Prerequisites for Further Deploying ITS Systems: The Case of Greece

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Abstract

The deployment of Intelligent Transport Systems (ITS) is a strategic decision for the European Union (EU). Through the integration of ITS in their transportation national strategy, the EU Member States can move decisively towards the achievement of the targets that have been set for a cleaner, safer and more efficient transport system. Moreover, the adoption of systems and services, that have been developed in other countries, and their induction in the national ITS frameworks can facilitate the interoperable and coordinated deployment of ITS and ensure the effort for the targets' achievement. This paper examines the possibilities of transferring in Greece the knowledge gained by three systems which have been developed in other three South East Europe (SEE) countries and defines guidelines for their future deployment in Greece.

1 Introduction

The promotion and further deployment of Intelligent Transport Systems (ITS) is an important priority of the transportation sector for the European Union (EU). The EU underlines that ITS development and deployment should be part of the overall designing process of an effective, transport related, strategy that accomplishes the goals for cleaner, safer and more efficient transportation systems (European Union, 2010). The extended deployment and use of ITS can be a strategic option for EU Member States, since ITS result to significant benefits taking into account their cost-benefit ratio (Giannopoulos et al., 2012).

Since 2010, the EU has adopted a dedicated legislative framework for ITS, the 2010/40/EU Directive on ITS deployment (ITS Directive) (European Union, 2010), where the importance of the integration of ITS in the overall transport policy context is recognized and the basic priority areas for their development are set. In addition, through several research initiatives and implementation projects, the EU aims to boost research on and implementation of ITS, in order to enhance the effort of achieving specific goals, related to the sustainability and the effectiveness of the transportation sector. These goals are mainly included in the White Paper for Transport (European Union, 2011) and are addressed both to the EU as a whole and to its Member States separately.

An important element for the successful deployment of ITS for Member States is the exploitation of the knowledge that has been produced through ITS adoption and introduction into national plans, technologies and systems that has taken place within the framework of European projects. This experience provides useful insight to EU strategies, in order to ensure the harmonized and interoperable implementation of ITS and the provision of unified services, which is essential especially for areas where the implementation of ITS is fragmented and uncoordinated (Mitsakis et al., 2015).

In the context of the SEE-ITS project, pilot applications of ITS have been implemented at six different countries of South East Europe (SEE) (Zubriczky, 2013). Three of these pilots, in Austria, Romania and Hungary (referred to as SEE-ITS systems hereafter) are related to the development of Advanced Traveler

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Information Systems (ATIS) and introduce different technologies and solutions with emphasis on influencing the local and regional transport policy providing important solutions in terms of harmonized and coordinated deployment of ITS. The work presented in this paper is based on the experience gained by the SEE-ITS project and focuses on the prerequisites needed in order to ensure the successful deployment of such ITS applications in Greece. The developed SEE-ITS systems have been examined in relation to their transferability and deployment in Greece, as well as their influence in the deployment of integrated National ITS strategies and nation-wide ITS activities (Mamarikas and Iordanopoulos, 2013). This paper emphasizes on national scale implementation, since the centralized planning, coordination and implementation are the most important elements of targets' achievement. The analysis also focuses on the ability of the SEE-ITS systems to enhance and support the priority actions that have been set by the Greek ITS Action plan (Ministry of Development, Competitiveness, Infrastructures, Transport and Network, 2012).

2 Description of the SEE-ITS systems

SEE-ITS was a transnational project aiming to stimulate cooperation, harmonization and interoperability between isolated ITS in SEE. SEE-ITS set the framework for ITS deployment in the field of road transport and its interfaces with other modes of transport based on the guidelines of the ITS Directive. The main objective of the project was to enhance the interoperable use of ITS for traffic monitoring and control along road transport networks at transnational, regional and local (urban/peri-urban) level. The project results set a long-term sustainable strategic and operational framework for institutional and operational integration of ITS in South East Europe countries.

2.1 Demonstration activities in Austria

The demonstration activities in Austria were composed of two parts: the development of a Server Platform for managing of traffic information and the development of a mobile application (for Android OS). The Platform includes a web interface for manual management of traffic information and an adapter to get automatic traffic information. The mobile application tests six use cases: In-vehicle signage, Hazardous location notification, Traffic jam ahead warning, Road works warning, Park & ride information and Floating car data.

