or already have a strategy for promoting and increasing the use of ITS/C-ITS? Yes, we already have such a strategy Yes, we are working on such a strategy No, we do not work with/have such a strategy
[if 16= Yes, we are working on such a strategy OR Yes, we already have such a strategy]	
17)	What themes are included in this strategy? (multiple responses possible) Research and innovation Commercial development Data management Systems development Application areas and user groups Interoperability Implementation and adoption Strategic goals Other, please specify
[if 16= No, we do not work with/have such a strategy]	
18)	In your view, what are the main reasons why your city does not have/work for a strategy for increasing the use of ITS/C-ITS? (multiple responses possible) We do not have sufficient financial resources We do not have sufficient personnel within the ITS/C-ITS area of competence We do not consider it likely that ITS/C-ITS can help us deliver our policies We have not considered it Other reason(s), please specify

Experience with use of ITS/C-ITS in your city

19) In general, what is the experience with use of ITS/C-ITS applications in your city related to the following issues?

	Not problematic	Somewhat problematic	Very problematic	Not relevant
Technical issues (*maturity, interoperability, standardisation, HMI, security, maintenance, privacy, validation*)				
Economic issues (*cost-benefit, investments and operations costs, business models*)				
Legal issues (*legal system, risks, liabilities*)				
Political issues (*political prioritisation, decision making processes, knowledge and awareness, support in public option, distribution of responsibility, governance and policies*)				
Organisational issues (*organisational architecture, stakeholder involvement, cooperation*)				
Other issues				

Current status regarding C-ITS in your city	
We are now going to ask some questions about C-ITS - that is, intelligent transport systems that cooperate and exchange data. Please indicate whether the following statements TO YOUR KNOWLEDGE describe the use of C-ITS in your city	
20)	My city has successfully implemented one or more C-ITS applications True False
[if 20= False]	
21)	My city has currently no intention of using C-ITS applications True False
[if 21= False]	
22)	My city has currently started implementing C-ITS applications, but is not fully ready for launch True False
[if 22= False]	
23)	My city is currently preparing implementation of C-ITS application(s) True False
[if 23= False]	
24)	My city is currently seeking information about C-ITS applications, but has not determined whether to take it into use True False
[if 20= True]	
25)	My city discusses experiences with implementing C-ITS applications with other cities True False
[if 20= True]	
26)	My city is modifying/extending implemented C-ITS applications True False
[if 20=true OR 21=false]	
27)	You have stated that your city has successfully implemented one or more C-ITS applications, or that your city may have an intention of using C-ITS. If possible, please describe this closer here:

Barriers towards use of C-ITS applications in your city	
28)	What do you consider the main barriers towards greater use of C-ITS in your city? (choose maximum 3 alternatives) Technical issues (maturity, interoperability, standardisation, HMI, security, maintenance, privacy, validation) Economic issues (cost-benefit, investments and operations costs, business models) Legal issues (legal system, risks, liabilities) Political issues (political prioritisation, decision making processes, knowledge and awareness, support in public option, distribution of responsibility, governance and policies) Organisational issues (organisational architecture, stakeholder involvement, cooperation) Other issues, specify
[if 20=true OR 21=false]	
29)	In your opinion, what should be done to overcome barriers towards greater use of C-ITS in your city?

Knowledge of C-ITS

30) How would you describe the overall knowledge of C-ITS in the following parts of your organisation?

	No knowledge	Little knowledge	Some knowledge	Extensive knowledge	Not relevant
Transport policy and strategy making					
Implementing transport policies					
Planning of transport systems					
Operation of transport systems					

Suppliers of ITS/C-ITS

31) Do you yourself have an overview over what suppliers of equipment and applications for ITS/C-ITS that your city uses, have planned or discussed to use or been in contact with?

Yes

No

[if 31=Yes]

32) Could you please provide your e-mail address for additional questions regarding this topic?

[if 31=No]

33) Could you please provide the e-mail address to someone who does have an overview over what suppliers of equipment and applications for ITS/C-ITS that your city uses, have planned or discussed to use or been in contact with?

Comments and feedback

34) Do you have any comments or feedback on this questionnaire?

APPENDIX 2 SURVEY B – CORE CITY STAKEHOLDER SURVEY

Introduction

CIMEC is a city-focused project which will explore the role cooperative ITS systems (C-ITS) can play to support city authorities, both in managing their transport networks and the delivery of other transport-linked services.

The purpose of this survey is to an overview of how familiar different parts of European cities are with such technologies and their use. This survey will serve as input to a workshop which will be hosted in your city, and where you will be invited to participate. The workshop is an arena for the city to discuss potential use and deployment of cooperative technologies, and the results of this survey will be used as input for designing the contents of the workshop.

We therefore hope you would please spend *5 minutes* to answer a few questions.

Your organisation and responsibilities

1) What department/unit/agency/organisation are you employed in?

2) Does your organisation have responsibilities related to any of the following? [multiple responses possible]

- Traffic management
- Traffic safety
- Public transport
- Parking management
- Pedestrian and cycling traffic
- Urban freight
- Domestic services (i.e. home care)
- Public maintenance service
- Emergency services (police, ambulance, fire brigade etc)
- Other services, please specify

3) What are the 3 main responsibilities of your department/unit/agency/organisation?

4) Would you please elaborate on your department/unit/agency/organisation?

