BUILDING A EUROPEAN TRANSPORT POLICY INFORMATION SYSTEM

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1. INTRODUCTION

The basis of good policy (not just transport policy) is good information. Unfortunately, the data available for addressing transport policy issues with a European dimension is limited, and quality questionable. There are three reasons for this lack of data: 1) the abolition of borders removed a reliable source of data for intra-EU transport flows, 2) the legal requirements for National Statistical Offices (NSOs) to supply transport data to EUROSTAT represent a bare minimum, and 3) the data collected by NSOs for national purposes is collected using different formats and methods making cross-border comparisons very difficult. Thus, getting a complete, consistent, and accurate picture of developments in the transport sector is both expensive and time-consuming. To address these shortcomings the European Union launched an initiative to develop and construct the European policy Transport Information System (ETIS).

2. HISTORY OF THE DEVELOPMENT OF ETIS

For a long time the need for a common transport policy and the monitoring of its performance has been addressed by funding numerous studies and initiatives at a national and European level. Most of these studies developed their own database. The databases developed were specific to the needs of the study and thus differed significantly not only in terms of content (e.g. variables, range, years), but also in terms of their technical formats. Sound documentation of methods and models used was often falling short, hindering the comparable and repetitive use. Consequently, the current data collection regime in Europe resembles a patchwork quilt: EUROSTAT, Member States, international organizations (United Nations Economic Commission for Europe (UNECE), European Conference of Ministers of Transport (ECMT)) and numerous projects are involved in various ways in collecting data. Despite the numerous parties involved in collecting data, there are still significant gaps, particularly when focusing on the European dimension. Here EUROSAT serves as the central body in the network of data exchange between the Member States and the Commission. Unfortunately, due to legal issues a lot of detailed data delivered to EUROSTAT can neither be provided to the Directorate General for Transport and Energy (DGTRREN) nor to related projects. So far, there is no one single database that can be used to respond to policy requests with a European dimension. This poses great difficulties in particular with regard to the transport policy of the European Commission.

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Attempts to remedy the lack of data started some decades ago. For example, the European Commission launched initiatives like ECIS (European Centre for Infrastructure Studies) and TERM (Transport and Environment Reporting Mechanism), and had regular consultations with Member States and experts. In 1997, the INFOSTAT study introduced the concept of ETIS for the first time. INFOSTAT provided for an expert consultation to fix the concepts of a European information system. A year later the CONCERTO project established a concerted action for a European Information Systems, providing a platform for Member States and the Commission to discuss this concept.

In 1999, the Member States and the Commission agreed to build up ATIS, a pilot version of an information system focusing on the Alpine area. The feasibility of this concept was demonstrated in the subsequent years with respect to specific transport issues such as the effects of the closure of the Gotthard tunnel. Further projects followed with ALP-NET providing a thematic network on transalpine crossings, and THINK-UP establishing a thematic network to understand mobility prediction.

Finally in 2002, the European Commission funded the three ETIS projects as part of its Fifth RTD Framework Programme. The scope of these three projects was to develop the first version of the European Transport policy Information System. These three projects were ETIS-AGENT, ETIS-BASE and ETIS-LINK. ETIS-BASE was responsible for collecting, validating, harmonising and aggregating data, for developing a complete and consistent ‘reference’ database, covering the EU25, Switzerland and Norway. ETIS-AGENT was responsible for the development of a user-friendly and policy-driven software environment for storing and updating the reference database, analysing the data, reporting and visually displaying the information in the database. ETIS-LINK was responsible for synchronizing the work of ETIS-BASE and ETIS-AGENT, for involving stakeholders in the development process, for creating awareness about ETIS in the Member States, and for developing a roadmap outlining the steps the European Commission would need to take if it wants to institutionalize ETIS.

3. THE ETIS PROJECTS AND THE PROCESS FOR THE ETIS PILOT DEVELOPMENT

The development of a European Transport policy Information System (ETIS) is a challenging project requiring expertise in both technical and transport-related issues, as well as an understanding of the information needs of transport policy-makers. To ensure that ETIS is relevant and useful for policy-makers and technically excellent, a five-member Steering Group was established. This Steering Group included representatives from governments and industry, individuals with the technical expertise (hardware and software) relevant for the
development of ETIS, and individuals with knowledge and understanding of the transport sector.