2.2 Demonstration activities in Romania

The Romanian demonstration activities included a multimodal traffic information system solution that covers four different transport modes. The system brings together relevant traffic information from public transport, railway, road and inland waterway transport and provides multimodal routing options. The routing services follow a corridor approach from Timisoara to Constanta.

2.3 Demonstration activities in Hungary

The demonstration activities in Hungary included the development of a mobile application addressed to cyclists, which supports intermodality between bicycles and Public Transport modes. Its functions/ characteristics include: route planning taking into account the user's GPS position and distance from the nearest public transport station, navigation support and travel time estimation.

3 Methodological approach

The present paper examines the transferability potential of the above described systems in Greece. Therefore, the experience and knowledge, resulting from these three systems' implementation, that is useful for the Greek environment as well as the recognition of the potential contribution of these three pilot activities to the implementation of the Greek National ITS strategy, are presented, in the context of the present paper, through an analysis of the following points:

- Description of the current general ITS status in Greece
- Identification of, relative to the SEE-ITS systems, state of the art in Greece and definition of the technological and organizational gaps
- Estimation of the impact assessment of the SEE-ITS systems' implementation in Greece
- Integration of the SEE-ITS systems to the priority actions defined by the Greek ITS action plan
- Recognition of relevant stakeholders that should be involved in the implementation of the SEE-ITS systems in Greece
- Definition of the prerequisites for possible deployment of the SEE-ITS systems in Greece based on the EasyWay project's guidelines (Kleine et al., 2012; Usath and Belarbi, 2012).

The rest of the paper is structured in a way so as to answer in detail the abovementioned points in view of ensuring the effective deployment of the SEE-ITS applications in Greece.

4 ITS status in Greece

Greece is under development in the field of ITS (Mitsakis et al., 2015). Large investments took place over the last years. The total ITS investment at motorway level for the years 2010-2014 is estimated to approximately 47 million euros and at urban level to 92 million, while the total ITS investment amounts to 145 million euros (Ministry of Infrastructure, Transport and Networks, 2014).

Greece has adopted the ITS Directive in its national legislation and has already drafted a National ITS Action Plan (Ministry of Development, Competitiveness, Infrastructures, Transport and Network, 2012). The Greek ITS Action Plan sets the main strategic targets that ITS are expected to serve. These targets are road safety, effectiveness of the transportation

system, social cohesion and sustainable development. In these specific strategic objectives for Greece the global and European strategic objectives are also included and based on them the priority areas and necessary actions that are related to the development and implementation of ITS are defined (Mitsakis et al., 2013). Therefore the Greek ITS Action Plan adopts and transfers the ITS priority areas of the ITS Directive and adapts them according to the national ITS status quo and the specific national needs.

The integrated transport policy in Greece is structured by the Ministry of Infrastructure, Transport and Networks. The Ministry is responsible for the formulation of the transportation strategy as well as the planning and implementation of public investments related to ITS. Moreover, it is responsible for the coordination of all relevant stakeholders (Regions, Municipalities, transport services providers, the Academia). The Regions of the country (as administrative bodies) and the Municipalities, despite the fact that they have responsibilities regarding the development, planning and implementation of transport related measures, they have limited capabilities for action. This is mainly observed due to their limited administrative capacity, the lack of adequate scientific background, the problematic conception of their role and the fragmented exploitation of opportunities and initiatives undertaking.

A first introductory step of the present analysis is the summary of the experience, concerning the current ITS status in Greece, that has been gained within the project though the Greek demonstration activities of ATIS in Thessaloniki and Patras. The analysis focuses on the provision of general guidelines describing the main steps that the Greek state should follow in order to ensure the coordinated, interoperable and harmonized deployment of systems and services which are able to contribute in the achievements of the national targets that have been set.

The general situation in Greece can be summarized in the following remarks:

- The development of appropriate infrastructure and the provision of services that cover a variety of functions and applications are at an advanced stage, owed to the utilization of European funds, participation in EU projects and individual initiatives by organizations and entities
- These services, in many cases, have been developed and currently operate independently
- Many traffic data remain unexploited
- There is fragmented and isolated development due to lack of central coordination and the fact that the unique strategic plan is currently immature and
- Existence of central infrastructure regarding the accumulation and the centralized provision of data is observed

5 Relative state of the art in Greece

The systems that have been studied and developed within the SEE-ITS project could be transferred in Greece and could be an important step towards the implementation of the previously mentioned general requirements, contributing in parallel to the implementation of the priority actions that have been set by the Greek National ITS strategy. The rate of their involvement is defined by the recognition of the existence of, similar or identical with the SEE-ITS applications, systems in Greece as regards the final services that are provided.