5) Is your organisation responsible for defining and/or implementing public policy on a strategic level?

- Yes, defining public policy
- Yes, implementing public policy
- Yes, defining AND implementing public policy
- No

Knowledge of C-ITS
Intelligent transport systems (ITS) are transport systems where information and communication technologies have been applied to make the transport system safer, more efficient, more reliable, more comfortable and more sustainable. The ICT systems enabling road hazard warnings and information on alternative routes are typical examples on how ICT has been applied to make the transport system safer, more efficient and more reliable. A further development of the different ICT systems which together make the backbone of ITS, has led to the term Cooperative Intelligent Transport Systems (C-ITS). The different ICT systems are related to the vehicle, the roadside equipment (e.g. light signals), the equipment carried by the transport service user (e.g. a smartphone) and to the central equipment (e.g. a traffic monitoring and controlling central). In a cooperative system, the different ICT systems exchange data/information in real time. This improves the ITS service beyond the scope of the stand-alone system, and this is the core idea behind C-ITS.
6) **Do you feel the above examples and explanations makes it easy to understand what C-ITS is?** No, not at all Yes, a little Yes, very much
Please indicate whether the following statement(s) describe your familiarity with C-ITS, as exemplified above
7) **I have never heard about C-ITS before (awareness)** True False
8) *[if 7=false]* **I have heard about C-ITS before, but I do not really know what it is** True False
9) *[if 8=false]* **I have heard about C-ITS before, but I do not know how it can influence my job/organisation and responsibilities** True False
10) *[if 9=false]* **I have heard about C-ITS before, but I do not know how I/my organisation can take it into use** True False
11) *[if 10=false]* **I have heard about C-ITS before, but I am not sure what the impact will be if I/my organisation take(s) it into use** True False
12) *[if 11=false]* **I have heard about C-ITS before, and I wonder how I/my organisation could work with others to take C-ITS into use** True False
13) *[if 12=false]* **I have heard about C-ITS before, and I wonder how to best implement C-ITS** True False

ITS in strategies	
14)	**To your knowledge, has your organisation included the use of C-ITS into strategic plans?** Yes No
15)	**What do you believe is the most important reasons C-ITS is not included in strategic plans?**

USE OF C-ITS	
	Please indicate whether the following statements TO YOUR KNOWLEDGE describe the use of C-ITS in your department/unit/agency/organisation
16)	**My department/unit/agency/organisation has successfully implemented one or more C-ITS applications** True False I don't know
17)	*[if 16= false OR I don't know]* **My department/unit/agency/organisation has no intention of using C-ITS applications** True False I don't know
18)	*[if 17= false]* **My department/unit/agency/organisation has started implementing C-ITS applications, but is not fully ready for launch** True False I don't know
19)	*[if 18= false]* **My department/unit/agency/organisation is currently preparing implementation of C-ITS applications** True False I don't know
20)	*[if 19= false]* **My department/unit/agency/organisation is seeking information about C-ITS but has not determined whether to take it into use** True False I don't know
21)	*[if 16= true]* **My department/unit/agency/organisation discusses experiences with implementing C-ITS with other departments/units/agencies/organisations** True False I don't know
22)	*[if 16= true]* **My department/unit/agency/organisation is modifying/extending implemented C-ITS applications** True False I don't know
23)	**What do you believe is the reason(s) your department/unit/agency/organisation has no intention of using C-ITS?**

Barriers	
24)	**What do you consider the main barriers towards greater use of C-ITS in your department/unit/agency/organisation? (choose maximum 3 alternatives)** Technical issues (maturity, interoperability, standardisation, HMI, security, maintenance, privacy, validation) Economic issues (cost-benefit, investments and operations costs, business models) Legal issues (legal system, risks, liabilities) Political issues (political prioritisation, decision making processes, knowledge and awareness, support in public option, distribution of responsibility, governance and policies) Organisational issues (organisational architecture, stakeholder involvement, cooperation) Other issues, specify
25	**If you wish to elaborate on the main barriers towards greater use of C-ITS in your department/unit/agency/organisation, you can do that here.**
26	**In your opinion, what should be done to overcome barriers towards greater use of C-ITS in your department/unit/agency/organisation?**

Comments and feedback	
27	**Do you have any comments or feedback on this questionnaire?**

Thank you for your reply!