The primary role of the Steering Group was to steer the design and development of ETIS. The Steering Group had two functions – one internal and one external. Its internal function was to advise the European Commission and to guide the development of ETIS with regard to the feasibility of including certain elements or capabilities, and the overall strengths, weaknesses, opportunities, and threats regarding proposed design and development strategies.

In its external role, the Steering Group was an instrument for generating interest in and support for ETIS in the European Commission, Member States, and other potential user groups. It did so through the prestige and influence of its members, and by its members’ participation in conferences and workshops.

Under the guidance of the Steering Group the ETIS projects worked over three years (2002-2005) to develop the first working version of ETIS, and to pave the way for its future uptake. The underlying principles guiding the development phase were: build on the past and link with existing work, foster strong user involvement, guarantee transparency, provide a tangible and working ETIS pilot focusing on a concrete set of policy issues, and allow for web based access.

To satisfy these principles the project activities included not only the technical development of the ETIS reference database and the ETIS software environment, but also the establishment of a process for involving Member States and other relevant stakeholders in order to improve the quality of and raise the interest in ETIS.

The user involvement was launched through a conference during the first year of the project introducing the community of potential users to the plans regarding ETIS, and explaining potential benefits for those involved with the monitoring, evaluation, and planning of transport policy at the Commission, Member States, regional and local levels. In the course of the project, another two conferences were organised. The objective of the conferences was to inform potential ETIS users and Member States’ representatives about the progress in developing the ETIS pilot; the other scope being to discuss strategic issues centred around the question of how to operate and manage ETIS after the end of the development phase taking into account the expected benefits for Member States as well as actual and potential cooperation modalities with the European Commission and EUROSTAT.

In addition to the conferences, seven thematic workshops were organized to address specific issues relevant for the development of ETIS. The project partners invited national experts and policy-makers to bring in external knowledge and experience for checking interims products and getting direction in crucial decisions. The topics of these workshops included a broad range of
issues, such as the inclusion of data and models in the reference database, terms and conditions under which data providers would be willing to provide data, peer review of models and methods applied, pilot testing and training of future users, as well as options for future uptake and institutionalisation of ETIS.

In addition to these workshops and conferences several steps were undertaken to involve Member States’ representatives in the evaluation of the data and the testing of the system. All 25 Member States plus Norway and Switzerland were provided with the three core data sets (Freight demand, Passenger demand, Networks (assignments)) for their respective countries. Furthermore, an expert panel was invited to evaluate all seven datasets (including also Socio-economic data, Freight services and costs, Passenger services and costs, External effects).

Once the preliminary datasets had been loaded into the interim software tool, a selection of Member States’ representatives were provided with access to the system. They gave their feedback based on their experience with using the data and software tool by answering questionnaires. Additionally, project partners performed several rounds of internal testing. These formal testing rounds were supplemented by several informal consultations with relevant ministries and other relevant stakeholders in the Members States. The final step during the testing was accomplished with the user-testing and user-training workshop. This extensive user involvement provided the developers with helpful insights into the user needs and pointed out possible improvements within the data structure and the software system.

Further input was provided by two position papers subcontracted to external experts, one on “Issues of intellectual property and liability in ETIS” by the Tilburg University, and another one on “The technical, organisational, and resource requirements for a feasible ETIS” by Accenture S.A..

To keep the process transparent and provide for a continuous information flow a project website (http://www.etis-eu.org) was established and newsletters were prepared on a regular basis to inform about the progress of the projects.

4. THE ETIS VISION AND PROJECT OBJECTIVES

The vision of a full-fledged European Transport policy Information System envisages a system capable of providing users with the most up-to-date data on all transport related questions, by providing remote access to dispersed data sources, automatically updating the reference database, and eventually providing forecasts of the future and the models for making these forecasts.
Specifically, ETIS would provide users with:

- Information to support the analysis of policy issues – Complete, consistent and harmonized data, including all relevant sources, and covering important transport policy issues. Indicators for monitoring developments in the transport sector as well as the performance of transport policy.
- An analytic environment for accessing, analyzing, and visualizing the information in ETIS based on policy needs.
- Meta-data: Descriptions of the data sources, variables, and methods used to collect, validate, harmonize, and aggregate data from different sources, fill in missing data, and to construct the indicators. This meta-data will help to improve the credibility of the information by documenting all the steps involved in producing this information, and making it available to users.
- A framework for data policy: proposals and guidelines for the sharing of information among public bodies; standards and definitions for data collection and validation; approaches for filling in missing data.

