Final Report

TREN/G4/FV-2008/475/02

Study regarding guidelines for public funding of Intelligent Transport Systems

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Executive Summary

Background

This study was commissioned by DG-MOVE in support of Action 6.3 of the European Action Plan for the Deployment of Intelligent Transport Systems in Europe. The aim of this study has been to establish the state of the art and enhance overall understanding on how ITS currently is being funded in Europe. It prepares the ground for the development of guidelines for public funding of ITS facilities and services at both European and national levels.

At the outset of this study an initial literature search of EU research in this area and of PIARC, IBEC and OECD sources, indicated that there is no readily available comparative analysis of transport funding schemes and ITS investment methodologies to support the decision making process. This study has therefore been timely, as a thorough understanding of the funding methods available and currently in use for Intelligent Transport Systems is key to promoting European deployment now that is becoming accepted as a proven instrument for delivering transport policy goals. The report coincides with the publication by the Commission of its Transport White Paper which highlights the need for a new funding framework for infrastructure investments. The recommendations from this study complement various initiatives included in the White Paper on modern infrastructure and smart funding. It is particularly timely as ITS is migrating from research and development to large scale deployment.

Methodology

To facilitate information gathering we conducted desk and internet research and developed a survey questionnaire (template) which was approved by the Commission. This was widely disseminated to targeted key stakeholders to ensure representative coverage and engagement. Responses were received from ten countries and seven cities. The quality of information was variable. From a review of the responses to the questionnaire it is clear that a great variety of different funding methods are in use within the public sector for ITS projects. Even where there are commonalities there are significant differences in characteristics. We therefore developed a classification of terms to enable structured analysis which comprises:

- **Funding framework:** the institutional, legal, organisational and budgetary framework within which the funding scheme operates
- **Funding model**: (generic) funding from a given *funding provider* (national, regional, local, operator, commercial etc) with a given *funding method* (grant, subsidy, competition, reinvestment of revenue, sponsorship or other financial tool / incentive)
- **Funding scheme**: (specific) a funding programme for specific purposes and policy goals, using a selected *funding method*, involving one or more funding agencies or partners as the *funding provider* (single agency, multi-partner, composite arrangements, Joint Venture)

- **Funding conditions**: the *funding provider* may impose qualifying criteria, such as specific eligibility criteria, a satisfactory business case (e.g. a cost-benefit analysis), conformance to national standards or to a system architecture
- **Funding source**: the *funding provider* will draw on one or more sources of funding for the *funding scheme*, for example through taxation, borrowing, income or revenue. Sponsorship and cost sharing with the private sector (banks, property developers)
- **Funding method:** *funding providers* use a great variety of methods for distributing funds. For example capital grant or operating subsidy from a National (State), Regional or Local (city) investment programme and performance payments and revenue support schemes.

The overall picture is of great diversity in funding frameworks, the sources of funding, the funding providers and in the models used in the funding schemes. We have been able to identify at least 12 distinct funding models that are in use for funding road transport and ITS-related investments:

- **European funding:** grants and co-funding from the Trans-European Transport Network and CIVITAS programmes, the EU regional development programmes and the Competiveness and Innovation Programme's "ICT for Policy Support" programme
- **National and regional transport investment programme:** capital grants for investment in strategic roads (motorways and other major routes) including ITS components
- **Local (municipal) transport investment programme**: capital grants and revenue support for investment in local roads, public transport networks and information systems
- **Transport operator funding:** investment in vehicles, infrastructure, operating systems and information services by bus, tram and rail operators, funded with revenue from users and exploitation of owned assets
- **Private finance, PPP, toll roads & private sector concessions:** covers various arrangements which make use of private finance for transport projects promoted by the public sector. They include toll revenue, user charges and the financial instruments that provide capital up front for construction and renewal of the infrastructure
- **Multi-partner composite funding:** where a group of public and private sector stakeholders agree to cooperate together in the financing of services of common interest, with each contributing at a level determined by themselves
- **Joint venture funding:** where a group of public and private sector stakeholders come together to form a single legal entity to invest in and deliver transport projects, including an element of public sector finance
- **Special innovation funds:** aimed at stimulating innovation to address grand challenges by providing support for new products, services and systems at a critical stage of their development
- **Funding incentives and subsidies:** from the public sector to offset user or service provider costs in order to achieve a specific policy goal
- **Sponsorship:** by the private or non-profit sector to offset public sector investment and operational costs in providing infrastructure and services
- **Special borrowing and investment arrangements: that** bridge the gap between the financial cost of a transport project and the revenue which they might generate by facilitating and promoting ways to finance and operate transport projects

- Dedicated funding for ITS: ring-fenced funding programmes (capital and operations) for ITS infrastructure and services.

We considered 17 different types of ITS applications clustered into five functional groupings:

- **Highway Network Operations:** Managed motorways; Inter-urban traffic control centres; Variable message signs; Incident management; Speed detection / enforcement; eCall; and other ITS-based safety applications
- **ITS in Towns and Cities**: Urban traffic control; Variable message Signs; Floating car data; Road pricing; and other urban ITS-based safety applications
- **Trip Planning, Traffic and Travel Information**: Real-time public transport and road traffic information; and journey planning
- **Public Transport Operations:** Bus fleet management; Smart card ticketing / payment; Real-time public transport information
- **Freight Transport**: Fleet management; and Intelligent truck parking.

We prepared country summaries and considered 33 different funding schemes from seven countries and identified the synergies between funding providers and funding models.

Overview of Results

It is clear that the funding of ITS involves a large number of different funding providers, ranging from single agencies to composite partners in joint ventures (involving both public and private sector organisations) - with a wide variety of funding providers and funding models. Despite being able to classify schemes into 12 generic models there is still considerable complexity at programme/scheme level. For instance:

- budgets may be one-off or extend over a number of years
- funding may be awarded competitively or through a system of regular grants
- some have statutory conditions attached to the award of money
- some require cost-benefit investment appraisal and a well developed business model
- some require regular monitoring of the project delivery against key performance indicators and/or mid-term evaluation and/or ex-ante evaluation
- some involve formal contractual relationships involving co-financing whereas in other cases no shared finance is involved (e.g. in-kind provision of data)
- national, regional or local transport authorities may be closely associated with the investment or at arm's length
- the use of user fees or charges is not uniform nor is the manner in which revenue streams are used
- the role of the private sector/finance is increasing due to the economic situation and the high cost of filling gaps in national networks and renewing infrastructure
- increased private finance has stimulated innovation in public-private partnerships, ranging from complex equity release schemes to simple sponsorship opportunities.

This means that Member States are working to different funding regimes and transport investment assessment methods which impacts directly on the assessment and financing of cross-

border infrastructure and ITS services. This is likely to impede progress on the ITS Action Plan priority areas. There is therefore a pressing need for action in three areas:

- European Guidelines: development of good practice guidance at policy level in relation to arrangements affecting the public finance of ITS, much of which will need to be prepared after consulting Member States
- Web-Based Resources: development and maintenance of web-resources for the benefit of ITS practitioners to support internal budget processes and to enable and push for ITS (funding) ex-ante scheme appraisal
- Further investigation: to support the development of robust guidance and tools to establish a more robust evidence base on Member States' existing arrangements in key areas and the role and importance of European funding in ITS deployments.

European guidelines

The Commission's aim in proposing to develop and issue ITS specifications and guidelines is to support Member States to implement the ITS Action Plan and Directive bearing in mind that one-size doesn't fit all and that there is a lack of easily accessible information about different funding schemes and options. Guidelines issued at European level will need to respect the principle of subsidiarity and will only be binding where there is direct European funding of transport projects - whether through the TEN-T programme or the Structural and Cohesion funds. In other respects the high-level aim of guidance will be to ensure:

- synergies and added value between EU funds and national sources of funding
- that EU funded projects provide European added value by contributing to the effectiveness of the European transport system and other EU policy goals.

Kernel requirements for European funding guidelines and web-based resources

We have looked at how most effectively the Commission can support Member States in providing guidance on funding ITS. We have identified kernel requirements for Commission guidelines and web-resources in four distinct areas:

- **Budget and finance processes:**
  - **Support for internal budget processes:** by making readily available, information on ITS costs and benefits specific to the European context including whole life and operational and maintenance costs
  - **Justifying investment in ITS:** development and promulgation of good practice on how to justify an investment in ITS and make the business case for public funding
  - **ITS scheme appraisal:** development and promulgation of good practice on ITS scheme appraisal for selecting ITS applications to meet transport policy goals alongside other transportation projects
  - **Monitoring and evaluation:** development and promulgation of good practice on the monitoring and evaluation of ITS schemes to demonstrate value for money
  - **Partnership working:** development of advice on partnership working, in particular through case studies and examples of inter-agency collaboration and co-financing

- **Use of enabling instruments**
  - **European ITS Action Plan and Directive:** development of policies with the Member States on coordinated funding for ITS infrastructure and services across borders
  - **Funding conditionality:** in-depth consideration of the case for funding conditionality (in particular in relation to ITS Architecture and Standards)
  - **Effective organisation for ITS deployment:** advice on effective organisation for ITS deployment through case study examples
  - **Collaboration:** with other organisations such as CEDR, PIARC, UITP, IBEC on the development and promugation of good practice guidelines

- **Mobilisation of investment actors**
  - **Importance of European funding:** further analysis on the significance of European Funding for ITS, for example with regard to modernising ITS infrastucture and updating legacy systems

- **Alternative funding sources**
  - **Use of private and innovatory finance:** guidance on the use of private and innovatory finance in ITS though case studies.

<u>Further investigation and ongoing review</u>

This development process needs to be supported by further investigation and ongoing review of Member States' practices in the areas of:

- funding conditionality in relation to ITS Architecture and standards, particularly with reference to Action Plan priority areas and in the long-term on cooperative vehicle-highway systems where a pan-European approach is needed
- securing details of scheme appraisal methods and guidance currently offered in relation to funding of ITS components. This will help to build the knowledge-base from which best practice guidance can be developed, flexible enough to respond to different countries' characteristics and needs, according to their geographical position in relation to European markets, financial situation, level of economic and regional development
- securing further information on organisational arrangements in terms of partnerships for the design, funding and delivery of ITS deployments. This often-neglected area is a pre-condition for successful collaboration and funding arrangements that take account of wider stakeholder interests. The request for information might be part of the five year strategies that they are asked to provide in August 2012 under the ITS Directive.

This should be supplemented by the Commission further investigating:

- Monitoring and evaluation: to develop recommendations on ITS project monitoring and ex-post evaluation of ITS deployments to demonstrate value for money, including guidance on the evaluation methodology and the use of policy-led Key Performance Indicators (KPIs). There is no agreement between countries and between different organisations on the need for monitoring and evaluation and no established good practice; nor any agreement on the appropriate proportion of budget for evaluation. This contrasts with the US where practice has to satisfy the requirements of the US Government Performance and Results Act of 1993
- Private and innovatory finance: in-depth case studies (for publication) on effective and innovative finance for ITS to serve as models for ITS deployments at European, national and local level in relation to ITS Action Plan objectives
- Justifying investment in ITS: guidance, for publication, on business planning and investment appraisal for public and private funding of ITS on the TEN-T Road Network to give effect to the Transport White Paper's proposals for a new funding framework. This would augment the Commission Guide on Cost Benefit Analysis (CBA) in 2002, updated in 2008 [1] - the methodology that Member States currently use in the preparation of infrastructure projects to be co-financed by the Commission
- Importance of European funding: the role and importance of European funding for ITS deployment as European funding for ITS is significant for many of the countries included in the survey, especially those European countries that are lagging behind with basic ITS infrastucture. Examination of EC funding rules was specifically excluded from this study.

Dissemination

This study has broken new ground and we therefore recommend that dissemination of the results would be extremely advantageous in fostering understanding and creating awareness. We suggest that this dissemination and engagement should be through:

- Awareness-raising: presentation of study findings to the:
  - European ITS Committee
  - European ITS Advisory Group
  - TEN-T Finance Committee
  - European Parliament Committee on Transport and Tourism

- Consultation workshops to present study findings and debate issues with:
  - stakeholders drawn from CEDR, POLIS, ERTICO, Association of ITS Nationals, EasyWay partners etc
  - EIB and private finance players
  - local authority groupings, including CEMR, EALA, CIVITAS cities, other stakeholders.