APPENDIX 3 TEXT RESPONSES TO SURVEY A

Q7: ELABORATE ON THE CHALLENGES OF YOUR CITY

- Strong private transport (mainly from the hinterland / missing beltway) - air pollution (according to European standards is currently not met) - high delivery traffic for the port - HGV traffic / increased abrasion of the infrastructure (bridges)!
- number of vehicles; limited traffic area; utilization of the traffic area for all road users (pedestrians, cyclists, public transport, delivery vehicles, etc.); compatibility and integration in existing systems (signalling device, interfaces); increased complexity of systems
- road works management, traffic volume
- The city of Frankfurt am Main is the transport hub with one of the largest European airports, the busiest motorway junction and the largest passenger station in Germany. Daily arrive 334,000 commuters in the city, Frankfurt's population is continually growing in the recent years. All this brings an increase of individual motor car traffic with all its consequences in addition to scarce housing: high traffic noise, strong air pollution, traffic congestion, etc.
- Due to the geographical position of the city in a valley along the river Wupper the historic infrastructure is positioned through a main axis through the Valley, multiple way ties at a right angle in the high altitudes. In the North, the motorway A 46 runs parallel through the town and on the south elevation the L418/L419. The challenge is to control destination traffic in the city especially during the traffic peak, on the one hand in the used mode of transport (IV, public transport) and on the other hand in the choice of the route or the combination of transportation by a traffic management, to avoid traffic congestion and to reduce that pollution and traffic noise. Also, a good quality of public transport and an effective parking management (parking guidance system) is associated.
- To cope with a very high volume of commuters (vehicular traffic) from surrounding areas, and to operate.
- One of the main points (according to Materolan) is the traffic avoidance in terms of mobility-saving urban development and spatial planning with high quality of life and experience in the city and also the modal shift (from motorized vehicle traffic to public transport) through changes in behaviour
- Compliance with EU environmental standards (concerning noise and air pollution) and minimising travel time losses. Achieving a high quality of life for citizens and guests
- Safe and attractive fashion pedestrian and bicycle traffic and public transport to prioritising, so as many people forgo the use of cars.
- Funding a "wise" use of traffic space
- As part of the integrated approach in the management of traffic in the State capital Stuttgart, there is currently a high traffic political link between the traffic congestion, air pollution and the quality of the public transport on the basis of the EU infringement procedures of the exceedances of the PM 10 values. The result is also an extension of the inner-city parking management.
- Air pollution as the cause of diseases in the population but also climate goals (including noise). Reducing traffic caused by vehicles that look for a parking slot; reducing traffic in the city; traffic safety as the principle task of the city
- Several large construction sites planned in the next few years; growing population and increasing traffic, increasing complexity of the transport system
- Reduction of traffic by 10% from 2010 to 2020
- lack of renewing traffic controllers; so a lot of budget is necessary that will not be available for operating and maintaining additional traffic management infrastructure
- many daily commuters; obsolete infrastructure; insufficient staff
- inadequate resources
- We are a small town of 70,000 inhabitants. Our traffic system has no real problems. But I see possibilities for applications in the area of public transport. We have more problems to bring cyclists safely and qualitatively tolerable through traffic.
- Challenges of our city are related to find the best ways to collaborate with and convince the political factor of the importance of a sustainable approach of the transport issues for the city. We are trying to achieve an integrated approach to mobility and urban development actually developed by finding bridges between all the factors involved in the process. The concept of intermodality is a priority to us, since in Ploiesti there is a large number of daily commuters.

Q7: ELABORATE ON THE CHALLENGES OF YOUR CITY

- Helmond wants to optimise the use of existing infrastructure. To this end, Helmond has tested several C-ITS services and believes in the potential of C-ITS for achieving mobility goals. However, lack of clear and proven benefits and thus lack of large scale deployment mean however that the impact is still very limited. This is very challenging with regard to limited human and financial resources
- * Significant increase in politically biased economic development initiatives conflicts with a lack of support for the required network improvements to cater for such economc growth. * Existing networks operating at max capacity therefore their needs to be a higher level of support to improve transport infrastructure.
- High communting pattern -- everyday, over 360.000 vehicles entre city limits form the metro area. This causes disruption in all modes. The pedestrian network has been hit hard over the past decades.
- Increasing vehicular traffic numbers on a finite road system can only lead to more congestion in the future, one solution would be a modal shift to another form of transport but that is proving a tough nut to crack.
- Increasing walking (in terms of share of trips 2018 compared to 2012) by 10% from a base of 32%; increasing cycling by 67% from a base of less than 2%; increasing public transport (bus. metro, tram..) by 3.5% from a base of 40%; these are the mode shift targets of the SUMP (Sustainable Urban Mobility Plan). Consider walking / cycling; witihin the 4-year mandate the key action of superblocks will be implemented in at least one neighbourhood of each of the 10 districts of the city.
- Objective to have a 50/50 modal share between private cars and others. Develop cycling , walking and use of public transport. Divide by two the number of road accidents.
- Rebalance street usage toward pedestrians, bicycles and public transport. Reduce congestion to improve air qualify and reduce traffic noise
- Rotterdam has over 600.000 inhabitants and is the second largest town in The Netherlands. Rotterdam is a modern city and a harbour city. It has the fourth port in the world and the biggest port of Europe. The port is of great economic importance for Rotterdam. Starting in the inner city hundreds of years ago and nowadays a whole new port area is developed 30 kilometers to the west. Rotterdam is part of the Metropolitan Region of Rotterdam The Hague, a region with 2,2 million residents. The urban development strategy of Rotterdam focusses on three goals: strong economy, attractive living city and healthy city. Complementary, the mobility strategy focusses on five challenges: facilitating the increasing use of bikes, reducing problems regarding air-polution, strengthening the economyy, realising an optimal quality of public space and realising a flexible and future proof moblity network.
- The city is very concerned about economic growth and unemployment - and to an extent social deprivation. The link between congestion and these wider challenges is very much a concern for us. We also see the better public transport would be a solution to these problems. On a more local level, elected representatives continue to be concerned by road deaths and are very concerned about the cities role in preventing these
- The City of Aalborg has some ambitious goals in relation to CO2 reductions. A goal is thus to be carbon neutral in 2050. To reach that goal multimodality and efficient transport systems is key subjects.
- The commuter traffic is still very much car dependent while the more sustainable modes are not utilised to the extent invisaged in the City Development Plan. There are plans to continue with the significant investment in bus lane priority and cycle lane construction. A key challange is the need to allocate resources including staff to undertake the promotion of PTP and the provision of significant incentives to switch to multi-modal sustainable travel options.
- The Dublin City-region continues to experience growth, with high demand for housing and consequential transport investment. The city needs to develop and deliver networks of alternative modes (esp Public Transport) to cater for mass movements to / from the city centre and between peripheral large centres. The city also needs to encourage / ensure that short trips are taken by walking and cycling to the greatest degree.
- The transport system of Budapest has several challenges which were clearly identified in Balázs Mór Plan, the recent transport development strategy of Budapest. The draft version of the strategy is available here: http://www.bkk.hu/bmt/docs/BMT_en.pdf Main challenges include the implementation of an integrated well-functioning transport system, as in former transport development practice (before the establishment of BKK in 2010) the responsibilities were unclear which lead to the deterioration of transport services and lack of professional supervision. The current developments and challenges aim to reach the transport related strategic goals of Budapest, namely, to have 1) liveable urban environment, 2) safe, predictable and dynamic transport, 3) cooperation in regional connections.
- Too many parking spaces provided in the city by the university and businesses for staff who drive though the medieval centre causing congestion. Drivers too set in thier ways to use ring road rather than drive through the centre at peak times even when journey times have been improved & become more reliable on the ring road. Narrow streets funnelling air