Developing such a complete ETIS is a huge undertaking, and doing this would have required more time and money than was available to the three projects in the ETIS cluster, hence, the decision to develop a pilot version of ETIS.

By definition, a pilot version of ETIS would not be complete in terms of both the functionality of the system and the data that it includes. Thus, the primary objective in developing this pilot version of ETIS was to demonstrate that it is possible to develop such a system, even for a field as complex and vast as transport policy. Therefore, in developing the pilot version of ETIS we had to balance limiting the scale and scope of this pilot version with the need to develop a pilot that included functionalities and data that were useful to policy-makers.

Consequently it was decided to: first, focus the pilot on the European Commission’s Trans European Networks – Transport (TEN-T) policy; the primary focus of the TEN-T policy is on the infrastructure needs the TEN-T network; and second, to focus on the data and analytic needs of policy-makers at the European Commission. Thus, the data included in the system, as well as the functionality built into the system primarily addresses the needs of policy-makers at the Commission.

Therefore, the visual presentation capabilities of the system were emphasised, while functionalities with regard to data collection and access were limited. The pilot version of ETIS collects all necessary data and manually harmonises, validates, and aggregates this data. Thus, although a policy information system should automate these functions to the extent possible, this has not been done in the pilot version.
Additionally, the importance of meta-data in order to guarantee a transparent harmonisation of data retrieved from different sources and to clear away any concerns about obscuring the reasons for differing data was stressed by various stakeholders and the Steering Group. For this reason, the developers paid special attention to this issue in the construction of the ETIS pilot.

5. THE ETIS PILOT

A pilot version of ETIS was submitted to the European Commission at the end of 2005. It included: 1) a reference database with data needed to make policy about the TEN-Ts; 2) a software environment for accessing, analyzing, downloading and visualizing data; 3) a methodology for updating data and constructing indicators, as well as guidelines for the harmonization and validation of data collected by different providers, that are often following different underlying methods.

5.1 The Reference Database

The reference database covers seven datasets: socio-economic data, freight demand, passenger demand, transport infrastructure network, freight service and costs, passenger service and costs, and external effects. To synchronize the ETIS reference data to the extent possible with the UNECE road census, the developers chose the year 2000 as the base year of the origin-destination matrices and the networks. Service and cost data are however more recent. A significant share of the data came from EUROSTAT’s NewCronos database. Additionally, data were collected from national statistical offices, universities, and research organisations.

Table 1: Data included in the ETIS pilot

<table>
<thead>
<tr>
<th>DATA CATEGORY</th>
<th>TYPE OF DATA INCLUDED (EXAMPLES)</th>
<th>DATA SOURCES (EXAMPLES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-Economic</td>
<td>GDP, participation in the labor market, population size and age distribution…</td>
<td>EUROSTAT (NEW CRONOS, REGIO, COMEXT, GISCO), EUROGEOGRAPHICS (SABE), Corine land cover, World Bank, IMF (International Monetary Fund), WTO (World Trade Organization), OECD (Organization for Economic Co-operation and Development), Worldfact Book (CIA database), project results including SCENES…</td>
</tr>
<tr>
<td>Freight demand</td>
<td>Transport chain OD (origin-destination) matrix, transport volumes, number of truck movements, origin and destination of cross boarder traffic, combined transport, trade volumes, tons of shipments, commodity types…</td>
<td>EUROSTAT (NEW CRONOS, COMEXT), CAFT (Cross Alpine Freight Traffic), national statistical offices, port authorities, UN (United Nations Trade data), Freight operators (ICF International Coach Federation, UIRR International Union of combined Road-Rail transport companies), Project results including INTERMODA and SPIN…</td>
</tr>
<tr>
<td>Passenger demand</td>
<td>OD matrix, number of passengers per day, trip purpose, mode of transport,…</td>
<td>EUROSTAT (NEW CRONOS), project results including DATELINE, IATA (International Air Transport Association) Digest on Statistics, UNECE (United Nations Economic Commission for Europe) Road Transport Census, Official World Airways Guide, Airline Coding Directory, HAFAS (German…</td>
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</table>
Seven policy domains ranging from “Accessibility” to “Modal split” are included in the reference database, each of which includes several policy issues such as “Improve connectivity to island areas” or “Encourage long distance freight market share for railways and waterways”. These policy issues correspond to several indicators calculated to provide policy-makers with the information they need to monitor relevant developments and measure the performance of their policies. The construction of these indicators is based on primary data, mathematical formulas and algorithms. As in many cases primary data is incomplete, aggregated or not harmonised, methodologies for harmonizing (e.g. road transport cost), combining (e.g. origin-destination freight data), or estimating (e.g. road traffic flows on links) data have been developed.