As mentioned above, the three SEE-ITS systems (Austrian, Romanian and Hungarian) have as a thematic framework the provision of ATIS. The Romanian and the Hungarian systems enable also the function of navigation since they are route planners. The Austrian application contains road safety enhancement functions and services. In all systems the information is provided through end-user mobile applications that cover a wide range of functions. The technological background (e.g. the traffic data sources) and the functions that these systems introduce are partially met in the Greek ITS status quo, through either already implemented applications or through applications that are currently under development.

More specifically, regarding the thematic framework of the Austrian end-users applications, which is the provision of information to drivers aiming at the enhancement of road safety, the only similar application that exists in Greece is the Road Hazard Warning (RHW) application, that is under development in the city of Thessaloniki through the Compass4D project (Mitsakis et al., 2014). Both applications are based on real time traffic data and are applied to interurban environments and periurban highways. The technological background used by the Austrian system is similar to the one applied in Greece, with the exception of the system's function that can easily adapt data of various formats. This function is the main innovation that the system introduces and the main function that can be adopted in Greece since, through this function, the system is able to accept data from various and different sources and can easily adapt data that are in various formats (Datex II, GeoRSS). Organizational gaps that could prevent the large scale implementation in Greece are related to the generation and combination of data from various sources, in a common base.

Regarding the Romanian system, the only quite relevant applications in Greece are two: the EasyTrip platform, that is able to provide multimodal (car and public transport provided by trains and buses) interurban routing information combining real time and static traffic data and the Mobithess platform which is a multimodal planning platform for the area of Thessaloniki and which combines real time traffic data and urban public transport static data. These two applications have regional and local character respectively, while at a national level no similar application exists. The Romanian system

combines more transport means (public transport, urban and inter-urban car transport, railway transport and inland waterway transport) compared to the Greek applications and utilizes a wide range of real-time data, when these are available. Moreover its geographical coverage is wider compared to the Greek applications. Concerning the technological similarities with the Romanian system, the main technological background exists also in Greece and both utilize real time traffic data from motorways and from urban public transport operators. As regards the provision of Floating Car Data, urban public transport fleets and taxis companies, in several cities, have already been equipped with GPS and GPRS systems and are able to transmit real-time traffic data that can be used in specific applications. On the other hand, only a limited number of Public Transport companies use these data in the framework of ATIS platforms. In the majority of cases only roadside infrastructure (i.e. Smart Bus stops) utilizes these data. However, these applications have a local character. A system that will be able to provide real time data for the railway is currently under development. Organizational gaps between the two systems are mainly related to issues regarding the difficulties of the collection of data from different data sources in Greece and their integration in a common database and by extension in a common platform.

Concerning the implementation of the Hungarian system in Greece, the general remark is that Greece is under developed in terms of bicycles' use. Only in some cities a cycling culture is gradually developed, in parallel with the construction of the appropriate infrastructure for bicyclists. Moreover parts of the Greek road network are included in three routes of the eurovelo network (8, 11, and 13), but none of them has been realized yet within the Greek territory. Regarding services and applications that can enhance cyclists, it seems that the only relevant application exists in the Mobithess platform, where Thessaloniki's bicycle lines network is presented in a static map while navigation services which include multimodal services for bicycle and other transport means do not currently exist. On the other hand bicycle related applications that include automated bike rental have been developed in several Greek cities like Athens, Thessaloniki, Kavala, Ioannina, Corfu and others. The technological background used in the Hungarian application is similar to the one applied in the various applications in Greece. Organizational gaps that could prevent the large scale implementation are related to the generation of data from various sources (modes) in a common database. An important gap that could be a barrier to the large scale implementation is the lack of appropriate infrastructure regarding bicycles.

6 Estimation of impact assessment

Part of the analysis is the estimation of impact assessment that the three systems could have in case they were implemented in Greece. In order to achieve this, the already identified and measured benefits from the three systems (Iordanopoulos, 2014)

need to be transferred to the case of Greece. The proposed methodology includes statistical methods used in several previous related studies (Zwaneveld and Van Arem, 1997; Maccubbin et al., 2008; Chiara et al., 2009; Klunder et al., 2009) which are based on the measurements of real world impacts/benefits coupled with transport-related statistics for weighting these benefits and obtaining ones for the studied area. Therefore, apart from the collection of the measurable (based on the nature of each system) impacts/benefits of each SEE-ITS system, there is necessity for desktop research to gather statistical data at city, regional and national level. These general data are the multipliers that allow transferring impacts of Demo activities in Greece.