  The issues raised in the workshops should be logged and a report made to the Commission identifying areas of consensus, knowledge gaps and other issues arising.

[1] http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf

Conclusion

On completion of the follow-on work programme the Commission will be in a position to develop the web-based resources and guidelines recommended by this study. This will provide the tools to enable organisations involved in commissioning to effectively determine appropriate funding arrangements for ITS.

1 Introduction

Intelligent Transport Systems (ITS) can significantly contribute to a cleaner, safer and more efficient transport system. The Commission took a major step towards the deployment and use of ITS in road transport (and interfaces to the other transport modes) on 16 December 2008 by adopting an Action Plan. The Action Plan suggested a number of targeted measures and included the proposal for the Directive. The goal is to create the momentum necessary to speed up market penetration of rather mature ITS applications and services in Europe. The initiative is supported by five co-operating Directorates-General: DG Mobility and Transport (lead), DG Information Society and Media, DG Research and Innovation, DG Enterprise and Industry and DG Climate Action.

The aim of the European Commission is to develop guidelines for the public funding of ITS facilities and services based on an assessment of their economic, social and operational value (ITS Action Plan 6.3) - and the present study addresses the potential definition of a minimum framework to be put in place for ensuring that ITS-based solutions are considered as an integral part of established transport investment assessment procedures. The objective is to integrate ITS with more conventional infrastructure, operations and maintenance solutions in the decision making process.

A new legal framework (Directive 2010/40/EU) was adopted on 7 July 2010 to accelerate the deployment of these innovative transport technologies across Europe. This Directive is an important instrument for the coordinated implementation of ITS in Europe. It aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide in which systems to invest..

Under this Directive the European Commission has to adopt within the next seven years specifications (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across the EU. The first priorities will be traffic and travel information, the eCall emergency system and intelligent truck parking).

The European policy context is the achievement of the objectives of the common transport policy and the Lisbon Strategy in terms of:

- the deployment of ITS systems and services on the Trans-European Road Network (TERN) as part of the wider European strategy to create a competitive single market with free movement of people and goods across borders
- sustainable mobility - improving co-modality and the efficiency of transport networks in tandem with improved safety and reduced negative environmental impacts – and to respond to the global challenges posed by climate change and energy security (amongst others)
- social protection including crisis prevention and management enabling European industry to capture a leading share in the global market by creating conditions for the

automotive, information technology and telecommunications industries to develop invest and bring to market new and innovative ITS-based products and services.

One of the key challenges facing wide scale deployment across Europe is that of funding. Investment decisions vary greatly and are influenced by policy, understanding and frameworks, rules and procedures. It is clearly beneficial to be able to determine the results and impact of various levels and types of funding as we seek ways to apply intelligence to our European transportation services.

This study was commissioned by DG-MOVE in support of Action 6.3 of the European Action Plan for the Deployment of Intelligent Transport Systems in Europe. It prepares the ground for the development of guidelines for public funding of ITS facilities and services at both European and national levels.

The study was led by Logica working with Ankerbold International and with input from ERTICO. Close cooperation has been achieved between the study team, the Commission and a wide constituency of stakeholders who have all contributed to the study. The work programme for the study is at Appendix 1.

2 Study Objectives, Methodology and Response

2.1 Study Objectives

A thorough understanding of the funding methods available and currently in use for Intelligent Transport Systems is an important aspect of promoting European deployment. There is a great diversity of actors at national, regional and local level. They work to different funding regimes and transport investment assessment methods. This leads to a lack of transparency and different funding criteria being applied – with unpredictable results in relation to EC policy priorities. These institutional differences will impact directly on the assessment and financing of cross-border infrastructure and ITS services and are likely to impede progress on the ITS Action Plan priority areas.

The aim of this study has been to establish the state of the art and enhance overall understanding on how ITS is currently being funded in Europe (examination of EC funding rules is excluded).

1) Rationale for the study:

Decisions on investments are typically based on awareness, understanding of possible options and are steered by benefits compared to costs. Instruments and sound procedures for economic, social and operational impact analysis of short listed solutions are required to underpin a correct decision making process, but in order to have decision makers considering ITS a valid option they also need to understand the pros and cons of ITS and that they can operate within a framework that allows them to go beyond 'adding more (hard) infrastructure'.

2) Objectives of the study:

The present study addresses the potential definition of a minimum framework to be put in place in order to have ITS correctly considered when it comes to solving mobility and traffic related problems. As a first step an inventory of applicable policies, frameworks, rules and procedures with regard to funding needs to be realised taking into account National, Regional and local levels. This process is combined with a brief assessment (what, how, result) and identification of potential common elements. The current study also makes recommendations for future work, aiming at the definition of a minimum framework to be put in place.

2.2 Methodology

An initial literature search of EU research in this area and of PIARC, IBEC and OECD sources, indicated that there is no readily available comparative analysis of transport funding schemes and ITS investment methodologies to support the decision making process. Our purpose has been to establish at national, regional and local (municipality) level:

- the public funding mechanisms that are currently used for ITS deployments, their institutional framework, legal basis and other key features (including financing arrangements, rules and procedures)

- case studies, mapping specific types of funding models and schemes to ITS strategic goals and applications and the core group of issues that need to be taken into account in developing future guidelines on public funding of ITS which are responsive to the ITS Action Plan and European transport policy goals in the Commission's Transport White Paper proposals.

An initial scoping study was conducted which confirmed that the proposed methodology was appropriate for this task. It comprised:

- Stage 1: Compile an inventory of existing policies and practice
    - Task 1a: Information gathering
    - Task 1b: Reporting
- Stage 2:Assessment of the information collected
    - Task 2a: Overview of results: information gathering
    - Task 2b: Analysis of funding and evaluation frameworks
    - Task 2c: Analysis of different funding instruments
- Stage 3: Identification of a common kernel
    - Task 3a: Synthesis of findings
    - Task 3b: Recommendations for further work

The Work Programme for the Study is attached at **Appendix 1**

To facilitate information gathering we conducted desk and internet research and developed a survey questionnaire which was approved by the Commission. This is attached at **Appendix 3**. It was widely disseminated to targeted key stakeholders to ensure representative coverage and engagement. Some respondents did not complete the questionnaire but sent brief unstructured responses. The study team conducted follow up activities with key stakeholders by email (providing, for peer review, a draft synopsis of country profiles and funding schemes where time allowed). A major factor has been that clear documentation on funding of ITS is not readily available. This highlights one of the challenges for ITS and reinforces the need for this study and any potential follow up.

An unexpected aspect of the study was the impact that the economic situation is having on the public sector authorities contacted. Most expressed great interest and support for the study, but were unable to respond quickly to the request for information due to internal pressures.

2.3 Questionnaire Response

Responses have been received from 10 countries as follows:

Austria, Canada, Czech Republic, France, Italy, Latvia, Netherlands, Sweden, UK and USA.

In addition POLIS has provided information on 8 cities / regions:

Edinburgh (UK), Eindhoven (NL), Nord-Brabant Region(NL), Paris (FR), Prague (CZ), Rome (IT) and Stuttgart (DE), Quebec Region (CA)

A log of responses is given in **Appendix 2**. The proportion of contacts responding to the questionnaire has been good but the quality of information received is extremely variable. In some cases no details are provided at all and in other cases the information is rather superficial. The study team has compensated for this through internet research with some success but this has been very time-consuming. We have been able to work with some of the respondents in a staged way to elaborate the initial information provided supplemented by internet research – which could then be peer reviewed.

The questionnaire used and the covering letter provided by the Commission are attached in Appendix **3**.

Detailed country information is provided in country profiles at **Appendix 4** and cover:

- Transport context, to show the priorities that each country is facing
- Policy context which informs the funding priorities
- Overview of funding arrangements
- Innovative finance, where this exists
- Investment appraisal requirements where these are specified as a condition of public funding
- Procurement guidelines where these exist specific to ITS
- Monitoring and evaluation arrangements
- Use of ITS architecture

The country summaries include outline case studies for a selection of funding schemes. A total of 33 schemes have been collated. Each details the funding models used and information specific to each scheme. A summary of country highlights is presented in Part 4.1 of this report.

Current practice in funding ITS applications is summarised in the tables at **Appendix 5** for the following 17 different types of ITS applications (see below) which are clustered into five typical ITS functional groupings (highway network operations; ITS in towns and cities; trip planning, traffic and travel information; public transport operations; freight transport applications):

1. Managed motorways (variable speed control and/or lane control)
2. Inter-urban traffic control centres (national/regional)
3. Variable message signs
4. Incident management
5. Speed detection / enforcement
6. eCall automatic emergency alert

7. Other ITS-based safety applications
8. Urban traffic control
9. Floating car (traffic probe) data
10. Road pricing / congestion charging
11. Real-time public transport information on the internet
12. Real-time road traffic information on the internet
13. Intermodal & multimodal journey planning
14. Bus fleet and / or fleet management
15. Smart card ticketing / payment
16. Real-time public transport information at static locations
17. Intelligent truck parking

Each entry records the funding model and funding scheme used, cross referenced to country respondent. Where information was available, the financial cost of each project is logged along with the proportional split between financing sources where costs were shared. An analysis of synergies for the five typical ITS functional groupings - between funding providers and funding models - is provided in Part 4.2 of this report.

A selection of six funding schemes have been developed as detailed case studies to illustrate the examples where private and innovatory finance have been mobilised. These are included at **Appendix 6**.

Summary information obtained in response to the questionnaire is logged in the following tables:

- Table 1 shows which countries have, or have not developed formal ITS deployment strategies and/or policies/guidelines on the public funding of ITS applications; whether dedicated funding schemes for ITS deployments exist; whether ITS investments are assessed in accordance with any formal decision making frameworks and whether those investments are monitored or evaluated; and whether a national ITS architecture exists and its use is compulsory or not. Further analysis and discussion of the results is provided in Part 4.3 of this report
- Table 2 summarises which of the 12 types of generic funding models, as identified by the study team, are in use country-by-country. (See Section 3.1 for our definition of a funding model and Section 3.2 for our working definitions of the 12 generic types). Aside from European funding, which is reported quite widely, the most commonly used funding models are the transport investment programmes at national, regional and local (municipal) level. Private finance is used in a number of countries. However special innovation funds and sponsorship are comparatively rare. The information provided in Table 2 is further elaborated in the country profiles in **Appendix 4** (discussed in Part 4.1 of this report) and the funding scheme case studies listed in **Appendix 5** (discussed in Part 3.3 of this report)
- Table 3 complements Table 2 showing for each of the eight city/region questionnaire respondents the types of generic funding models that are in use. The information

provided is similarly further elaborated in the country profiles in **Appendix 4** (discussed in Part 4.1 of this report) and the funding scheme case studies listed in **Appendix 5** (discussed in Part 3.3 of this report)

- Table 4 summarises which countries use which of the 12 generic funding models for the 17 different types of ITS applications identified above. **Appendix 5** (discussed in Part 4.2 of this report) looks in more detail at current practice on funding of ITS for different types of ITS applications.