Q7: ELABORATE ON THE CHALLENGES OF YOUR CITY

pollutants caused by deliveries.

- The municipal strategy for these challenges are the implementation of the municipal mobility plan. The main objective of this plan are the planning of road traffic, by creating parking places for residents, to loading and unloading operations and rules to removal of abandoned vehicles on public roads.
- Transport infrastructure can not keep up with the growth and demands of the region. Lack of government recognition of the problems means the region is undermined due to London getting a massive chunk of the funds.
- We would achive the aims of our SUMPS - We would achive the aims of our Masterplane for Energy - We are developing a new model Urban freight logistics
- York is a very historic city with an ancient centre. It is a very popular destination for tourists as well as being an important regional commercial and retail centre. The challenges of delivering modern, efficient transport network management and public transport in suc a historic setting, where increasing the capacity of the network is unlike to be possible are extremely complex.
- Zaragoza´s public transport network has been developed by citizens request, without any technical consideration. Only the recently built tram line 1 has been designed with technical criteria and thus, it has been a success in terms of efficiency and number of travelers. An in-depth analysis is required for public bus network, this means that the quality of the service could be improved . Regarding freight distribution there is no related policy, therefore it is really necessary to start working on it.
- To have a friendly, sustainable city with a promising future
- Not enough bicycle roads. Risky to ride. High NOx values on days with cold and nice weather.
- Oslo has a well-functioning signal control system with a focus on public transport. We'd love to be able to prioritize new traffic in the same system. We need low emission zones. We need a more efficient traffic management system of parking management. We have major challenges with construction work in the city. We need a stronger partnership with the NPRA, especially for the implementation of ITS solutions. Local distribution, and bicycle use are important areas for us
- A high degree of passage traffic must pass downtown Oslo. More complex tunnels are challenging in relation to dangerous goods. Challenges with air quality in the city on cold days in winter.
- Trondheim is a relatively small city with limited problems, but residential patterns and localization of jobs still provides some challenges. Trondheim has a public transport where all routes must pass through the center. This makes the car a very attractive means of transportation for those who do not live and work along the same public transport route. Trondheim user queue to regulate modal choices. This gives unnecessary emissions along highways (especially Elgeseter gate). Product distribution is to a great extent based on trucks inside the center zones. Co-loading and smaller vehicles could give environmental benefits for the city centre.
- Trondheim reduces capacity in the secondary roads so that Trondheim reduces capacity in the secondary roads so that there is no extra capacity in case of incidents.
  In the structure of priorities, first priority is given with a heavy hand to transit, while distribution of goods is treated the same way as passenger car
- Increase bike share through better accessibility och infrastructure. Västsvenska Paket includes infrastructure investments for 34 billion with ia construction of new rail tunnel under city until 2027. Meanwhile large urban development project is running to receive 150,000 more inhabitants until 2035. The accessibility for transit och profession traffic is the most critical challenges in these years. There must be a large transfer of travels from car to public transport, cycling and walking.

Q8F_TXT: OTHER TRANSPORT POLICIES/STRATEGIES, PLEASE SPECIFY

- Promoting cycling and public transport
- Implementation of the first stage of a noise action plan to reduce noise, for example through innovative road surfaces and speed limits
- Traffic management and information (also C-ITS)
- Development and delivery of quality alternative options, including tram, enhanced bus / BRT, bicycle network, rail enhancements etc.
- improving transport efficiency by use of C-ITS and act as Living lab for new technologies

Q14: MEASURES AND HOW FAR THE IMPLEMENTATION OF ITS/C-ITS HAS COME FOR EACH MEASURE. PLEASE INDICATE THE NUMBER OF ONE OF THE FOLLOWING ALTERNATIVES IN BRACKETS BEHIND EACH MEASURE

- https://www.envirocar.org/
- to 3) traffic guidance system for a central event area with fair, Stadium, arena, historic site, Open-Air area and popular fairground is in operation. High compliance rate among foreign event visitors to 1) no considerations to expand the ITS; in areas where mainly local traffic is on the road there might not be a benefit, due to low compliance rates .
- Public transport 4.0 - C-ITS use for public transport acceleration 2) (current version: 3) traffic information and traffic situation 2) incorporating pedestrian/cyclist 2)
- ITS is being used in (i) cycle network development (bike counters, bike signal detection, bike share scheme) (ii) tram extension (RTPI, Integrated ticketing, signal priority,journey planning etc.) (iii) enhanced bus (Signal priority, RTPI, Integrated ticketing, journey planning etc.)