Figure 1: The ETIS Pyramid

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<table>
<thead>
<tr>
<th>Policy domain</th>
<th>Data variables</th>
<th>Indicators</th>
<th>Policy issues</th>
<th>Metadata information on the data sources, models, and methods used to calculate the indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight services and costs</td>
<td>Transport schedules, Price per ton, equipment deployed and detailed information per vessel/vehicle, operators…</td>
<td>EUROSTAT (GISCO), transport operators, shippers, ports and terminals, business directories, project results including RECORDIT, SPIN and GBFM…</td>
<td>Flight, rail and ferry schedules, ticket prices, airport taxes, access times, routing…</td>
<td>Official Airline Guide (OAG), EUROGEOGRAPHICS (SABE), websites of ferry and rail companies, timetable for passenger ferry services, international rail timetables, tariff database of a consolidator for air tariffs, UIC, EUROCONTROL, ICAO, HAFAS…</td>
</tr>
<tr>
<td>Passenger services and costs</td>
<td>Emissions, accidents, injuries…</td>
<td>EUROSTAT, national data sources and publications, project results including COMMUTE, RECORDIT, TEN-STAC, INTERNAT, MEET…</td>
<td>Flight, rail and ferry schedules, ticket prices, airport taxes, access times, routing…</td>
<td>Official Airline Guide (OAG), EUROGEOGRAPHICS (SABE), websites of ferry and rail companies, timetable for passenger ferry services, international rail timetables, tariff database of a consolidator for air tariffs, UIC, EUROCONTROL, ICAO, HAFAS…</td>
</tr>
<tr>
<td>External effects</td>
<td>Emissions, accidents, injuries…</td>
<td>EUROSTAT, national data sources and publications, project results including COMMUTE, RECORDIT, TEN-STAC, INTERNAT, MEET…</td>
<td>Flight, rail and ferry schedules, ticket prices, airport taxes, access times, routing…</td>
<td>Official Airline Guide (OAG), EUROGEOGRAPHICS (SABE), websites of ferry and rail companies, timetable for passenger ferry services, international rail timetables, tariff database of a consolidator for air tariffs, UIC, EUROCONTROL, ICAO, HAFAS…</td>
</tr>
<tr>
<td>Transport infrastructure network</td>
<td>GIS data (nodes and links), Kilometers of network, number of railway or motorway lanes, airport capacity, quality of infrastructure…</td>
<td>UNECE, UIC, EUROSTAT (GISCO), EU project results like TEN-STAC and GETIS (Geo-Processing Networks in a European Territorial Interoperability Study), ICAO (International Civil Aviation Organization) statistics, Official Airline Guide (OAG), EUROGEOGRAPHICS, EUROCONTROL (European Organisation for the Safety of Air Navigation), Computer Reservation Systems, government internet websites, tariff database of consolidator (air tariffs)…</td>
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In brief, the reference database includes:

- Indicators for monitoring the most important aspects of the European Union’s TEN-T policies
- Data variables to calculate the indicators, from many different data sources, describing passenger and freight transport flows, for all modes, and covering the EU25 (as well as Norway and Switzerland)
- Meta-data describing the indicators, data variables, methods, and models