6.1 Measured Impacts and Benefits

Based on the results deriving from the impact assessment studies executed in the framework of SEE-ITS project (Mamarikas and Iordanopoulos, 2014) the following tables were created including all the measurable impacts/benefits of the three SEE-ITS systems.

Table 1 Impacts of the Austrian System

Impacts	Unit	Percentage
User Satisfaction	N° of people	+ 31%
User acceptance	N° of people	+ 50%
Emmissions reduction	CO_2/day	5%

Table 2 Impacts of the Romanian System

Impacts	Unit	Percentage
Increased number of better informed travellers	N° people	+ 60 %
User Satisfaction	N° of people	+ 80%
User Acceptance	N° of people	+ 90%

Table 3 Impacts of the Hungarian System

Impacts	Unit	Percentage
Reduction Vehicle – kilometers travelled	(Vkm/day)	0.1%

6.2 Statistical data for Greece

In Greece the collection of transport related statistical data is problematic, since there is lack of data sources regarding transport activities. The available data, provided by the official authorities, are limited only to the ones provided by the Hellenic Statistical Authority (n.d.) and these cannot meet all the needs of the present activity adequately. Therefore in the framework of the present work this gap is filled with the use of the projections of the TREMOVE model (n.d.). TREMOVE is a model that estimates various indicators such as transport demand, modal shifts, vehicle stock renewal as well as emissions from transportation activities for several EU countries for the period 1995-2030. Apart from data coming from TREMOVE model,

specific data for the city of Thessaloniki have been obtained from the traffic macro-model of the Hellenic Institute of Transport (CERTH-HIT, 2011), while other literature sources (Ministry of the Environment, scientific papers, Eurostat, etc.) have also been used so as to fill the missing gaps.

The City of Thessaloniki, as an urban environment, has been judged representative in order to be used as the basis for the extrapolation of the results at Greek urban level. Respectively the Region of Central Macedonia (RCM) could play the same role at regional level.

As regards the necessary types of data that needed to be collected, these were closely related to the nature of the three SEE-ITS systems. The systems that are implemented in Austria and Romania are able to increase the number of informed travelers. Therefore it was feasible to measure the number of better informed travelers, their satisfaction and their acceptance. The transfer of the systems' impact in Greece can be performed using the indicator of the total number of private vehicles that are registered. These numbers are considered as an indicator of the people that potentially can be informed and accept the information that is provided to them. Moreover, two additional impacts that could be measured during the evaluation phase of the Austrian and Hungarian systems is the emissions reduction and the reduction in the vehicle-kilometers travelled (VKM).

Total number of private vehicles. The number of vehicles ownership in Thessaloniki can be utilized as an indicator of the users' of the road network. The data have been obtained by the Hellenic Statistical Authority (n.d.). At regional level, the number of vehicles registered at RCM are taken into account and compared with the national values. The respective numbers, from the Hellenic Statistical Authority are provided on the table below.

Table 4 Total number of vehcles per area of interest

Area	Total Number of vehicles
Thessaloniki	627,502
RCM	986,020
National	6,539,944

Vehicle-kilometers travelled (VKM). For Thessaloniki's urban area, data regarding the total daily VKM performed have been derived from the traffic macro-model of CERTH-HIT with the use of VISUM software. For a typical day 8.17 million VKM occur. At national level there is a lack of information about VKM. Therefore the estimations provided by the

TREMOVE model have been used. According to it, total VKM travelled per day at urban areas in Greece are 65,89 million. The model, for the road transport activities estimates that at annual basis the total VKM activity in Greece is 62,139 (in millions) for year 2010. This corresponds to 170.24 million VKM per day at the entire country for all road types.

CO_2 emissions. The high CO_2 emissions caused by the road transportation sector made reasonable the research of the ways to reduce those emissions. According to recent studies, the impact of the road transportation sector in the overall CO_2 emissions is approximately 25% (Török, 2007).