Table 1: Country – ITS Frameworks (Strategies, Policies, Monitoring & Evaluation)

	Austria (AT) Bmvit / ASFINAG	Canada (CA)	Czech Republic (CZ) CDV/Ministry	France (FR)	Germany (DE)	Italy (IT)	Latvia (LV)	Netherlands (NL)	Sweden (SE)	United Kingdom (UK)	United States (USA)
		Quebec Region	Prague	Paris	Stuttgart	Rome City		Eindhoven Nord Brabant			
ITS Deployment Strategy											
National	Yes/Yes	Yes	Yes	No			No	Yes	Yes	No	Yes
Regional		No						Yes		Yes & No	Yes
Local			Yes	No	Yes	Yes				Yes & No	Yes & No
Policy on ITS Public Funding (Guidelines)											
National	Yes/No	Yes	No	No			No	No	No	No	Yes
Regional		No						No			
Local				No	Yes	No				No	
ITS Deployment: Dedicated Funding Schemes											
National	Yes/No	Yes	No/Yes	No			No	Yes	Yes & No	No	Yes
Regional		No						Yes		No	
Local			No	No	Yes	No				No	
ITS Expenditure Decision Making Framework (investment appraisal/cost-benefit /evaluation)											
National	Yes/Yes	Yes	No/Yes	Yes			No	No	Yes	Yes	Yes
Regional		Yes						Yes			
Local			No	No	Yes	No				No	
Monitoring/Assessment Investments (including ITS)											
National Mechanisms	~Yes/Yes	Yes	No/Yes	Yes			Yes	No	Yes	Yes	Yes
KPIs	~Yes/?		No	Yes				N/A	No	N/A	
Regional Mechanisms		No						Yes			
KPIs		N/A						No			
Local Mechanisms			Yes	No	Yes	Yes				No	
KPIs										N/A	
Existence of National Architecture	Yes/Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes
Compulsory - public money	?/No	Yes	No	No	Yes	No		Yes & No	N/A	N/A	Yes

Unclear

Table 2: Country - Use of Different Funding Models

Funding models	ITS Infrastructure and Applications: Examples of where the funding models have been applied										
	Austria (AT)	Canada (CA)	Czech Republic (CZ)	France (FR)	Germany (DE)	Italy (IT)	Latvia (LV)	Netherlands (NL)	Sweden (SE)	United Kingdom (UK)	United States (USA)
European Funding	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
National Transport Investment Programme	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional Transport Investment Programme	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
Local (Municipal) Transport Investment Programme	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Transport Operator Funding (including revenue)	Yes			?					Yes	Yes	
PPP, Toll Road & Private Sector Concessions	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Multi-Partner Composite Funding				?					Yes	Yes	
Joint Venture Funding				?					Yes	Yes	
Special Innovation Funds	Yes	Yes	Yes	Yes	No	Yes		Yes	Yes	Yes	Yes
Funding Incentives & Subsidies	Yes(S)	No	No	Yes	No	No	No	No (1 region)	Yes	Yes	
Sponsorship	No	Yes	No	Yes	No	No	No	Yes (1 region)	Yes	Yes	
Special Borrowing & Investment Tools	No	No	No	Yes (SB)	No	No	No	No	No		Yes
Dedicated Funding: ITS Capital Schemes	Yes	Yes	No	No	Yes	No	No	Yes	?	Yes	Yes
Dedicated Funding: ITS Operations	No	No	No	No	Yes	No	No	Yes	Yes	No	

No information Unclear

Table 3: Cities and Regions - Use of Different Funding Models

Funding models	ITS Infrastructure and Applications: Examples of where the funding models have been applied									
	Edinburgh	Eindhoven	Nord-Brabant	Paris	Prague	Quebec Region	Rome	Stuttgart		
European Funding	No		No	No	Yes	No	Yes	Yes		
National Transport Investment Programme	No	Yes	Yes	No	No	Yes	Yes	Yes		
Regional Transport Investment Programme	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes		
Local (Municipal) Transport Investment Programme	Yes		Yes	Yes	Yes	Yes	Yes	Yes		
Transport Operator Funding (including revenue)	Yes			?						
PPP, Toll Road & Private Sector Concessions	No	Yes	Yes	Yes	No	Yes	No	Yes		
Multi-Partner Composite Funding										
Joint Venture Funding				?						
Special Innovation Funds	No	Yes	Yes	Yes	No	Yes	Yes	No		
Funding Incentives & Subsidies	No		No	No	No	No	No	No		
Sponsorship	No		Yes	No	No	No	No	No		
Special Borrowing & Investment Tools										
Dedicated Funding: ITS Capital Schemes	No			Yes	No	No	No	Yes		
Dedicated Funding: ITS Operations	No	Yes	Yes	Yes	No	No	No	Yes		

No information Unclear

Table 4: Use of Funding Models for Different ITS Infrastructure and Applications

Funding models	ITS Infrastructure and Applications: Examples of where the funding models have been applied								
	Managed motorways - (active traffic management)	**Floating car (traffic probe) data**	**Inter-urban traffic control centre**	**Urban traffic control centre**	**Variable Message Signs**	**Incident Management**	**Speed detection/ enforcement**	**eCall emergency alert**	**Other ITS based safety applications**
European Funding	AT, CZ, DE,		AT, CZ	CZ	AT, CZ, DE, SE,	AT, DE, SE, US,	AT,	CZ, DE, IT, NL, SE,	AT,
National Transport Investment Programme	CA, CZ, NL, SE, UK	CA, CZ, SE,	CA, CZ, LV, UK, US,	CA, CZ, UK, US,	CA, CZ, UK, US,	CA, UK, US,	CA, CZ, IT, SE, UK,	CZ,	CA, CZ, LV, IT, SE, UK,
Regional Transport Investment Programme	CA, NL, UK	CA, NL,	CA, NL, SE, UK,	AT, CA, NL,	CA, NL, UK,	CA, NL, SE, UK,	CA, NL, UK,	NL,	CA, NL,
Local (Municipal) Transport Investment Programme		DE, SE,		AT, CZ, FR, SE, UK,	CZ, IT, UK,	CZ, UK,	AT, CA, CZ, FR, UK,		
Transport Operator Funding (including revenue)									
PPP, Toll Road & Private Sector Concessions	AT, US	UK,	AT, UK,		AT,	AT,	AT,		
Multi-Partner Composite Funding									
Joint Venture Funding									
Special Innovation Funds	UK,	AT,							
Funding Incentives & Subsidies									
Sponsorship		SE,							
Special Borrowing & Investment Tools									
Dedicated Funding: ITS Capital Schemes									
Dedicated Funding: ITS Operations			SE						

Key: ( ) = data entry to be confirmed

Table 4: Use of Funding Models for Different ITS Infrastructure and Applications - continued

Funding models	ITS Infrastructure and Applications: Examples of where the funding models have been applied								
	Smart card ticketing/ payment	**Road pricing / congestion charge**	**Public transport real-time info: static**	**Public transport real-time info: internet**	**Inter-urban road traffic real-time info: internet**	**Urban road traffic real-time info: internet**	**Intermodal & multimodal route planning**	**Bus/freight fleet management**	**Intelligent truck (T) /car (C) parking**
European Funding		IT,	CZ,	AT,	AT,	CZ,	AT,		AT(T), SE,
National Transport Investment Programme	AT, CA, SE, UK,	IT, SE, US,	CA, CZ, UK, US,	CA, IT, UK, US,	CA, IT, SE, UK, US,	CA, IT, SE, UK, US,	CA, SE, UK,	CA, LV,	US,
Regional Transport Investment Programme	CA, CZ, FR, NL, SE,	NL, **(SE)**	CA, CZ, FR, NL, SE, UK,	AT, CA, CZ, NL, SE, UK,	CA, FR, NL, UK,	CA, NL, SE, UK,	AT, CA, NL, SE, UK,	AT, CA, NL,	SE,
Local (Municipal) Transport Investment Programme	CA, CZ, IT, SE, UK,	IT, **(SE)**, UK,	AT, CZ, UK,	AT, CZ, IT, UK,	DE, IT, UK,	CA, CZ, DE, IT, SE, UK,	AT, IT, SE, UK,	AT, IT,	AT(C), UK,
Transport Operator Funding (including revenue)	CZ, SE, UK,	**(SE)**	AT, UK,	AT, UK,		SE,	AT, SE,	AT, SE, UK,	
PPP, Toll Road & Private Sector Concessions		AT, US	UK,	AT,	AT, UK,	UK,	AT,		AT(T),
Multi-Partner Composite Funding	CZ		AT, CZ,	AT, UK,	CA,	SE,	AT, SE,	AT,	AT,
Joint Venture Funding	SE,			AT,			AT, SE,		
Special Innovation Funds	AT,	US,				AT,			
Funding Incentives & Subsidies	UK (FI)		AT(S)	AT(S)				AT(S), UK (FI)	
Sponsorship									
Special Borrowing & Investment Tools		US (B)							
Dedicated Funding: ITS Capital Schemes		US							
Dedicated Funding: ITS Operations									

Key: ( ) = data entry to be confirmed

3 Funding Models and Funding Schemes

3.1 Definitions

From a review of the responses to the questionnaire it is clear that a great variety of different funding methods are in use within the public sector for ITS projects. Even where there are commonalities there are significant differences in characteristics. We have therefore developed a classification of terms to enable structured analysis:

- **Funding framework:** the institutional, legal, organisational and budgetary framework within which the funding scheme operates
- **Funding model**: (generic) funding from a given *funding provider* (national, regional, local, operator, commercial etc) with a given *funding method* (grant, subsidy, competition, reinvestment of revenue, sponsorship or other financial tool / incentive).
- **Funding scheme**: (specific) a funding programme for specific purposes and policy goals, using a selected *funding method*, involving one or more funding agencies or partners as the *funding provider* (single agency, multi-partner, composite arrangements, Joint Venture)
- **Funding conditions**: the *funding provider* may impose qualifying criteria, such as specific eligibility criteria, a satisfactory business case (e.g. a cost-benefit analysis), conformance to national standards or to a system architecture
- **Funding source**: the *funding provider* will draw on one or more sources of funding for the *funding scheme*, for example through taxation, borrowing, income or revenue. Some of the funding sources that are available are listed below but are not explored further:

  User charges or user fees
  - Electronic tolling
  - Congestion charge
  - Sale of vignettes
  - Passenger (customer) fare revenue
  - Workplace parking levy

  Revenue from a franchisee or concession holder
  - Concessionaire rents
  - Premiums & performance payments

  Hypothecated Taxation:
  - Fuel tax
  - Heavy vehicle tax

  Sale of disposable assets (such as land sales or reclaimed material)

  Loan finance: such as commercial bank loans

  Bond issues

  Sponsorship and cost sharing with the private sector (banks, property developers)

- **Funding method**: *funding providers* use a great variety of methods for distributing funds. Examples are:

  Capital grant from a national (state), regional or local (city) investment programme

  - Road schemes capital grant
  - Freight facilities grant
  - Innovation fund

  Operating subsidy to operating companies/ concession holder from a national (state), regional or local (city) budget

  Performance payments to operating companies/ concession holders

  Revenue support scheme: assisting with public transport operating costs

3.2 Funding Models

In the course of our analysis we have been able to identify at least 12 distinct funding models that are in use for funding road transport and ITS-related investments. Although the specification for this study specifically excludes analysis of the rules for funding at European level and is focused on public rather than private funding, both European funds and private sources feature in the responses received. We therefore include them in our analysis for the following reasons:

- the EU12 (new Member States) rely on European funding for assistance with upgrading infrastructure and developing and deploying complementary ITS services
- in many parts of the EU27 transport investments promoted by the public sector increasingly draw on private finance, user fees and charges and commercial streams of funding. These trends mean that the public sector is no longer restricted to established funding sources such as general taxation and public borrowing.

Our working definitions of the 12 funding models are as follows:

European funding: grants and co-funding from the Trans-European Transport Network and CIVITAS programmes, the EU regional development programmes and the Competiveness and Innovation Programme's "ICT for Policy Support" programme.

National and regional transport investment programme: capital grants for investment in strategic roads (motorways and other major routes) including ITS components.

Local (municipal) transport investment programme: capital grants and revenue support for investment in local roads, public transport networks and information systems.

Transport operator funding: investment in vehicles, infrastructure, operating systems and information services by bus, tram and rail operators, funded with revenue from users and exploitation of owned assets.

Private finance, PPP, toll roads & private sector concessions: covers various arrangements which make use of private finance for transport projects promoted by the public sector. They include toll revenue, user charges and the financial instruments that provide capital up front (similar to a mortgage) for construction and renewal of the infrastructure.

Multi-partner composite funding: where a group of public and private sector stakeholders agree to cooperate together in the financing of services of common interest, with each contributing at a level determined by themselves.

Joint venture funding: where a group of public and private sector stakeholders come together to form a single legal entity to invest in and deliver transport projects, including an element of public sector finance.

Special innovation funds: aimed at stimulating innovation to address grand challenges by providing support for new products, services and systems at a critical stage of their development. Selection is usually on a competitive basis and the fund may be jointly financed with the private sector.

Funding incentives and subsidies: from the public sector to offset user or service provider costs in order to achieve a specific policy goal.

Sponsorship: by the private or non-profit sector to offset public sector investment and operational costs in providing infrastructure and services.

Special borrowing and investment arrangements: that bridge the gap between the financial cost of a transport project and the revenue which they might generate by facilitating and promoting ways to finance and operate transport projects. They can be divided into two major categories: cash management tools, and credit enhancement and/or investment tools.

Dedicated funding for ITS: ring-fenced funding programmes (capital and operations) for ITS infrastructure and services.