Table 2: Policy domains and policy issues included in the ETIS pilot

<table>
<thead>
<tr>
<th>POLICY DOMAIN</th>
<th>POLICY ISSUES</th>
</tr>
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</table>
| Accessibility                  | Improve connectivity to island areas  
Increase quality of surface connection of major airports  
Minimise constraints in trip making and increase service availability to population |
| Environment                    | Decrease atmospheric pollution around TEN links  
Minimise effects of transport in environmentally sensitive areas  
Mitigate noise effects in TEN corridors  
Reduce energy consumption and CO2 emissions at network-level |
| Intermodality / Interoperability| Develop international rail traffic  
Encourage utilisation and containerisation of freight  
Improve accessibility to the intermodal transport system  
Increase in interoperable rail infrastructure on the TEN  
Increase terminal utilization |
| Mobility                       | Eliminate bottlenecks and reduce congestion  
Improve Level of Service on TEN infrastructure  
Optimise capacity on existing infrastructure  
Optimise modal split along international corridors for road and rail |
| Modal Balance                  | Encourage long distance freight market share for railways and waterways  
Increase market shares of non-road modes to a competitive level shifts in selected Corridors/Areas  
Revitalise passenger demand for railways, rail access to airports, and modal split with air travel |
| Optimal use of capacity        | Encourage use of TEN-T as major corridors for long-distance and international traffic Seaports shall promote short sea and international shipping |
| Safety                         | Reduce fatalities and injuries |

5.2 The Software Environment

The software environment is providing the capabilities for accessing, analyzing, downloading and visualizing data. Technically it consists of three elements: data integration, data storage, and front-end environment.

The fully automated data collection from remote data sources has proved to be impossible for the time being. The reasons for this are basically that data owners are often reluctant to provide direct access to their data sources, and that data is not always available in the right format. The ETIS data integration element allows for the direct web-based as well as for the manual loading of data variables and indicators into the ETIS repository. Thus, once data variables or indicators are in
the appropriate XML format they can be loaded into ETIS through the Data Loader module. If data sources allow direct access remote loading through a web service is possible. The system provides also the appropriate template describing the required meta-data structure, relating data variables or indicators to the relevant policy domain and policy issue, providing information on the computation methods used, identifying data sources, and describing validation and harmonisation rules.

The data storage element is a repository used to store data variables, indicators, meta-data that have been loaded into the system. To allow analysing the data variables and indicators from a variety of policy-related perspectives the ETIS storage element is designed as a data warehouse, storing transport information data in multidimensional structures (data cubes). Consequently, indicators can be viewed along one or more dimensions (e.g. mode, time).

The front-end element allows users to access, analyze, compute and visualize data variables and indicators along with their meta-data. The system combines analysis and elaboration technology (OLAP – on line analytical processing) with a visualisation tool that provides the possibility to view data in tabular, graphical and GIS (Geographical Information Systems) format. Under the condition that the information provides the necessary quality and detail of meta-data definitions, and the source is connectable, the front-end element also provides an interface to access and analyse information residing in external databases.

Figure 2: The ETIS software architecture
In brief, where supported by the necessary data the software environment allows to:

- perform direct web-based as well as manual loading of data variables and indicators
- browse the meta-data of data variables or indicators according to transport policy or keyword
- access data variables or computed indicators
- perform analyses on data variables or computed indicators (including the creation of new indicators) and store results
- visualize indicators in tabular format, graphical format or on maps (GIS view)

It should not go without saying, that the ETIS software environment is designed to function not only as a client server application but also via the web. This innovative approach was chosen to facilitate application maintenance and to provide licence free use. Furthermore, ETIS has a Service Oriented Architecture (SOA), with three individual software components (query tool, OLAP tool, GIS viewer) that can run on different machines. These services use standards such as Web Services, and communicate with each other by using XML messages.

5.3 The Harmonisation Methodology

Strong emphasis was placed on the documentation of the methods used in constructing the reference database. The reasons for this being twofold: first, the aim was to guarantee transparency regarding differences in data and information; second, the exercise of constructing a reference database should allow for repetition. Therefore, the meta-data that come with the data and information residing in ETIS as well as the project reports provide a sound documentation of the methods used for collecting, harmonizing, combining, and estimating data. It is clear that in the course of time, given changing data availability, and new methods and models, these methods will need to be assessed and adjusted. However, the methodology used provides a first blueprint for data harmonisation efforts.