Q15: ELABORATE FURTHER ON ANY OF YOUR STRATEGIES/MEASURES, AND HOW ITS/C-ITS IS INCLUDED

- When disruption to traffic in the upstream network (motorways) a strategic switch the lights (LSA) with elevated green times (or traffic dependend changing of phases) in the direction of the detour routes.
- so far lacks of regional partners to implement practical approaches to networking
- The Hamburg Senate has focused on the strategy of digital city. The authorities, land holdings, etc. are therefore encouraged to develop ITS projects.
- Currently no relevant considerations exist.
- Strategy: with ITS running the private traffic and public transport safer, more efficient, ecological and trouble-free by own DataSet to complement external data. Submitting: switched green times / switched signal phase detector values aggregated status of dynamic signs (variable message signs, changing guidance sings) data from parking management; state of the traffic management (traffic lights/tunnel, a/out/error/maintenance...) Earn: Routing information: source, destination, planned change a section State: location, direction, speed message the type of vehicle (truck, bus, car, dangerous goods,...) type of vehicle; parking: parking request, parking time; looking for parking, unloading process...); vehicle data: to derive where possible incidents from.
- rather low, since the results of the ITS/C-ITS projects so far are rather low. Practical pilots are required to proof the success. So far the results of the research projects were not sufficient.
- I find it very difficult to judge the two defined groups ITS and C-ITS in a course. While most existing transport systems have the claim to be intelligent transport systems the cooperative element of C-ITS is so far definitely not standard. Due to this mixing, I find it quite difficult to answer the questions.
- I would have to deal with me further before a statement with the possibilities of ITS.
- in urban transport networks, the effort for ITS is high due to the high number of links [in a nodes-links-system] and the benefits are low due to the compliance of the mainly road users that are familiar with the local road network. In the urban environment the cost/benefit ratio is only explainable, by further destinations.
- ITS/C-ITS is part of the national ITS action plan. ITS as part of measures of traffic management, the creation of new mobility services, travel information, etc.
- ITS/C-ITS is the technical basis of today's traffic control and traffic management. Therefore, it is inconceivable how measures in this area without ITS should be possible
- ITS/C ITS are already or would be incorporated into traffic management and traffic control measures to a still greater extent (e.g.: in terms of improvement of the signal control on the basis of floating car data, recommended routes, etc.)
- Routing during events
- Traffic control
- Environment-sensitive traffic management in relation to meteorology, the traffic data and environment data
- Traffic information to influence the road users via mobile Internet in many areas makes sense and is in the broadest sense C-ITS. All new policies should consoder, whether C-ITS can or should be used
- transmission of traffic management strategies and traffic restrictions on the basis of projected air exceedances to stationary panels, navigation equipment and vehicles.
- Adaptative timing plans for traffic signals oriented towards shortened pedestrian waiting times at crossings. Bus and tram priority systems to increase commercial speed and frequency reliability.