3.3 Funding Scheme Case Studies

The information provided by respondents to the questionnaire has been supplemented with internet research to obtain further information on particular funding schemes. Summaries have been prepared for a total of 33 different funding schemes drawn from seven countries:

Austria, Canada, Czech Republic, Latvia, Sweden, USA and UK.

These are grouped in the tables below to show which generic funding model (as described above) most closely describes the specific funding scheme. Page references are to the Country summaries in Appendix 4.

European co-funding (with national and local investment programmes)

National / Regional Transport Investment Programme

Local (Municipal) Transport Investment Programme

Transport Operator Funding (including revenue)

PPP, Toll Road & Private Sector Concessions

Multi-Partner Composite Funding

Joint Venture Funding

Special Innovation Funds

Funding Incentives & Subsidies

Sponsorship

Special Borrowing & Investment Arrangements

Dedicated ITS Funding

4 Funding Frameworks

A "funding framework" has been defined as the institutional, legal, organisational and budgetary framework within which a funding scheme operates. Results from the analysis of ITS funding are presented in Appendix 4 and Appendix 5 to this report. Appendix 4 gives country-by-country summaries of funding arrangements and Appendix 5 looks at the pattern of funding in the five typical ITS functional groupings selected. The overall picture is of great diversity in funding frameworks, the sources of funding, the funding providers and in the models used in the funding schemes.

4.1 Country Highlights

The following is a summary of key points that stand out on the funding arrangements described for the eight countries included in Appendix 4.

Austria

Austria has well-developed strategic plans and policies in place for ITS; and the funding arrangements that are in place cover a variety of funding providers.

Funding of ITS on Austrian motorways is financed from income generation of about €1bn per year from electronic tolling of trucks, sale of vignettes for cars and leasing of land, with no investment from Austrian Federal budget (taxation) sources. (Austria Scheme #1)

Revenue generated from enforcement activities (red light cameras and speeding) contributes to city administration investment programmes and pays for radar and video-based equipment amounting to €10m in 2010 (Austria Scheme #3).

Composite funding arrangements involving City Administration budgets (Vienna, Graz, Linz, Innsbruck) and Public Transport Operator Investment budgets are used for real-time bus, tram and metro station dynamic information points and a multi-modal and intermodal journey planner (Austria Schemes #4 & #5)

Joint Venture funding is used for internet-based real-time public transport information services for metro, bus and tram, including iPhone Applications (AnachB, Austria Scheme #6)

Single-agency transport operator funding (including revenue) is used for rail travel information (SCOTTY, Austria Scheme #7)

The National Strategic Innovation Fund (for pre-competitive activities) covers prototype developments, field tests on floating cars and smart card ticketing payment (Austria Scheme #2)

Canada

There are several programmes in Canada that provide funding for ITS. Specific allocations are the:

- Strategic Highway Infrastructure Program - $30M (€21 M) is dedicated strictly for ITS – this funding is almost all committed now (Canada Scheme #1)
- ITS Border Crossings Program- $6M (€4M) for ITS technology deployment at Canada/USA land border crossings
- Asia Pacific Gateway and Corridor Initiative - $2B (€1.5B) in total, $7M (€5M) of which is for ITS related deployments

Some 180 ITS projects have been co-funded by Transport Canada since 2000, generally under matching funding programmes. Commercial entities are eligible recipients under most of these funding programmes. However, the Canadian federal government has no jurisdiction to support ITS operations. In Canada, operating and maintenance of the transportation network is the responsibility of provinces, territories and municipalities. This is strictly their responsibility.

A $1.25 billion (€1B) *Public Private Partnerships fund* will support innovative projects that provide an alternative to traditional government infrastructure procurement.

Czech Republic

The Czech Republic is investing heavily in ITS control systems, location and navigation systems as part of new national infrastructure. Public sector engagement with ITS is aimed at providing the public sector infrastructure and legal framework for ITS deployment.

Public funding of ITS is primarily through European programmes with the required national top-ups. National ITS transport investments are funded from the state budget or through the State Transport Infrastructure Fund. Individual regions and cities have their own budgets which are used to fund their own transport investments – including expenditure on ITS (Czech Scheme #1). Public funding of ITS applications is restricted to supporting:

- improved traffic management and safety and a reduction of the negative effects of congestion on the environment
- multi-modal transport and improving the attractiveness and reliability of public transport (public transport fleet management)

The provision of ITS services is primarily the responsibility of the private sector. Like many countries, the Czech Republic experiences problems with financing their existing ITS operational costs.

Innovation funding supports projects of applied research and experimental development and projects which promote effective R&D cooperation between businesses and research organisations in the area of sustainable transport and telematics (Czech Scheme #2).

France

France has an interesting mix of public authorities and private concession-holders who invest in ITS:

- the French motorway network is managed by 15 privately owned companies and 2 public owned companies (ATMB, SFTRF), 1 by a local authority (CCI du Havre). The State grants to the concessionaire companies all the responsibilities for financing, building and exploiting the motorways including investments in ITS. Any public funding needed to ensure the financial balance of future motorway concessions is supplied in the form of subsidies.

- for the towns and cities there is a decentralised administrative system with the result that they have total autonomy over their traffic management and public transport systems.

The general situation regarding public funding in France, as in most European countries, is extremely difficult at the moment, both at national level and at the level of local communes, departments and regions. Private funding is not so restricted: loans for companies, including Public-Private Partnerships do not appear to be difficult to find, even with very low interest.

There are no fiscal incentives for ITS projects but there are for energy saving schemes, electromobility, etc, which may include elements of ITS.

Latvia

A lack of sufficient financial resources during the last twenty years has limited the planning and implementation of rehabilitation works on outworn asphalt pavement and gravel roads and repairs to bridges. Within the cities, transport networks need improvement to make urban transport more efficient and introduce more environmentally-friendly types of urban transport.

The main sources of financing for national road infrastructure are the EU Cohesion and Structural Funds' Operational Programme for Infrastructure and Services (providing €851 million over 2007-2013 for the development of a transport network of European significance) and centralised allocations generated from the general national budget linked to state revenues from excise duty (license fees and fuel duty). Currently approximately 35 – 40% of all income from national excise duty has been allocated for improvement of public road infrastructure. Approximately 25% of all road financing is being transferred for regional roads (as subsidies to nine city municipalities and 109 regional municipalities). Regional municipalities may set up their own road funds to manage the grant.

There are plans by the Latvian Ministry of Transport to introduce a national concept of ITS although investments in ITS are not yet planned on a long term basis. Latvian State Roads is mainly focused on decision making tools for road management rather than on road user oriented ITS projects.

There are no toll roads in Latvia and no plans for them in the near future. However, there is a strong need to attract private sector funding and Latvia has set up legislation to accommodate Public-Private Partnerships.

Sweden

Sweden takes a comprehensive approach to ITS funding through the application of the "four-step"[2] principle. This requires consideration of:

1. PROCESSES
   - Budget processes internally
   - Strong focus on cooperation and joint efforts with many actors working together
2. ENABLERS
   - Standards
   - Laws and Directives
   - ITS Action plans – international and national
   - Organisation for enabling efficient deployment i.e. the new transport authority
   - Participation in other projects
3. INVESTMENT ACTORS
   - Transport authorities = network operators
   - Municipalities
   - PT operators
   - Transport operators
   - Telecom operators
   - Universities, educators
4. SOURCES
   - Most financing comes from taxes and charges
     - through the ministry
     - through municipalities sourcing channels
     - through charges (congestion charging, bridge charges)
     - through fees from users (PT, telecom)

The Swedish Government's (intermodal) National Transport Plan for 2010-2021 provides funding for transport infrastructure, operations and maintenance. It is complemented by County plans for intermodal regional transport covering the same period (2010-2021). The national plan consists of SEK 417 billion (€46.5 billion) in central government funding and SEK 65 billion (€7.25 billion) from congestion taxes, road tolls, EU funding and municipal contributions. There is no budget

[2] As reported in the CEDR Informal Note on ITS Funding, 18 April 2011.

dedicated to ITS capital deployment; however national, regional and local transport investment programmes are all utilised. Swedish traffic control centres receive dedicated funding for their operations.

A Multi-Modal ITS Strategy and Action Plan for Sweden was published in March 2010. Individual measures are grouped into areas of intervention and have been selected against clear criteria - those:

- which are considered to be the most beneficial
- with a strong link to transport policy goals
- which foster increased use of ITS in the transport system
- that strengthen Swedish enterprise; and
- can be implemented up to 2015.

The models used for funding ITS investments range from single agency national transport investment programme (Sweden Scheme #4) to a joint venture involving 21 public transport authorities and 14 public transport operators to deliver a specific ITS service (Scheme #5). A multimodal internet-based traffic information service and journey planner covering the six regions in Southern Sweden is financed on a multi-partner basis (Scheme #3).

Urban congestion charging has been deployed in Stockholm and is planned for Gothenburg (2013). It is implemented as a state tax approved by the Swedish Parliament since municipalities may only tax their own citizens (Sweden Scheme #2). Otherwise, road user charging can only be levied on new roads/bridges. The net revenue is used to part-fund other infrastructure projects.

The Swedish Governmental Agency for Innovation Systems (VINNOVA) administers a vehicle research and development innovation fund, joint funded by the state and the automotive sector (Sweden Scheme #1).

UK

There are currently no specific ITS funding schemes in the UK, but a number of schemes exist under which ITS receives funding.

- The Highways Agency's (HA) Technology programme (UK Central Government funding) has been used to fund deployment of ITS infrastructure and services on the strategic road network to date
- Managed Motorway schemes are funded from the HA's Major Projects (capital improvements) allocation (UK Scheme #1)
- Transport Innovation Funding has been used for a number of schemes including the A14 Trunk Road ITS deployment (UK Scheme #3)
- A central Modernisation Fund (no longer available) was used for the M42 motorway Active Traffic Management pilot scheme.

Transport funding to UK Local (Municipal) Authorities is divided into a major schemes (capital) programme for schemes costing more than £5 million (€5.7m), for which a fully developed business case is required and an integrated transport block for minor projects costing less than £5 million (UK Scheme #4). ITS projects such as a city traffic control centre would be classed as a major scheme.

An increase in grants to bus operators is available for buses equipped with Automatic Vehicle Location and smart ticketing capability. Grant payments totalling £20m (€22.7m) have been paid to large urban areas to encourage the roll out of smart ticketing. This is a good example of a funding incentive, to achieve the objective of installing smart ticketing infrastructure for most public transport journeys by 2014 (UK Scheme #6).

The UK Government's Private Finance Initiative (UK Scheme #2) has been used as a framework to fund two major ITS-related infrastructure projects:

- National Roads Telecommunications Service
- National Traffic Control Centre (PFI).

In both cases capital for the project was raised from private equity. Government payments are made to the private sector as a single ("unitary") charge for both the initial capital spend and the on-going maintenance and operations costs. A separate funding case study has been prepared on the NTCC project (Appendix 6).

Transport for London has been successful in raising significant sponsorship finance (£25 million or €28.4m) from a major bank (Barclays) in relation to the London Cycle Hire and Cycle Super Highway schemes, which has a number of ITS components (UK Scheme #7).

USA

In the USA funding arrangements for ITS have matured over more than a decade. Starting in 1992 and continuing until 2005 the USA allocated on average $208 million (about €148 million) each year to Intelligent Transportation Systems (ITS) to fund a Federal research and development programme to operationally test ITS and promote implementation. Guidelines on funding of ITS were first issued by the Federal Highway Administration in 1998. Today funding for ITS is part of the mainstream of transport funding along with other transportation investments through the National Highway System Program (NHS) and Surface Transportation Program (STP) (USA Schemes #1, #2, #3). Funding allocations are used to support a complex mix of different activities and there is an incentive for certain types of ITS-based schemes: e.g. additional funding (up to 90%) for high occupancy vehicle or auxiliary lanes (USA Schemes #1, #2). A dedicated fund for integration of legacy systems operated until 2005 but has now closed (USA Scheme #5).