CO_2 emission caused by humanity
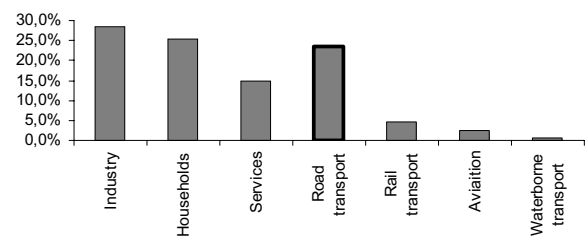
Fig. 1 CO_2 emissions produced from human activities (Source: Török, 2007)

CO_2 emissions for the entire Greek territory have been derived by the "Greenhouse Gas Emissions Inventory" report of the Ministry of Environment (2012), according to which total CO_2 emissions from road transport, for year 2010, are estimated at 18,907 kt. Data for specific areas of the country are not available. So, in order to estimate fuel consumption in Thessaloniki, it is assumed that this is proportional to the total VKM travelled in the area compared to the total VKM performed at a country level. Therefore, the allocation of CO_2 emissions is performed according to the following table.

Table 5 CO_2 emissions per area of interest

Area	CO_2 emissions (in kt)
Thessaloniki	907.5
RCM	472.7
National	1512.6

6.3 Transferred impacts

As regards the Austrian SEE-ITS system, the table below presents the potential number of satisfied people and also the potential number of people that can accept the system in Greece. Moreover it shows the potential impact in CO_2 emissions that the system is expected to have if implemented in Greece.

Table 6 Impacts of the Austrian System in Greece

Impact to be transferred	Local Transferred Impact	Regional Transferred Impact	National Transferred Impact
User Satisfaction in No. of people	203,800	315,500	2,027,400
User Acceptance in No of people	313,700	493,000	3,270,000
Emissions (CO_2) reduction in Kt/year	45.375	23.635	75.63

The following table presents the respective results for the case of the Romanian SEE-ITS system.

Table 7 Impacts of the Romanian System in Greece

Impact to be transferred	Local Transferred Impact	Regional Transferred Impact	National Transferred Impact
Increased number of better informed travellers	0.317 M	0.453 M	3.134 M
User Satisfaction in No. of people	0.253 M	0.362 M	2.650 M
User Acceptance in No. of people	0.283 M	0.410 M	2.820 M

Finally, Table 8 presents the results for the case of the Hungarian SEE-ITS system.

Table 8 Impacts of the Hungarian System in Greece

Impact to be transferred	Local Transferred Impact	Regional Transferred Impact	National Transferred Impact
VKM Reduction in million	0.00817	0.00872	0.0288

7 Integration of the SEE-ITS systems to the Greek ITS Action plan

Having recognized the potential of each system to be transferred and developed in Greece, the present section examines and analyses the ability of the systems to answer to the priority actions of the ITS Action Plan.

The Austrian system would be contributing in several priority actions of the Greek ITS Action Plan since it is a system that, by harmonizing data, can be used as the basis for the design of national systems that collect and process data from different sources. Moreover the system can be used as an example for the development of traveler information services that focus on the provision of road safety information and advice. The specific priority actions are:

A. "Actions for the development of national scale systems and platforms for the collection, processing and utilization of traffic data"

B. "Actions for the development of national scale real time traveler information systems"

C. "Actions for the development of Integrated traffic monitoring center for motorways network"

D. "National actions for the development of accident prevention and suppression systems"

The Greek ITS Action plan has sets as priority, under the priority area of the optimal use of road data, the development of a national multimodal planner and the development of systems and platforms for the collection, processing and utilization of traffic data. The Romanian and the Hungarian systems are able to contribute to this priority since the platforms that have been developed combine different transport modes and provide route planning services for a large geographical area. Especially the example of Hungary could be introduced in Greece and contribute to the achievement of the targets set by the Greek Action Plan regarding the implementation of a national multimodal planner and the implementation of actions that focus on the promotion of bicycles.

8 Actors involved

The implementation of the SEE-ITS systems at national level requires planning and coordination from the Greek Government and more specifically from the Ministry of Transport, Infrastructure and Networks. The implementation of traveler information provision and multimodal routing services, requires the collaboration of the Ministry with the Regions of the country, as well as with the public transport operators and the transport services providers (railway, ports etc.).