Q15: ELABORATE FURTHER ON ANY OF YOUR STRATEGIES/MEASURES, AND HOW ITS/C-ITS IS INCLUDED

- BKK aims to increase the efficiency of already existing infrastructure and public transport system with the help of FUTÁR, a dynamic passenger information and traffic management system which is based on vehicle tracking through satellite systems. The local implementation of an Automated Fare Collection system is to be completed until the end of 2017. After the system is in operation, it will provide valuable information about the travellers which will help in optimising the services and will contribute to a more efficient transport system. Furthermore, ITS related strategy also incorporate the following fields: 1) Modern route organisation, traffic-dependent systems, 2) Modern traffic surveillance system, 3) Extension of solutions prioritising public transport vehicles For more information: http://www.bkk.hu/bmt/docs/BMT_en.pdf
- C-ITS is largely being considered in terms of traffic management and congestion reduction. We are in the early stages of considering it to provide priority to freight and public transport vehicles. We note the links between safety and C-ITS in our draft road safety strategy - but this is likely to come more through legislation and vehicle manufacturers than the local authority
- Helmond believes it is now time for large scale deployment of C-ITS. To overcome the chicken-egg discussion, Helmond was one of the main ambassadors to free up financial resources in the national funding program ("Beter Benutten") to invest in upgrading the infrastructure to C-ITS ready infrastructure.
- In 2013 Aalborg Municipality passed a state-of-the-art Mobility Strategy. This strategy cuts across mobility sectors and propose to move away from “units” and towards “unity”. It thus addresses both transportation of goods as well as transportation of people in all modes. Further it addresses all geographical areas within the municipality both the city of Aalborg, the surrounding towns as well as villages and rural areas. The mission in the strategy is to secure mobility for everyone and that this mobility is SMART (Social, Mind the environment, Attractive, Remunerative and To access). Presently, this strategy is being translated into a Mobility Action Plan. In this plan, actions will be defined on four levels: 1. Affect the need for transport and the choice of mode. 2. Effectively utilise the existing infrastructure. 3. Improve the existing infrastructure. 4. New Infrastructure constructions. These levels also mark a hierarchy where level 1 is the base – the place to start the initiatives, and level 4 is when there is no other options. ITS and C-ITS is important on both level 1 and 2 and will thus be more in focus in the coming years.
- Lisbon has full notion of the importance of ITS, and of its indispensability. both in terms of vehicle to vehicle and vehicle to infraestructure. We are trying to incorporate available technology through planning and pilot projects. The City is developping and will be implementing several measures where this matter will have centre stage, namely: (1) a Lighthouse project, (2) an Integrated Operational Center for Mobility Management and (3) a new Mobility Strategy.
- THE NTA conducted a study in 2011 (WSP report) on ITS in surface transport. In 2015, the NTA undertook a short study to consider options for integration of those services and centres for the Greater Dublin Area.
- UTC used to identify traffic issues and automatically implement system activated plans to alleviate local network pressures. VMS used to provide advanced information regarding events that may impact upon traffic congestion levels. VMS used to promote highway safety satndards. VMS being upgraded to a more user definable format permitting more appropriate signage and notifications.
- We are developing a City Centre Movement Strategy with a view to targeting National Transport Authority funding to enhance and entend the city infrastructure to support more sustainable transport. Incorporating ITS/C-ITS would enhance the proposed investments and as an example, deliver much need priorities on the network for an existing Park & Ride facility on the southern approach to the city centre.
- We are evaluating with french ministry the capacity of C-ITS services to bring efficient and cost-effective solutions to address urban mobility problems with respect to traffic efficiency, safety and impact on the environment. We are going on Compass4D pilot's exprimentation, and Identifying new urban C-ITS services according to priority defined by EC C-ITS Platform, with priority given to services that can be evaluated in piloting conditions and with best expected cost/benefit ratio based on experience gained from past and ongoing C-ITS piloting activities carried out in Bordeaux.
- We are planning to integrate the use of VMS, VAS, JT & UTMC as strategies within a common database to control the flow of traffic and information to road users and are actively seeking the assistance of organisations who could partner us in this task or provide innovative ideas.
- York has a long history of the use of UTMC standards for traffic and car park management and public information dissemination. York is also a partner in a regional RTIG compliant bus real-time system and uses data from these systems to drive official Council supported mobile apps and websites.
- Regulated parking payment through mobile apps. Route planner (public transport and by foot) apps and webpage.

Q15: ELABORATE FURTHER ON ANY OF YOUR STRATEGIES/MEASURES, AND HOW ITS/C-ITS IS INCLUDED

- To improve the quality of available information (parking, public transportand and traffic) and its usage for all involved stakelholders in the most important mobility policies.
- Trondheim has an advanced public transport priority system and good real-time information for bus. Trondheim has a coordination / cooperation between bus and taxi from bus stop to home address
- We use ITS in signal regulation (ASP) and real-time information. We have established is parking garage just for electric cars, with application for monitoring and controlling access. We are working on a pilot with sensors for monitoring and controlling the entire set of parking regulations at street level, in spring 2016. We have expressed the need for utilizing AutoPass for different functions, eg access control for residential parking for low emission zones (which are now under planning) Our new chargeingposts are RFID controlledBottom of Form

Q18E TXT: REASONS FOR NOT HAVING A STRATEGY FOR INCREASIN GUSE OF ITS/C-ITS - OTHER

- currently still too few practical examples implemented
- concrete use cases not yet defined
- Further development unclear
- The municipality of Torres Vedras recently concluded a mobility strategy plan. Before developing a strategy for increasing the use of ITS/C-ITS, we need to put into practice and implement the various measures and actions of that mobility plan

Q27: DESCRIPTION OF IMPLEMENTED C-ITS SOLUTIONS

- -Traffic light Wizard - priority circuit for emergency vehicles - school backup - Smart lighting - accessibility / blind support - smart point (public Wi-Fi, lighting, docking stations, etc.)
- a) UR: BAN switching time prognosis (SPaT/MAP) via MDM in operation b) mobile app for use in proposal phase c) public transport 4.0 C-ITS for public transport in preparation phase
- Bus acceleration projects be carried out successfully. Project between vehicle manufacturers and city FAS data were sent to BMW and the vehicle Wizard in the vehicle could indicate green/red hours window!
- Data exchange with municipal transport company for quality management; public transport acceleration
- The city of Frankfurt am Main was a partner in the project simTD and has successfully tested the traffic light phase Wizard and the influence of traffic lights. These developments are not but used in the operations. The city of Frankfurt am Main opts for in terms of data sharing strategically on the MDM (mobility data market place).
- In the context of R & D projects/implementation projects, were installations were made in the city of Vienna.
- intelligent traffic actuated signal controllers along event axes ("motion", SIEMENS) Functionality and results not available so far .
- MDM - Datex II - interface mobility data market
- Implementation of switching time forecast in the framework of the BMWi project UR: BAN; bake-radio-system for registration and acceleration of public transport vehicles, as well as considerations for the replacement of the system by a more modern.
- Traffic volume and traffic situation data from urban traffic control system and urban parking guidance system provide data and decision basis for the incident strategies on the Federal Highway network (dWiSta)
- Link between road works data and public transport data via traffic management
- Public transport priority widely in use; Fire pre-emption under construction; conceptual planning of use cases for vulnerable road users
- Cork has established a Smarter Gateway initative and and as part of this undertaking 'Open Data' access to relevent information sources is being developed.
- Dublin currently has public transport systems (bus, tram) centre-to-centre (and some locally operated) co-operation with the centralised traffic light system. We have compared this arrangement with TfL's operation.
- Energy Efficient Intersection Services (priority at traffic lights and time to green/speed advice) ahve been tested in a.o FREILOT and Compass4D and are now in operational use for transport company and emergency services
- GERTRUDE for traffic light management. Traffic radar system. Traffic monitoring cameras.
- Possibly of joint working arrangements with adjacenet authorities due to declining budgets and the need to make