The Federal-aid program has been augmented with an array of project finance tools to facilitate the delivery of projects. Tolls, user fees, and other project-based revenue sources, in combination with new finance tools, can substantially increase state and local governments' ability to deliver projects. Innovative transportation project finance available to project sponsors include: Federal

Loans, State Infrastructure Banks, Grant Anticipation Revenue Vehicles, Credit Assistance, Private Activity Bonds, and Build America Bonds. Examples of innovative finance are:

- The Real-Time System Management Information Program - a policy-led initiative but with no dedicated funds (USA Scheme #6)
- The Value Pricing Pilot Program - a policy-led initiative supported by dedicated funding but limited to 15 "slots" (USA Scheme #7)
- "TIFIA" credit assistance has been used as a funding tool in a public-private partnership (USA Scheme #4)
- 511 support assistance was an example of pump-priming for a new ITS initiative in 2001 (USA Scheme # 8, now complete)

4.2 Current Practice in Funding ITS

The following are the main findings on the funding patterns for five typical functional groupings of ITS systems and services shown in Appendix 5. This grouping was chosen because the organisations and agencies involved differ considerably from one group to the next, but inevitably there is a degree of overlap between the groups, for example in the part that information services and public transport play in cities. Differences in the source of funding (shown by the funding provider) are not as great as might be expected. However there are some interesting variations in the extent to which different funding models are used.

A. Highway Network Operations

Major funding providers in this group are drawn from:

European Commission: Trans-European Transport Network programmes; the EU regional development programmes; and the ICT for Policy Support Programme. [3]-

National and regional government agencies

Public highway agencies

Privately operated motorway companies

Funding models for the projects reported for Group A are European, national and regional with significant private sector tolling and private finance. Innovation funding was used very selectively. Budgets range from as little as €100,000 for planning of a Traffic Information Centre for Latvia to as much as GBP 160million (€181.6) over 10 years for the National Traffic Control Centre for England.

[3] Part of the Commission's Competitiveness and Innovation Programme. Funding a pilot deployment of eCall (the HeERO project) in which Czech Republic and other countries are participating.

B. ITS in Towns and Cities

Funding providers in this group are drawn from:

European Commission: Trans-European Transport Network and CIVITAS programmes; the EU regional development programmes

National and regional government agencies

Local (Municipal) Authorities

Transport operators

Commercial and private sector

Funding models for the projects reported for Group B are: national, regional and local (municipal), with two cases of European funding, one of transport operator funding and two using composite funding (multi-partner). Budgets range from GBP 450,000 (€514,000) for the Edinburgh Urban Traffic Control database, to €216million for the Stockholm congestion charge.

C. Trip planning, Traffic and Travel Information

Funding providers in this group are drawn from:

European Commission: Trans-European Transport Network and CIVITAS programmes; the EU regional development programmes

National and regional government agencies,

Local (Municipal) Authorities

Transport operators

Commercial and private sector

Funding models for the projects reported for Group C are: national, regional and local with three cases of European funding, two of private finance, one multi-operator partnership and one joint venture. Budgets range from €150,000 for the Verkehrspilot web site in Austria to GBP 60.9 million (€69.5 million) over 5 years for the Transport Direct multi-modal journey planning web site in UK.

D. Public transport operations

Funding providers in this group are drawn from:

European Commission: Trans-European Transport Network and CIVITAS programmes; the EU regional development programmes

National and regional government agencies,

Local (Municipal) Authorities

Transport operators

Commercial and private sector

Funding models for the projects reported for Group D are: national, local, operator, composite (including private finance) and multi-partner. Budgets range from €1 million of

R&D funding to support national trials and a test bed for electronic fare management to GBP 58million (€66 million) to support smart card ticketing in England.

E. Freight transport applications:

Funding providers in this group are:

National and regional government agencies

Transport operators

Commercial and private sector

Funding models for the projects reported for Group E are: European, national and private sector tolling. Only one budget was declared: €700,000 for fitting Automatic Vehicle Location to salt spreading vehicles in Latvia.

4.3 Funding Rules and Guidelines

A. ITS strategic plans and guidelines

Funding priorities are dictated by the priorities that apply to the road transport sector in each country. The following is a summary of the strategic plans and guidelines that have been identified from questionnaire responses supplemented by internet research. The objective here is to see the kind of policy frameworks that are in use to inform funding of ITS deployments and that might be adapted to support European policy goals. The study team has not been able to examine these documents in any detail, so it is not possible to say to what extent, if any, they specifically address funding.

- **Austria:** developed in 2004 a National Telematics Masterplan to inform priorities, to be revised in 2011
- **Canada:** has a National Plan: "En Route to Intelligent Mobility" which recommends that ITS Strategic Plans are developed at provincial and local level to guide further investments
- **Czech Republic:** has adopted a National ITS strategy; additionally Prague has a Metropolitan Area Traffic Management Strategy (2003)
- **France:** is considering a possible "National ITS Plan" in response to the European Action Plan and Directive
- **Italy:** has a National Plan on ITS under consideration, linked to the requirement to report on national activities and projects related to ITS Action Plan priority sectors by August 2011. In addition the General Mobility Strategy for the city of Rome has an annex on ITS
- **Netherlands:** has adopted a general policy framework for mobility and accessibility. Eindhoven has the BBZOB Regional Plan for Better Accessibility http://www.bbzob.nl/; a strategy for North Brabant is to be published in May 2011

- **Sweden:** has established an ITS Board and has a Multimodal ITS strategy and action plan in place, owned by the Swedish Transport Administration, supported by a 10 year national plan for ITS, a 3-year plan, and a 1 year investment plan
- **UK:** published a policy document "Intelligent Transport Systems (ITS) the policy framework for the roads sector" in November 2005 but this is no longer current. Regional ITS strategies were in place for Wales (2002-2007, not renewed), and Northern Ireland (2009-15).

B. Guidance on ITS Scheme appraisal

ITS projects have to demonstrate value for money to qualify for public funds and justify funding. This is especially the case when public funds are under pressure, as is currently the case in most European countries. Some countries require a comprehensive business case and apply highly developed scheme appraisal techniques (UK is an example). Others rely more on the political process and lobbying to determine priorities:

- **Austria:** The national motorway company (ASFINAG) requires scheme assessment against economic criteria but there is no uniform procedure for ITS Projects
- **Canada:** Each Federal funding programme has unique parameters including associated criteria evaluation for the evaluation of proposals
- **Czech Republic:** Scheme appraisal methods are not used, but a national Research and Development project on this topic is under way
- **France:** There is case-by-case analysis but no systematic assessment method has been adopted
- **Germany:** Stuttgart: A case for investment is presented to local government and the local city council
- **Netherlands:** Eindhoven: proposals have to be in compliance with the BBZOB Regional Plan for Better Accessibility
- **Sweden:** Cost-benefit analysis is used for all large projects but different traffic models are in use (MOVEA, Vectura, WSP, etc.). The Swedish Transport Administration is considering whether the same framework method should be applied to all ITS projects
- **USA:** The US DoT publishes the "Intelligent Transportation Systems (ITS) Reporting and Evaluation Guidelines" and an ITS Evaluation Resource Guide (see below)
- **UK:** Bids from Local Authorities for funding major transport schemes have to be supported by a Major Scheme Business Case (MSBC). An ITS Toolkit **i**nternet resource is available for local authority planning purposes when considering ITS projects in relation to local transport policy objectives: http://www.dft.gov.uk/itstoolkit/. Appraisal of ITS projects has to conform to the general guidance on the conduct of transport studies and scheme appraisals, published as Transport Analysis Guidance – WebTAG http://www.dft.gov.uk/webtag/.

C. Performance monitoring and ex-post evaluation

Questionnaire responses suggest that the practice of performance monitoring in relation to ITS projects is not well established, although there is widespread recognition that it is good practice to specify this. The questionnaire responses from European cities show various ad hoc arrangements including the use of the local political process to identify whether there are problem areas. For example Prague depends on political oversight for judging the effectiveness of its programme. Rome undertakes yearly monitoring of the use of extraordinary funds. The city of Eindhoven works in collaboration with the technical university of Eindhoven to plan an evaluation programme:

- **Austria:** will be defining performance indicators for ITS in the forthcoming 2011 Telematics Masterplan
- **Canada:** measures the level of partnership building between different government agencies and organisations leading to improvements in the transportation system
- **Czech Republic:** reports that monitoring and evaluation mechanisms exist but are not used. A national research and development project on this subject is under way
- **France:** in the case of concession arrangements for motorways and PPP projects there are Key Performance Indicators (KPIs) specified which relate to the contract; the city of Paris is part of the CONDUITS European Project which is working on KPIs for ITS
- **Netherlands:** follows a "No regret" evaluation procedure to assess whether the cost savings of adopting a specific technology more than offset the costs of investing in the technology and using it. (This is used especially in relation to climate change where the benefits to climate change are uncertain)
- **Sweden:** has no set standards or procedures for monitoring and ex-post evaluation varies from project to project. Work is in progress to reach uniform and comparable Key Performance Indicators and evaluation mechanisms
- **USA:** the US DoT is required by law to publish guidelines for evaluating innovative ITS projects (the SAFETEA-LU Reporting and Evaluation Guidelines). It covers two categories of project evaluations:
    1. Self-Evaluations – Innovative projects that are valued up to, but do not exceed $1 million (€0.7 million), are required to conduct self-evaluations
    2. National Evaluations –sponsored and funded by the Federal ITS Program. These formal, in-depth evaluations may be funded, partially or entirely by the ITS Joint Program Office. The total budget for evaluation is determined by the project partnership, in coordination with US DoT officials (ITS JPO staff etc).

D. Funding conditionality

The requirement to reference an ITS architecture or conform to agreed ITS standards and specifications is only exceptionally a condition for funding. Many countries have no agreed architecture and only a few of those that do make its use compulsory:

- **Austria:** the Telematics Masterplan includes an architecture based on FRAME/eFRAME: but its use is not compulsory
- **Canada:** conformance with a Regional Architecture based on the ITS Architecture for Canada is a condition for Federal funds
- **Czech Republic:** the national ITS Strategy makes reference to ITS Architecture but its use is not compulsory. The Czech Technical University in Prague is doing work to see how to link ITS architecture with business planning
- **France:** a national architecture (ACTIF) has been published and is available to support ITS project development but its use is not compulsory
- **Italy:** has developed the ARTIST architecture which is not compulsory but its use is strongly recommended
- **Netherlands:** has some national architecture elements that are compulsory (however no details were provided)
- **Sweden:** does not have a national ITS Architecture
- **UK:** has no single national architecture but follows a number of (national) standards, for example for Urban Traffic Management and Control, National Motorway Control system, ITSO smart ticketing (for buses). Use of the ITSO specification is mandated in recent rail franchise agreements, for local authorities issuing concessionary passes for public transport and when spending public money for smart ticketing schemes
- **USA:** All ITS projects funded with highway trust funds must use applicable ITS standards and interoperability tests that have been officially adopted through rule-making by the US DOT. The national ITS Architecture Rules state that conformance with a Regional Architecture is a condition for Federal funds. Guidance on planning and deployment of ITS is published at http://www.its.dot.gov/its_overview.htm.

4.4 Conclusions

Based on an analysis of the responses received at national level from ten countries and eight cities and regions it is clear that the funding of ITS involves a large number of different funding providers, ranging from single agencies to composite partners in joint ventures (involving both public and private sector organisations) - with a wide variety of funding providers and funding models. For the purpose of comparative analysis we have classified funding schemes into 12 generic models (cfr Chap 3.2) but at programme / scheme level there is considerable additional complexity. For instance:

- budgets may be one-off or extend over a number of years
- funding may be awarded on a competitive basis or through a system of regular grants
- some have statutory conditions attached to the award of money and others do not
- some require cost-benefit investment appraisal and a well developed business model, others do not

- some require regular monitoring of the project delivery against key performance indicators and/or mid-term evaluation and/or ex-ante evaluation, others do not
- some involve formal contractual relationships involving co-financing whereas in other cases no shared finance is involved (e.g. in-kind provision of data)
- national, regional or local transport authorities may be closely associated with the investment or at arm's length
- the extent of the use of user fees or charges is far from uniform as is the manner in which the revenue stream is used – in some cases revenues are ring-fenced for reinvestment in transport, in others they are part of central government revenues
- the role of the private sector and private finance is increasing because of the economic situation and pressures on public funds which is exacerbated by the high cost of making good gaps in national networks and the need to renew worn-out infrastructure
- the increased involvement of private finance has stimulated innovations in public-private partnerships, ranging from complex equity release schemes to simple sponsorship opportunities.