9 Prerequisites for possible deployment of the SEE-ITS systems in Greece

The final step of the analysis is related to the formulation of guidelines, based on the logic proposed by the EasyWay project (Usath and Belarbi, 2012; Ministry of Infrastructure, Transport and Networks, 2014) and which are able to provide directions and create the preconditions for the successful deployment of the SEE-ITS systems in Greece and the implementation of the priority actions defined in the Greek Action Plan. The guidelines are separated to functional, technical and organizational categories. Each guideline is addressed to the ITS categories in which the SEE-ITS systems have been classified.

9.1 Functional Guidelines

- Services should include, at a minimum, functions of real time travel times provision and real time traffic conditions description such as those provided by the Greek services
- The installation of the appropriate roadside infrastructure is necessary. The provision of information through VMS, as performed in the Greek applications, is essential
- Services should include functions of real time routing for at least two different means of transport regarding the local-regional implementation, while at national level several means should be included as performed in the Romanian application
- Real time and static public transport data, like the ones utilized in the Romanian application should be introduced in the applications

- In case of lack of real time data availability, the continuity of information provision should be ensured by static data as implemented in the Romanian application
- ATIS applications should include any existing bicycle lanes information as implemented in the Hungarian application
- The design of ATIS platforms should take into account the future development of the eurovelo routes
- Information on the ability of transporting bicycles with other transport means should be provided when available
- Data collection platforms/observatories should be able to provide data for large parts of the urban and the motorway road networks
- Data collection platforms should be able to provide data for the development of applications and services such as information provision services
- Data collection platforms should be able to enhance the operation of traffic management centers

9.2 Technical Guidelines
- Real time traffic data should be available
- The system should be able to provide alerts when data are not available
- The traffic data measuring equipment should ensure the continuity of data provision
- The quality of traffic data should be examined constantly
- The system should be able to immediately respond to traffic conditions changes
- European standards like Datex II should be followed
- The technology used for data processing should be easily transferable as indicated by the Austrian system
- Interfaces should be easily developed so as data could be easily transmitted to local traffic management centers
- Appropriate interfaces with the centralized systems should be developed within the existing systems
- A common national database should be developed as described in the Greek ITS Action plan

9.3 Organizational Guidelines
- The exchange of data deriving form stakeholders that serve the public interest must be continuous and unobstructed
- The consortium's structure should ensure the viability and the continuity of the services with specified and clear role allocation
- The administrative body that is responsible for the supervision of the services, should ensure the quality of data provision and should enhance the synergies between mutual platforms and services
- The Greek State should have the primary role in the implementation phase of the action and ensure the appropriate coordination and collaboration of stakeholders, while

the regional and municipal authorities of the country should also play a key-supporting role

10 Conclusions

Within the framework of the present work, the main conditions, in order to successfully transfer and implement in Greece three ITS systems that have already been developed in other SEE countries, have been discussed. The analysis performed, mainly focused on the potential contribution of these systems in the implementation of the existing national ITS strategy. The resulting guidelines indicate the importance of strategic and centralized transport planning and the primary role, that the Greek state should have, in the phases of planning, designing and implementation of the priority actions set by the Greek ITS Action plan and as well as in ensuring the appropriate coordination and collaboration of the several stakeholders involved.

The guidelines are based on the analysis of the current status in Greece and the investigation of the similarities and differences between the SEE-ITS systems and the systems that currently exist in Greece. For all systems, specific functions of the system that has been developed in Austria, the technological background of the systems has already been implemented in Greece. A major organizational issue that is observed in the framework of current ITS deployment in Greece is the difficulty in the accumulation of traffic data that derive from various sources, a fact that increases the complexity of the SEE-ITS systems transferability.

The SEE-ITS systems have been analyzed according to their potential contribution in the priority actions proposed by the Greek ITS Action Plan. The information and navigation systems are able to enhance actions that are related to the development of national scale multimodal planners. The system of Austria seems to be able to influence Greek ITS strategy more because it is able to answer to more than one priority actions of the Greek ITS action plan.

The guidelines that are formulated present the appropriate preconditions for the large scale development of ITS systems, similar to the ones that have been developed in the framework of SEE-ITS project, effectively answering to the Greek ITS priority actions. The guidelines underline the importance of information provision through various means (smart devices applications, roadside infrastructure, etc.), the need for interoperability between the different applications through the deployment of the European standards, the need for traffic data accumulation in a unique platform and the importance of frequent monitoring of the data quality and the continuity of the services provision. Concerning the organizational issues, the need for a clear role allocation and responsibilities description among the several stakeholders is highlighted as well as the need for collaboration among stakeholders that serve the public interest.

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