efficiency savings against all operations.

- The most substantial, already implemented project of BKK in the field of ITS was the implementation of FUTÁR system, a dynamic traffic management and passenger information system. All vehicle in the PT fleet are equipped with satellite based tracking devices which enables the transport operators in retrieving real-time data about the position of the vehicle and possible disruptions on PT lines. This facilitates the real-time journey planning and reduction of travel times for passengers. Furthermore, the FUTÁR system manages 30 signalised intersections in Budapest, where PT vehicles are automatically prioritised. The extension of the traffic management system is expected in the future.
- The Municipality of Torres Vedras considers relevant the issues relating to mobility and road safety At this stage we are implementing the mobility plan, which will be evaluated later. Than, if the strategy go through the deployment of ITS, naturally we will analyze the best solutions for the city of Torres Vedras. Currently we are focus on mobility plan implementionand and follow the best practices developed by other countries in this field, as well as the ITS
- The trials carried out under the COMPASS4D project need to be extended. C-ITS is needed to help Bordeaux Metropole in limiting the use of private vehicles in the city centre, decongesting traffic and reducing its impact, while facilitating modal shift towards the structuring public transport lines (P&R) and implementation of parking policy. A link-up with the SCOOP@F pilot site on the bypass is a determining factor.
- Traffic signal priority for fire service vehicles
- UTMC systems linked to neighbouring authorities. Hosting HE UTC systems.
- We are running a UTMC system and separate VMS, JT, AQM systems but slowly trying to integrate them together via a Common Database.
- We have implemented some limited bus priority.
- We strongly believe that C-ITS is a way to develop our transport systems in the future. However we experience challenges especially with protocols where the different systems are unable to communicate. The City of Aalborg is divided in two parts by a fjord and it only has two crossings, a highway tunnel and a city bridge. When accident happens in the tunnel the transport system of the entire city collapses. We want to do test where real time detection in the tunnel can communicate with the Traffic signals in the city centre in thus give a better flow. At the moment that would probably not be possible. However we are in the middle of a tender with surveillance and maintenance of our traffic signals and as part of that a request is that all signals are upgraded to an open protocol. We hope that this will provide us with many more opportunities for C-ITS in the future.
- We want to use C-ITS to promote - bicycles (to provide information about time to green/ time to red of traffic lights on bicycle routes), - public transport (preconditioned priority at traffic lights, based on full/ empty vehicle, timetable) - air-polution (green time/ waiting time traffic lights based on actual values air polution), - emergency transport (full priority at traffic lights)
- We would like to consider C-ITS with neighbouring transport authorities.
- York makes use of an open data plaform, utilising RTIG XML, DATEX and UTMC standards to share live travel and network status data and drive a range of public facing information dissemination systems, (on-street, web and mobile). We are also developing links with CRM systems, intitially to exchange car parking data and allow for customer focussed car parking provision.
- Within a European project, they are working on a mobile apps and sensors-based pilot to interact with the freight distributor in the detection of the occupancy of the parking slots to inform the user about the availability of theseparking slots in real time
- Public transport information is used to inform users about waiting times and combinations of routes. they also inform about any kind of parking slot availability, some of them with real time information. Traffic congestion data is also available. All the available information it is offered to the developers in Open Data.
- Some examples: Bus Priority works between the city and transit agency (KomFram), now developed as one wireless system based on GPS and Rachel (tetra). The city has a newly developed map-based system for recording roadworks (StartUp) which transfer data into traffic management center Trafik Gothenburg via DATEX II. We are testing system connected trafiksignaler for the long term to be able to monitor and control these from Trafik Gothenburg. The city cooperates with Volvo on Drive-Me project which is self driving cars that will go on a test stretch around the city. The project ElectriCity used GPS controlling what drive and what speed electric and hybrid buses should useBottom of Form
- Travelling Information

Q27: DESCRIPTION OF IMPLEMENTED C-ITS SOLUTIONS

- Real-time information for bus and public transport priorities use cooperative elements where the bus itself identifies and requested priority and de-registering the need after passage of the stop line.
- Signal regulating for public transport where vehicles reports into the system and are assigned priority.
- We are thinking here of the active signal priority for public transport, and real-time information system. These communicate with bus and tram Bottom of Form

Q28F TXT: BARRIERS TOWARDS GREATER USE OF C-ITS - OTHER

- Staff availability
- It's not our market to control
- market uptake and large scale deployment. We need more users and more cities !