5 Scope and Reach of European Action

5.1 European Context

The European ITS Action Plan and associated Directive aims to provide a basis for better coordination of ITS deployment. Until now there has not been a European framework for ITS for the roads sector, in contrast to other modes of transport. This reflects the highly diversified nature of the roads sector, providing personal – often localised – transport for individuals and operators of passenger and freight services. The concentration on national, regional and local solutions has led to uneven deployment at national and European level and for European cross-border services. This national and localised approach means that ITS systems are not well harmonised and lack continuity across borders - and by extension: across modes, networks, operators, which impedes the delivery of the benefits of the Single European Market. To some extent this cannot be avoided because funding inevitably and rightly reflects national, regional and local priorities, the availability of finance and the institutional framework for delivery of transport services, as illustrated in Part 4 of this report.

Significant is the way in which ITS is often perceived as something separate from the usual realm of transport – something new and unknown – because it is the domain of ICT and telecoms specialists who tend to work outside of the traditional transport policy and engineering mainstream. Decision makers need to understand the pros and cons of ITS and how they can operate within a framework which goes beyond adding more (hard) infrastructure or soft policy measures. At the moment there is a degree of scepticism in some quarters about the potential value of ITS in delivering solutions to problems. Responses to the questionnaire survey show there is no consistent methodology for appraisal of ITS investments (whether as part of a wider scheme or a self-contained application) or for ex-post evaluation to fine-tune the appraisal process and to better understand post-installment costs. This problem is compounded by a cautious approach to working across institutional and agency boundaries, uncertainty on how to cooperate and who should take the lead in an area of shared interest – and in particular how shared projects encompassing different transport modes, as called for in the Transport White Paper, can be funded.

The Commission's White Paper "Roadmap to a Single European Transport Area"[4] stresses the role that infrastructure and its intelligent use play in shaping the mobility of people and freight and achieving the economic goals of the single market and other transport and socio-economic policy objectives. This is indeed a key theme of the White Paper – which recognises explictly the importance of the role of intelligent transport systems and services in achieving its objectives: "no

[4] COM(2011) 144 final, 28 March 2011

major change in transport will be possible without the support of an adequate network and more intelligence in using it". The White Paper recognises the pressure on public resources that funding of infrastructure poses - and highlights the need to develop a new approach to its funding and to the pricing of transport. Approaches which include the private sector, diversified public and private finance, innovative financing mechanisms such as the European bonds initiative,[5] better coordination of European regional development funds with transport policy objectives and fuller application of the user/polluter pays principles and internalisation of external costs. The aim is to limit tax and other distortions and harmful subsidies, generate revenue and ensure more sustainable financing of transport investments. The White paper also stresses the role that project assessment and ex-ante project evaluation criteria play in ensuring that infrastructure projects are carried out efficiently and transparently – limiting time delays, costs and uncertainty and delivering added value. It proposes introducing PPP-screening to the ex-ante evaluation process to ensure it is addressed in EU funding decisions. In short it proposes a new funding framework for infrastructure investments and issuing guidelines (where necessary) on the public funding for infrastructure and the different transport modes.

5.2 Scope for EC Action on Funding

The primary aims of the Commission in proposing to issue specifications and guidelines on the funding of ITS are to:

- support Member States in realising accelerated and interoperable deployment and use of ITS, bearing in mind that one size does not fit all and that there is a paucity of easily accessible information about different funding schemes and options from which to draw
- provide a framework for appraisal of project financing, and to monitor/ assess real impacts
- contribute to the selection of 'optimal investments' and to realising the goals proposed in the Commission's Transport White Paper regarding a new funding framework for smart transport infrastructure, enabling efficient and sustainable transport operations on Europe's strategic road network. This is intended to bring together[6] diversified finance from public (European and national) and private sources (financial institutions and corporate) using new capital markets, funding models and pricing mechanisms.

Guidelines issued at European level will need to respect the principle of subsidiarity but could be binding where there is direct European funding of transport projects (whether through the TEN-T

[5] COM(2010)700

[6] SEC(2011) 391 final. The Commission's Staff Working Document accompanying the White Paper

programme or the Structural and Cohesion funds) or in compliance with specifications adopted under the ITS Directive. In other respects the high-level aim of guidance will be to ensure:

- that funding of ITS, both capital expenditure and operational costs, is correctly planned and budgeted - in support of ITS being considered a valid option for tackling mobility problems
- synergies and added value between EU funds and national sources of funding
- that EU funded projects provide European added value by contributing to the effectiveness of the European transport system and other EU policy goals.

Consideration of what guidance and other actions might be taken at European level is grouped here under four headings, which are an adaptation of those offered by the Swedish Transport Administration in their response to CEDR on how to improve funding of ITS deployments:

A. Budget and Finance Processes
B. Enabling Instruments for European Integration
C. Mobilisation of Investment Actors
D. Alternative Funding Sources.

A Budget and Finance Process

A1. Support for internal budget processes

ITS deployments are many and varied and are made by a multitude of different actors. No matter what organisation is making the investment, whether it is public sector or private at local, regional or national level, it will have to satisfy is own internal budget processes in order to allocate funds for a project. In many organisations, experience of ITS deployment is relatively new and the knowledge needed to inform the business case is unavailable. The variety and nature of ITS projects is a further complication. An ITS project can, for example:

- be part of a new infrastructure investment project such as new highway construction
- include modernisation of out-dated legacy ITS systems, infrastructure, data systems or traffic management tools
- focus on the development of complementary services such as inter-modal journey planning, fleet management, navigational and logistics time and location-based services rather than on the realisation of infrastructure and equipment.

Compared to expenditure in different fields of transport, ITS cost components are in general comparatively low and may generate a revenue stream. On the other hand day-to-day operational costs and on-going expenditure on technology updates can be considerable.

For all these reasons estimating costs for budgetary purposes and making the case for ITS deployment is not a straightforward matter. There is a need for guidance. An example is the USA's Costs and Benefits databases, where the US Department of Transportation has responded to the

need for practical guidance to be consolidated in a user-friendly on-line resource. The USA is a country where ITS deployment is mature and there is a long-standing discipline of justifying public expenditure and maintaining financial control. The EU's 2DECIDE toolkit demonstrates this kind of approach and has the potential to be developed in the same way as the US costs and benefits databases.

Full-life costing of ITS deployments will cover various stages in the life of a system: introduction, operation, maintenance and de-commissioning or upgrading. It is significant that in the USA where a Federally-funded deployment programme has been in place since 1998, €85million was allocated to modernisation and integration of legacy ITS systems during the period to 2005. In Europe similar problems exist and is one of the reasons why some organisations are concerned about the implications of conforming to the ITS Action Plan - in case it imposes a costly requirement to upgrade existing systems.

A similar concern, raised in a response from the Czech Republic, was the difficulty of meeting the ongoing operational costs of ITS. The questionnaire asked for details of any dedicated funding for ITS operations. Only the Netherlands and Sweden responded positively on this point (but did not provide details).

The issue of long-term full-life costs needs further attention at European level in order that budgets can be properly allocated:

- ITS operational costs and legacy upgrade costs need to be considered as a component of project investment appraisal to ensure that selected projects deliver a positive cost-benefit ratio - and that funding provision for operations is in place
- Operational costs associated with ITS are often difficult to identify with any certainty and need to be monitored with greater transparency so that they are known and understood for budgetary reasons and forward planning.

A2. Justifying Investment in ITS

It is unrealistic to look at ITS schemes in isolation as free-standing budget elements. In every case proposals for ITS deployments will need to demonstrate value for money in competition with other transport investments and public expenditure priorities. To do this successfully a strong business case is needed to provide the evidence base, alongside any political considerations. For ITS investments to stand up to scrutiny they have to be embedded in wider transport scheme appraisals with clear delineation between capital and revenue costs and a clear understanding of their real-life impacts in tackling problems and delivering policy goals. This approach is consistent with the Commission's Transport White Paper's commitment to project assessment and ex-ante project evaluation. However the study team does not know to what extent, if any, these issues are addressed in the National ITS strategies that some Member States have developed.

An example of the core elements which might be included in guidelines at European level on support for securing fianance for ITS deployments - is provided by the UK's Major Scheme

Business Case procedure for local authorities' transport funding bids which requires local authorities to demonstrate, in the following areas:

- Strategic objectives: that the scheme is consistent with and will contribute to local, regional and possibly national, objectives in transport and other relevant areas
- Appraisal and value for money: the likely benefits and disbenefits of the scheme against its likely costs
- Delivery: how the promoter will be able to deliver the scheme to time and budget, including a clear project plan, governance arrangements, plans for stakeholder involvement and engagement and robust risk management plans.
- Financial: that the scheme is based on sound costings, that the promoting Local Authority is able to meet its own contribution, that any proposed third party funding is confirmed and that the Local Authority is willing and able to underwrite this element.
- Commercial: a sound procurement strategy and a rigorous approach to any private sector involvement.

Transport for London applies an additional financial discipline by separating the treatment of economic and social benefits from the financial cost of the project and budgetary constraints. This means that the financing required for the investment is fully transparent.

A similar business case procedure might be adopted in cases where European funding is being sought and the approach could also be recommended to Member States.

A3. ITS Scheme Appraisal

As Part 4 of this report illustrates, transport scheme appraisal (where it is undertaken at all) is approached in a variety of different ways within single states across Europe, and in response to different funding sources / provider requirements. But no-one is investing in ITS for its own sake. The investment is made to address specific problems or to deliver specific policy goals. The "Toolkit" approach developed by the UK Department for Transport relates the choice of appropriate ITS services and applications to specific targets or policy goals (http://www.dft.gov.uk/itstoolkit/generic-advice.htm). This is another approach which could be developed at European level, with recommendations on which ITS applications will best serve the goals of safety, efficiency, sustainabliity and the environment in different contexts (urban/inter-urban/rural; Northern Europe/Central Europe/Southern Europe; high traffic situations/low traffic situations, etc).

The process of developing an ITS project from initial project conception through to full realisation is complex. The stages include concept development, market analysis, stakeholder consultations, system testing and evaluation, public procurement, quality assessment and performance monitoring. All of these aspects are potential subjects for a "Toolkit" approach.

A4. Monitoring and Evaluation

We have noted that the practice of performance monitoring in relation to ITS projects is not well established. The use of Key Performance Indicators (KPIs) is also ad hoc. The European project CONDUITS is understood to be working on KPIs for urban ITS. PIARC has done some preliminary work on KPIs in relation to network operations[7]. It would be advisable for the Commission to build on this and develop the European equivalent of "a few good measures" advocated by the US DOT in 1997 - focusing on a few measures that are robust enough to reflect the goals and objectives of the Action Plan:

http://www.fhwa.dot.gov/publications/research/operations/its/98002/contsuccess.pdf

US practice is also well-developed in evaluation methods and their application. The US DoT is required by law to publish guidelines for evaluating innovative ITS projects (the SAFETEA-LU Reporting and Evaluation Guidelines). It covers two types of evaluations:

- Self-Evaluations – for projects valued up to $1 million (€0.7 million)
- National Evaluations – for projects costing over $1 million (€0.7 million). Evaluation costs are funded by the Federal ITS Program – with the budget for evaluation being determined by the project partnership, in coordination with US DoT officials..

The US DoT also sponsors a website setting out its preferred six step approach to evaluation (Reference: http://www.its.dot.gov/evaluation/eguide_resource.htm):

> **Step 1**. Form the Evaluation Team from the project partners and stakeholders: each designates one member to participate on the evaluation team. The programme manager designates an evaluation team leader
>
> **Step 2**. Develop the Evaluation Strategy: it includes a description of the project to be evaluated and identifies the key stakeholders committed to the success of the project. It also relates the purpose of the project to the overall ITS goal areas, such as safety, mobility, efficiency, productivity, energy and the environment and customer satisfaction
>
> **Step 3.** Develop the Evaluation Plan: in addition to hypotheses regarding system and subsystem performance, the Evaluation Plan identifies qualitative studies that will be performed. The evaluation addresses key components of the project, such as, but not limited to:
>
> - Implications of achieving consistency with the National ITS Architecture
> - Standards implementation
> - Consumer acceptance

[7] PIARC Road Network Operations Handbook, 2003

- Institutional (non-technical) issues.

Non-technical and institutional factors cover such items as procurement practices, contracting policy, organisational structure and relationships among major participants such as prime contractors and their subcontractors.