6. THE FUTURE OF ETIS

The pilot version of ETIS is a significant milestone. However, it is by definition still pretty far away from realizing the vision of ETIS. In order to fully exploit the benefits of this system and make progress towards the ETIS vision, an organizational and institutional framework for operating, updating, and expanding the ETIS pilot is required.

With respect to this questions arose, such as: where should ETIS reside? Should ETIS be hosted within or outside the EU’s institutions (e.g. EUROSTAT, Agency)? What is the level of service that should be offered? Should training for
users be provided? How should the capabilities of the current ETIS be enhanced?

Consequently, another objective of the ETIS projects was to assess different alternatives, and issues related to an institutional framework. These issues are touched on in the following.

*Centralized versus network of ETIS-like national system*

An important issue to consider is who will have access to ETIS, i.e. only EC staff, or non-EC staff as well. The EC has expressed its willingness to provide Member States with the ETIS reference database and the ETIS software. Thus, Member States, if they wish to do so, will also have the possibility to develop a national ETIS by bringing in their national data into a national system. From a European and technical perspective this is not ideal. However, if Member States do use the software to access their own data, they are de-facto adopting the ETIS standards. Thus, when Member States agree on a EU-wide ETIS, it would be a simple matter to bring together the national ETISs. The approach fostering ‘soft harmonization’ of national data, assuming that data not delivered to EUTOSTAT will also be formatted consistent with the ETIS standards, would result in savings of time and money when exchanging or comparing data across national borders. Furthermore, this approach reinforces the dissemination of the reference data to Member States.

*Content updating and expansion*

The system is only as good as its content. The content needs to be regularly updated and perhaps expanded to provide policy-makers with the necessary information. The updating and expansion of content can refer to the content for current Member States, the accession countries or countries making up the wider Europe, e.g. Ukraine, Algeria or Morocco.

Updating and expansion of the data in ETIS may be needed to reflect changes in policy priorities and/or improved estimation methods for calculating indicators. Of course, the use of up-to-date data contributes to improving the analysis. However, given the significant amount of resources required for collecting, validating, harmonizing, and aggregating data, the decision on the frequency of updating the data should be based on some sort of cost-benefit evaluation.

For the bulk of the content of the reference database, the updating should be synchronized with the UNECE road census that takes place every 5 years. The socio-economic, the cost as well as service data plus the indicator list should be updated annually. For the moment, data provision to ETIS is voluntary. However, over time a legal basis could be created for providing data to ETIS.
Service levels

It needs to be considered how certain activities are performed, and how some services are provided. The activities and tasks can be grouped into the following categories:

- System governance (Who has access to the system? Under what terms and conditions? Which new data elements are included, etc.)
- Operation of the system
- Service desk (Helpdesk/Training)
- Updating of the reference database to include the latest data
- Expansion:
  - Expanding the reference database
  - Inclusion of other data sources in the data warehouse

The intervening period

Several Member States have actively considered using ETIS for their own purposes. As mentioned above this represents an opportunity to accelerate the harmonization of data collection and validation procedures (for data that is needed but not collected by EUROSTAT). One of the factors influencing Member States that wanted to adopt the system was whether ETIS would continue once the pilot had been completed. For this reason alone the ETIS projects stressed the importance of continuing with ETIS.

In the period between the completion of the ETIS pilot and the decision whether and how to go forward with ETIS, it would have been advisable to continue some ETIS activities to maintain the interest of the Member States in using ETIS.

The minimum activities to ‘maintain’ ETIS could have been to:

- Establish an ETIS governance group, consisting of representative from all 25 Member States, EUROSTAT, and DG-TREN
- Establish an ETIS users group that meets twice a year to discuss various issues related to the contents of ETIS
- Establish a helpdesk for assisting users in installing, using, and understanding the ETIS software as well as the content of the database

Given the progress the ETIS projects have made in the three years with respect to the development of a pilot version of ETIS, it would be a pity if this effort were not to be continued. Although much progress has been made, still a lot remains to be done to improve the quality and access to European transport data and statistics.
BIBLIOGRAPHY