Q29: WHAT SHOULD BE DONE TO OVERCOME BARRIERS TOWARDS GREATER USE OF C-ITS IN YOUR CITY?

- -Joint plenary session for all involved - standardization of technical applications (interfaces!) - more resources (also personnel) - discourse and determinations on issues of data protection and operational models and responsibilities
- 1) relevant use cases with high benefits for the cities 2) financial support 3) legal requirements/support to the implementation
- demonstration projects to see the benefits from C-ITS.
- The benefit of C-ITS must be clearly described and visible to the citizens. Cost-benefit aspects need to be pointed out.
- The staff has to be increased. Then, a strategic alignment (necessary infrastructure and provision of funds) can be developed in the direction of ITS/C-ITS. This must be represented politically also.
- Financial support of local authorities through federal and State funds
- Promotion of cross-system, automatic plausibility checks regarding realization of the analysis recommendation
- The states' initiatives to integrate potential partners, deployment of personnel and finance for operation and maintenance
- projects to promote the application to show actually successful applications. Cooperation in working groups to resolve technical issues. Public work to the topic of data processing and data protection.
- Standardization of individual components in the range C-ITS to facilitate cooperation
- improved information
- - shift public transport to C-ITS based priority systems. This will to a large extend stimulate large scale roll out of C-ITS towards more user groups
- (I) development of "contracts templates" to cater for the capital delivery, operational and end stages of ITS contracts; including statutory processes where contracts become problematic (ii) surrendering of proprietry software into a performance bond situation for operational phases (iii) development of functional specifications for tendering, where such specifications have clear and unambiguous definitions of services, software, hardware etc...
- European (technical) standards
- Finding solutions that do not visually impact on the city.
- Increase funding from whichever source along with the technical in-house expertise would go a long way to helping achieve our goals.
- ITS / UTC / UTMC standardised mandatory protocols for communications and hardware operations
- low barriers
- More funding, less corporate obstacles.
- Need more revenue funding to develop the systems.
- Obtain political support and ensure that politicians are fully aware of the impact of the drive for continued economic growth whilst neglecting transport infrastructure
- Open protocols Larger budgets for the whole ITS area
- Share know-how. Share examples. Deeper understanding of the market and recent technology. Lack of human and finantial resources.

Q29: WHAT SHOULD BE DONE TO OVERCOME BARRIERS TOWARDS GREATER USE OF C-ITS IN YOUR CITY?

- The application of C-ITS is rather complex and requires thorough planning and precise implementation. Such projects usually require a substantial amount of funds which is often not available. The implementation of FUTÁR system also required high subsidisation.
- The C-ITS strategy was being promoted as a strategy for auotomated transportation (this being a good way of ensuring funds from higher levels). This top-down initiative has not yet been mapped into the SUMP actions in a coherent way, (such that C_ITS is not yet seen as a facilitating connecting tool across the SUMP). The revised organisation is an opportunity to address this ....
- The need to support more sustainable travel as the means to addressing Climate Change needs to be emphasised nad the incentives offered to support the deployment of C-ITS and switching to multi-modal travel options needs to be increased.
- The primary motivation of the Bordeaux pilot site is to improve mobility and safety in the Bordeaux urban area through connected vehicle technologies. This objective is directly aligned with the Bordeaux Metropole mobility plan, which has several objectives among which: 1. Leading to sustainable, clean and efficient transport 2. Implementing efficient multimodal transport 3. Innovative traffic management 4. Improving Urban and inter-urban (ring road) safety 5. Improving vulnerable road users protection In addition as a result of the deployment carried out in the frame of the demonstration programme of the ITS World Congress in Bordeaux in 2015 several partners including IFSTTAR, CEREMA, GEOLOC SYSTEMS and Bordeaux Metropole decided to build a living lab focused on C-ITS in the vicinity of Bordeaux. The purpose of this living lab is to create a framework/Ecosystem to design, develop and test in real conditions (open environment), in which users contribute and participate in the creation of new products and services. This Bordeaux pilot site provides an ideal opportunity to evaluate C-ITS technologies and services in a dense urban transportation system.
- There are too few adequate European standards in existence relating to system level interoperability. this causes small authorities like York problems in ensuring best value in procurement and avoiding system supplier lock-in. this is most prominent in the ITS on-street equipment larket and is less of a problem for in-station integration, where internet technologies are capable of offering interoperability.
- We understand that ITS should rise in the second phase. More than barriers, there is an initial work that must be done performed prior to accession to the ITS, at least in Torres Vedras
- Definition and management of European standards for information exchange about multimodal mobility in urban environment which should be mandatory for cities of more than one certain number of inhabitants.
- To have standardized systems with a favorable cost-benefit ratio that is clear and allows to show the benefits to the political level. To give adequate information to the responsibles of the different municipal areas.
- Demonstrate solutions and document that "do nothing" strategy municipality has adopted not give possitive effects but only exposes problem.
- It is a political challenge to present users' advantage. This is of course linked to costs and economic framework - which often comes in competition with physical investment with a higher priority. Thereafter organizational queations must be solved about who owns and manages the system / subsystem. It is also about of knowledge, so that ITS solutions have their natural place in the planning of traffic and infrastructure. Here needs cooperation and exchange of experience.
- Clear political orders with related financial assets
- Greater use of information about benefit conditions. The interest is on the rise! There is also problem related to access to qualified personnel, both for our agency and with consultants