Step 4. Develop One or More Test Plans: A Test Plan lays out all of the details regarding how the test will be conducted, and identifies the number of evaluation personnel, equipment, supplies, procedures, schedule and resources required to complete the test.

Step 5. Collect and Analyse Data and Information

Step 6. Prepare the Final Report.

A5. Co-funding / Partnership Working

Deployment of ITS solutions requires effective cooperation between all parties, clear allocation of all responsibilities between stakeholders and a joint understanding of aims, objectives and delivery. This is a pre-condition for successful collaboration and to inform funding decisions that take into account wider stakeholder interests.

The study team did not request information on partnership working but it became apparent from internet research that this is a key factor in securing the finance for many ITS projects – one which is often neglected. Few of the strategy documents discuss cooperation. Those that do tend to be high level, for example:

- Austria's Federal Ministry of Transport, Innovation and Technology, established an advisory council comprising high level stakeholder representatives to work on implementation of **Austria's Telematics Master Plan**. The Council is supported by a technical secretariat responsible for operational delivery of the Plan including its management, the maintenance and updating of its knowledge base - and marketing
- UK's on-line **ITS Toolkit** recommends establishing a steering group of representative stakeholders to oversee a project, ensure that it has clear goals and that the project is delivered in such a way as to meet its original goals. It suggests the group meets regularly and reviews the project at each stage in the process from scheme design, through procurement, implementation to operation, maintenance, evaluation and marketing.

A simple yet structured model is that provided in **Sweden's Multi-Modal ITS Strategy and Action Plan** (March 2010). This groups all individual ITS measures identified in the Plan into Focus Areas for intervention. For each it sets out:

- context - for action: an outline description of the intervention area
- targets: a listing of target objectives
- strategies: that will achieve the objectives
- ITS measures: detailing for each:
  - organisational lead and stakeholder partners:

(the organisational lead is responsible for assembling all parties with a shared interest in the outcome and willing to invest the necessary resources; it is this group which is responsible for drawing up time schedules, costs and financing sources)

- timetable for deployment.

The Swedish approach provides a helpful model which could be developed into guidelines for those involved in building partnerships for the design, funding and delivery of ITS Deployments.

B. Enabling Instruments for European Integration

B1. European ITS Action Plan and Directive

The "ITS Directive" (Directive 2010/40/EU of 7 July 2010) provides a legal framework for the deployment of ITS services across Europe and for developing the ITS Action Plan. It has a seven year lifespan during which time the EC is required to develop specifications for ITS systems and services in four priority areas.

- Optimal use of road, traffic and travel data
- Continuity of traffic and freight management ITS services
- ITS road safety and security applications
- Linking the vehicle with transport infrastructure.

Member States are required to cooperate with respect to the priority areas; and ITS deployments will have to comply with any specifications which may be made under the Directive. In terms of the ITS Action Plan and Directive, any guidelines or specifications on funding will need to focus on the scope of the priority areas agreed to foster cross-border continuity of ITS infrastructure and services - involving the following components:

- Funding conditionallity, depending on satisfactory compliance with set service requirements, functional specifications and the use of European specifications and standards
- Importance of partnership working, especially across national borders, regional boundaries and between different organisations
- A robust business case (life-cycle costs) and investment appraisal
- Commitment to the evaluation of impact, effectiveness and performance..

The importance of partnership working, the need for a robust business case and the importance of evaluation and perfomance monitoring have already been discussed.

B2. Funding conditionality

Current practice varies with regard to funding conditionality in relation to technical aspects of ITS. Funding conditions are most noticable in two areas: ITS Architecture and Standards.

Conditonality and ITS Architecture

In the USA those seeking funding from Federal sources are required by law to demonstrate conformance to a Regional ITS Architecture. Extensive on-line guidance is issued on this topic. http://www.fhwa.dot.gov/cadiv/segb/views/document/sections/Section4/4_3.htm http://ops.fhwa.dot.gov/its_arch_imp/docs/architecture.pdf; http://onlinelibrary.wiley.com/doi/10.1002/9780470432853.app3/pdf

The development and use of ITS architecture is very patchy in Europe in contrast to Canada and the USA where it is well developed and its use is compulsory in projects receiving federal funds. Some European countries have developed a national ITS architecture , in some cases based on the European Frame architecture, http://www.frame-online.net/. None make it mandatory to link state funding to the use of architecture. The reason for this difference may be a consequence of the North American continental perspective and the Federal structure of government which is behind the top-down development of Canada's and the USA's ITS deployment programmes.

The current European approach has considerable flexibility to accommodate local and regional priorities and their funding and institutional arrangements. Further work is needed to examine the issues regarding funding conditionality with regard to an ITS Architecture (still to be defined) before any recommendation can be made on the desirability of Europe following North American practice. The situation needs to be kept under review because this may become an imporant issue in relation to cooperative vehicle-highways systems.

Conditionality and Standards

Standards have particular significance in the EU and apply in all EU countries. They are used to promote an open market and prevent public authorities adopting "buy national" policies. In the area of ITS the motivation for standardisation is the desire to create pan-European interoperable systems and a European-wide market for related equipment. CEN and ETSI are now working under the umbrella of Mandate M/453 (dated October 2009) to develop standards and technical specifications for cooperative ITS services.

The role of European standards has been strengthened by the ITS Action Plan and ITS Directive. Additionally, for cooperative systems, the European Commission (DG-INFSO) and the US have signed an agreement to work towards global harmonisation of standards. We have found examples of national funding linked to the use of a national standard (UK enhanced bus grant linked to smart ticketing) and this kind of conditionality may have a part to play in relation to the Priority Actions as defined in the ITS Directive:

- EU-wide multimodal travel information services
- EU-wide real-time traffic information services
- basic (road safety related) universal traffic information free of charge to users
- an interoperable EU-wide automatic accident alert & location system (eCall)
- information services for safe and secure parking places for trucks and commercial vehicles.

- reservation services for safe and secure parking places for trucks and commercial vehicles.

B3. Effective Organisation for ITS Deployment

Organisational arrangements can be shaped – either by necessity or with intent – to increase the role of private funding or achieve policy goals. In other cases a particular funding model can be used as an incentive to deliver a policy goal. Examples found in the survey include:

- Highway Network Operations: contracted out to a concessionaire with all expenditure funded from revenue generated by tolls, vignettes and land leasing. (e.g. ASFINAG in Austria)
- ITS in Towns and Cities: schemes with ITS back office functionality can attract sponsorship or can be contracted out to the private sector (e.g. the Barclays bank sponsorship of London's cycle hire scheme; and the operation of Stockholm's congestion charging tax which raises net revenue which is ring-fenced to be reinvested in transport infrastructure).
- Trip Planning, Traffic and Travel Information: can involve the formation of joint ventures between transport authorities, private operators and service providers (e.g. AnachB in Austria and Samtrafiken in Sweden)
- ITS for Public Transport Operations: incentives can be used to deliver policy goals (e.g.UK bus service operator grant, which is uplifted to offset the cost of installing the equipment for smart card ticketing and automatic vehicle location).

The value of organising in ways that deliver collaborative funding (joint ventures, sponsorship funding) or that tap into new sources of revenue (particularly user charges and tolls) should be stressed in any guidance that is issued.

B4. Collaboration

In developing guidelines there are advantages in the Commssion working with other players who have a similar interest in developing good practice with regard to ITS funding:

- CEDR (Taskgroup 14) has already contributed evidence on this topic. The organisation represents senior professionals in the public highways sector. Enquiries could also be made of UITP on how they regard funding of ITS, while PIARC's Technical Committee B2 is known to be interested in developing guidance on public funding requirements

- IBEC has an established reputation and particular expertise on the methods of ex-ante and ex-post evaluation, monitoring requirements, etc

- ITS Congress organisers will be willing to arrange sessions / workshops to raise profile and develop good practice (this has already been considered by DG-MOVE)

- European Investment Bank offers loans, technical assistance, guarantees and venture capital to clients and could be approached to help with developing guidelines on private finance for ITS and innovative funding instruments. The World Bank is known to have a very close interest in this as well

- USA and the EU have a collaborative agrement on co-operative systems architecture. This might be complemented with a parallel ageement to collaborate on developing good practice, knowledge-sharing (e.g. databases) on the funding and financing of ITS.

C. Mobilisation of Investment Actors

Sweden identifies the main actors for ITS funding as:

- Transport authorities = network operators
- Municipalities
- PT operators
- Transport operators
- Telecom operators
- Universities, educators

This study confirms the first 4 on this list, with the clarification that transport operators should include the infrastructure operators as well as those offering road transport services. Telecoms operators do not feature strongly in this group, nor do universities and educators who are mostly involved in R&D projects. The funding providers, identified in Appendix 5 as being active in each of the five ITS application areas considered, are unsurprisingly those most closely engaged in the sector. In general:

- Highway Network Operations: are undertaken by national highway authorities
- ITS in Towns and Cities: is primarily the responsibility of local government and transport operators
- Trip Planning, Traffic and Travel Information: brings together national, regional and local authorities, together with transport operators
- ITS for Public Transport Operations: are led by the operators' drive for efficiency and profits
- Freight Transport Operations: are the domain of road hauliers and shippers (although very little information on funding of ITS operations and freight transport has been obtained)

C1. Importance of European Funding

European funding of transport projects under the TEN-T programme and Cohesion and Structural funds is particularly significant within the new EU12 and their immediate neighbours - to bring infrastructure up to scratch and complete the road network necessary for the single market:

- the Czech Republic's Operational Programme for Transport receives €5.8 billion and the Operational Programme for Prague provides an additional €87.5 million for transport accessibility and ICT development
- Latvia's Operational Programme for Infrastructure and Services receives €851 million to support development of the transport network and sustainable transport.

This significance is, and could be further, increased if:

- as part of the new funding framework proposed in the Transport White Paper, project proposals were required to use any cost benefit investment appraisal, project monitoring and evaluation procedures which the Commission decides to introduce
- both TEN-T and regional development funding of the ITS components of wider transport projects were linked to the use of European ITS standards and specifications, in a similar manner to federal funding of ITS projects in the USA.

D. Alternative Funding Sources

The Swedish report to CEDR notes that most financing for ITS comes from taxes and charges through:

- the ministry
- municipalities sourcing channels
- charges (congestion charging, bridge charges)
- fees from users (PT, telecom)

The results obtained from this study confirm this view. A notable difference in the USA is the reliance on a gasoline tax as the main source of funding for transportation infrastructure. The other principal inovation is the use of private finance and more sophisticated loan instruments.

D1. Use of Private and Innovatory Finance

The Commission's Transport White Paper highlights the pressure on public funding of transport infrastructure. All nine countries for which we have information echo this. They either use, or are paving the way for the use of, private finance for transport investments (Part 2 Table 2 of this report records which countries have applied these arrangements to ITS). This is in response to the scarcity of public finance which has been exacerbated by the current economic situation and the need to renew and build missing links in national transport networks and their connections to international gateways.

Of the 33 funding case studies reported in Appendix 4, six stood out as interesting examples of private and innovative financing. These six have been developed into the extended case studies shown in Appendix 6. They cover:

- internet based real-time information service (Austria: Joint Venture, value €10m)
- intermodal journey planning and ticketing portal (Sweden: Joint Venture, value €113m in revenue, costs not publicly available)

- urban congestion charging tax (Sweden: national funding with recognition of the scope for including other funding partners in future schemes; cost €216m, generating a net revenue surplus of €57m per annum which is reinvested in other infrastructure projects)
- national traffic information centre (UK: Public-Private Partnership, part of the UK Private Finance Initiative: value €183m)
- national inter-modal journey planner (UK: national funding with extensive private "in kind" contributions: value €70m)
- Capital Beltway HOT Lanes (Construction of High Occupancy Toll lanes) (USA: Innovative Loan Finance: value €415m – of which only a proportion is for the ITS components)

These examples and others (for which detailed information was not available to the study team) such as the:

- Austrian private motorway company concession (funded through toll revenue) and
- London Cycle Hire and Cycle Super Highways (sponsored by Barclays bank)

show a range of imaginative financing schemes for funding investment and generating revenue whilst delivering transport solutions and policy objectives. There is wide expectation that increasingly the private sector could and will be more engaged in the development of user-friendly ITS-based services and will be willing to fund up-front costs of major schemes through shareholding and bond finance.

The Commission's White Paper looks towards such new financing tools to bridge the gap in public finances. This is an emerging area and further work is needed to identify good examples of these innovative funding arrangements and to develop guidance relevant to ITS stakeholders and based on experience.

5.3 Kernel Requirements for European Funding Guidelines and Web-based resources

Based on the foregoing analysis we have identified the following kernel components that together would provide an effective package of Commission guidelines and web-resources to support Member States in ITS investment decision making, monitoring and evaluation. These are summarised below in four distinct areas (and cross-reference to the discussion in Section 5.2 above):

A. Budget and finance processes:

1. **Support for internal budget processes:** by making readily available, information on ITS costs and benefits specific to the European context including whole life and operational maintenance costs
2. **Justifying investment in ITS:** development and promulgation of good practice on how to justify an investment in ITS and make the business case for public funding
3. **ITS scheme appraisal:** development and promulgation of good practice on ITS scheme appraisal for selecting ITS applications to meet transport policy goals alongside other

transportation projects

4. **Monitoring and evaluation:** development and promulgation of good practice on the monitoring and evaluation of ITS schemes to demonstrate value for money
5. **Partnership working:** development of advice on partnership working, in particular through case studies and examples of inter-agency collaboration and co-financing.

B. **Use of enabling instruments**

1. **European ITS Action Plan and Directive:** development of policies with the Member States on coordinated funding for ITS infrastructure and services across borders
2. **Funding conditionality:** in-depth consideration of the case for funding conditionality (in particular in relation to ITS Architecture and Standards)
3. **Effective organisation for ITS deployment:** advice on effective organisation for ITS deployment through case study examples
4. **Collaboration:** with other organisations such as CEDR, PIARC, UITP, IBEC on the development and promugation of good practice guidelines.

C. Mobilisation of investment actors

1. **Importance of European funding:** further analysis on the significance of European Funding for ITS, for example with regard to modernising ITS infrastucture and updating legacy systems.

D. Alternative funding sources

1. **Use of private and innovatory finance:** guidance on the use of private and innovatory finance in ITS through case studies.

6 Conclusion of the Study and Recommended Next Steps

6.1 Main Findings

This was very much a preliminary scoping study. Despite the limitations of the information provided in response to the questionnaire, further research and analysis has provided valuable insights and useful information about how ITS is currently funded. As we can see from this report, there is a great diversity of actors involved in funding ITS at national, regional and local levels. They work to different funding regimes and transport investment assessment methods. This leads to a patchy situation with different funding criteria being applied and lack of transparency – with unpredictable results in relation to EC policy priorities. The institutional differences revealed impact directly on the assessment and financing of cross-border infrastructure and ITS services and are likely to impede progress on the ITS Action Plan and ITS Directive priority areas.

Our main conclusion is that there is a pressing need for (European) action in three areas:

1. European Guidelines: development of good practice guidance at policy level in relation to arrangements affecting the public finance of ITS, much of which will need to be developed after consulting Member States

2. Web-Based Resources: development and maintenance of web-resources for the benefit of ITS practitioners to support internal budget processes and to enable and push for ITS (funding) ex-ante scheme appraisal

3. Further investigation: to support the development of robust guidance and tools to establish a more effective evidence base on Member States' existing arrangements in key areas and the role and importance of European funding in ITS deployments.

We recommend that these **three topics** be the subject of **further investigation** before any actions (if any) can be recommended; and we elaborate below on the appropriate place to address the kernel requirements identified in Part 5.2 above and the issues needing further investigation.

Need for European guidelines

We recommend the development of advice and guidelines on the following, illustrated by case studies where possible:

- Justifying investment in ITS: guidance on how to make a business case to justify investment in ITS. (An example is the Major Scheme Business Case procedure used in UK). (Ref: Section 5.2 A2)
- Partnership working: advice on how to approach partnership working of the kind provided in Sweden's Multi-Modal ITS Strategy and Action Plan, which provides a methodology for collaboration assigning responsibilities for funding (Ref: 5.2 A5)
- European ITS Action Plan and Directive: guidance on how best to achieve effective cross-border funding for ITS infrastructure and services involving organsiations from more than one member-state working together (Ref: 5.2 B1)

- Effective organisation for ITS deployment: guidance on organisational arrangements that will release collaborative funding arrangements or tap into new sources of revenue such as joint ventures, concession arrangements (Ref: 5.2 B3)
- Collaboration: collaboration with organisations such as CEDR, PIARC, IBEC, EIB and World Bank (Ref: 5.2 B4)
- Use of private and innovatory finance: guidance on private and innovatory finance relevant to ITS stakeholders based on experience with case study examples (Ref: 5.2 D1).

Development of web-based resouces

For practitioners, such as the EasyWay partners, POLIS members, ERTICO partners, CEDR, local authorities, Freightwise partners. etc., a suitable format for guidelines would be a user-friendly web-based resource. We see in particular a need for:

- Support for internal budget processes: an on-line resource on ITS costs and benefits modelled on the US DOT websites http://www.itscosts.its.dot.gov/ and http://www.itsbenefits.its.dot.gov/ - to support investment actors in the preparation of budgets for ITS deployments. The 2DECIDE toolkit could be developed in this way (Ref: Section 5.2 A1 of this report)
- ITS scheme appraisal: an ITS "Toolkit" as a decision-tree aid for planning and financing ITS deployments covering scheme selection and ex ante-appraisal, such as the "ITS Toolkit" developed by the UK http://www.dft.gov.uk/itstoolkit/generic-advice.htm (Ref: 5.2 A3).

Topics requiring further investigation and ongoing review

This report coincides with the publication by the Commission of its Transport White Paper which highlights the need for a new funding framework for infrastructure investments. Specific White Paper initiatives - which relate directly to the analysis provided by this study - concern modern infrastructure and smart funding and are listed in Annex I to the White Paper.

In this context and to advance Action Line 6.3 of the ITS Action Plan (concerning the development of guidelines for EU and national public funding of ITS systems and services), we recommend that this development process be supported by further investigation of:

Member State's practices in the areas of:

- funding conditionality in relation to ITS Architecture and Standards, particularly with reference to the Action Plan priority areas and in the long-term on cooperative vehicle-highway systems - where a pan-European approach is needed
- scheme appraisal methods and guidance currently offered in relation to funding of ITS components. This will help to build the knowledge-base from which best practice guidance can be developed, flexible enough to respond to different countries' characteristics and needs, according to their geographical position in relation to European markets, financial situation, level of economic and regional development
- organisational arrangements in terms of partnerships for the design, funding and delivery of ITS deployments. This often-neglected area is a pre-condition for

successful collaboration and putting in place funding arrangements that take account of wider stakeholder interests.

The request for this information could be included in the coverage of the five year strategies that Member States are asked to provide in August 2012 under the ITS Directive.

This work would usefully be supplemented by the Commission further investigating:

- Monitoring and evaluation: to develop recommendations on ITS project monitoring and ex-post evaluation of ITS deployments to demonstrate value for money, including guidance on the evaluation methodology and the use of policy-led Key Performance Indicators (KPIs). There is no agreement between countries and between different organisations on the need for monitoring and evaluation and no established good practice; nor any agreement on the appropriate proportion of budget for evaluation. This contrasts with the US where practice has to satisfy the requirements of the US Government Performance and Results Act of 1993 (Ref: 5.2 A4)
- Private and innovatory finance: in-depth case studies, for publication, on effective and innovative finance for ITS to serve as models for ITS deployments at European, national and local level in relation to ITS Action Plan objectives (Ref: 5.2 D1)
- Justifying investment in ITS: guidance, for publication, on business planning and investment appraisal for public and private funding of ITS on the TEN-T Road Network to give effect to the Transport White Paper's proposals for a new funding framework. This would augment the Commission's Guide on Cost Benefit Analysis (CBA) in 2002, updated in 2008 - the methodology that Member States currently use in the preparation of infrastructure projects to be co-financed by the Commission (Ref: 5.2 A2 in relation to European guidelines – though strictly these are outside the scope of this study)
- Importance of European funding: a study on the role and importance of European funding for ITS deployment given that European funding for ITS is significant for many of the countries included in the survey, especially those European countries that are lagging behind with basic ITS infrastucture. Examination of EC funding rules was specifially excluded from this study (Ref: 5.2 C1).

6.2 Dissemination of study results

At the outset of this study an initial literature search of EU research in this area and of PIARC, IBEC and OECD sources indicated that there is no readily available comparative analysis of transport funding schemes and ITS investment methodologies to support the decision making process. It is likely that no such analysis has been undertaken given the relatively recent shift in ITS from research and development to being a proven instrument for delivering transport policy goals.

This study has therefore broken new ground and we recommend that dissemination of the results would be extremely advantageous in fostering understanding and creating awareness. This can be taken forward in a number of ways:

- Awareness-raising: presentation of study findings to the:
  - European ITS Committee
  - European ITS Advisory Group
  - TEN-T Finance Committee
  - European Parliament Committee on Transport and Tourism

- Consultation workshops to present study findings and debate issues with:
  - Stakeholders drawn from CEDR, POLIS, ERTICO, Association of ITS Nationals, EasyWay partners etc
  - EIB and private finance players
  - Local authority groupings, including CEMR, EALA, CIVITAS cities, other stakeholders
- An analysis of the issues raised in the workshops captured in a report identifying areas of consensus, knowledge gaps and other issues arising.

6.3 Proposed follow-on work programme

The outcome of the analysis of issues arising from the awareness-raising presentations and consultation workshops will provide the basis for specifying the work needed as a follow-on to this study. The work programme for the follow-up should be sufficiently comprehensive to support the development of appropriate guidelines as specified in Section 6.1 above.

We consider that the material needed to develop these deliverables will require in-depth investigation and analysis of key issues using a methodology involving targeted stakeholders in an interactive way - to draw on their knowledge and experience. A preliminary list of issues for consideration by the Commission is outlined below:

A. Making the business case for ITS funding:

- How to undertake scheme appraisal and make the business case for ITS infrastructure, systems and services
- How best to monitor and evaluate ITS deployments and share best practices
- How best to orchestrate support, allocate responsibilities and organise funding where multiple partners are involved
- How to engage with private finance and innovative funding opportunities
- How to justify funding for ITS component systems and services as part of wider transport investments
- How to develop funding for a combination of ITS services - where the benefits come from the synergies
- How to factor into the funding scheme the operational and maintenance costs of ITS
- The special case of legacy systems – how to justify and develop a funding programme for upgrading, replacement or decommissioning
- The special case of linked cross-border projects – how to synchronise the funding from all funding providers

B. In-depth case studies to illustrate the use of different funding models

- National and regional transport investment programme
- Local (municipal) transport investment programme
- Transport operator funding
- Private finance, PPP, toll roads & private sector concessions
- Multi-partner composite funding
- Joint venture funding
- Special innovation funds
- Funding incentives and subsidies
- Sponsorship
- Special borrowing and investment Arrangements
- Dedicated funding for ITS

C. ITS Toolkit (Decision Tree) for planning and funding ITS deployments

- Review existing interactive toolkits for selecting and planning ITS deployments in response to policy objectives
- Develop a preferred structure and an outline of content coverage which will include funding options (these are not covered in existing toolkits) that will embody best practice
- Include options to engage with private and innovatory finance
- Develop a prototype for testing with stakeholders and evaluation

D. Further Investigations

We further recommend that the Commission takes forward the further investigations at Member State and European level recommended in Section 6. 1 on "Topics requiring further investigation and ongoing review"

- Member State's practices in the areas of:
  - funding conditionality in relation to ITS Architecture and Standards
  - scheme appraisal methods and guidance on funding of ITS components
  - organisational partnership arrangements for ITS deployments

- This work would usefully be supplemented by the Commission further investigating (and publishing where appropriate) and keeping under review:
  - monitoring and evaluation methodologies and guidance
  - private and innovatory finance - in-depth case studies
  - business planning and investment appraisal guidance on ITS on the TEN-T Rroad Network
  - a study on the role and importance of European funding for ITS deployment .

On completion of the proposed follow-on work programme the Commission will be in a position to further develop the web-based resources that are recommended through the publication of guidelines and in-depth case-studies as described above.

Acknowledgements

The study team are grateful to all the questionnaire respondents for their input. It has not been possible to peer review with all respondents - the country, regional and city information kindly provided. The study team has taken care to interpret the information provided as accurately as possible, supplementing it with information published on the internet. Any errors and omissions which may have found their way into the analysis are unintended.

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