

EXECUTIVE SUMMARY

Background

The European Commission is engaged on a bold and long-term mission to improve the **Trans-European Transport Network (TEN-T)** so that it operates in an efficient and seamless manner, irrespective of location. In July 1996 the European Parliament and Council adopted **Decision N° 1692/96/EC** on Community guidelines for the development of the trans-European transport network. These guidelines comprise roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems which serve the entire continent, carry the bulk of the long distance traffic and bring the geographical and economic regions of the Union closer together. The European Parliament and the Council adopted **Decision N° 1346/2001/EC** in May 2001 as an amendment to the TEN-T guidelines regarding seaports, inland ports and intermodal terminals. It also specifies in detail the criteria of projects of common interest in relation to these infrastructures.

Enlargement of the European Union brings to light the need for accessibility and development of priority infrastructure for Candidate Countries. The intention of the Commission is to revise the TEN-T Guidelines more fundamentally in 2004, to take account of Enlargement and expected changes in traffic flows. New outline plans for the period 2020-2025 will be drawn up to concentrate on a primary network made up of the most important infrastructure for international traffic and cohesion on the European continent.

Critical to the co-ordinating and promoting role of the TEN-T guidelines is knowledge of the performance of the TEN-T network. At the trans-European level this translates into examination of all the effects of investing in and using the network in relation to policy objectives, in order to monitor the guidelines related to the TEN-T. Such information must reflect policy objectives in terms of **regional development** and **accessibility**, as well as other factors such as **mobility, modal balance, environment, safety, interoperability** and **intermodality**. Member States maintain national statistical databases to monitor the implementation of transport infrastructure and monitor the progress of their national Transport Masterplans. Levels of network detail and scope vary with the transport context and policy priorities of each country.

The Need for Performance Indicators

The central issue is to develop a consistent performance-based framework that will provide a cost effective (and acceptable) basis upon which to measure policy measure effectiveness at a trans-European network level. What is needed at a European level is a **concise set of indicators**, (in measurable standard terms), that can be used at a “network element” scale. This set of indicators should evaluate and monitor the performance of the TEN-T network and provide adequate support for **informed decision-making** towards achieving specific goals and targets for the various transport modes and sectors.

On that basis and within the framework of the European Union TEN-T activity, the European Commission’s Directorate-General for Energy and Transport (DG TREN) initiated the **“INDICATORS”** project. This project has been managed and co-ordinated by TRL (UK), as lead partner of a European consortium from four EU countries. The Consortium comprises TRL as project co-ordinator, DHV Environment and Infrastructure (NL), Dorsch Consult (D), and ISIS (F). In addition, various local partners within the European Union and outside its borders (Accession Countries) have been utilised building upon a network of local presence and existing relationships to ensure easy access to stakeholders all over Europe.

Project Objectives

The project brief was to develop a set of indicators covering all modes (road, rail, inland waterways, airports and seaports) within the **Trans-European Network** in the EU, Switzerland and Norway, and the **TINA**¹ network in the Candidate Countries. These indicators will form a monitoring framework for the implementation of the TEN-T guidelines for the European Commission related to the establishment of such a framework.

The objectives of the INDICATORS project were to study the technical, institutional, legal, and contractual aspects related to the establishment of a consistent monitoring mechanism to evaluate trans-European infrastructure and demand.

Scope of Indicators

In keeping with the role of the EU and the Community guidelines and priorities for development of the Trans-European Network, the performance indicators in the INDICATORS project serve in the following specific domains for strategic infrastructure planning and evaluation:

- **Network monitoring** (monitoring the implementation of the guidelines, including development of the TEN-T network, safety, mobility, and environmental impacts)
- **Network planning** (revision of the trans-European guidelines to reflect priorities and needs)

The performance indicators surveyed cover the following application contexts:

- **Sector:** Passenger, Freight
- **Mode:** Road (car, bus, truck), Rail, Airports, Inland waterways, Seaports; Intermodal
- **Area:** National transport network and links forming part of the Trans-European transport network including networks for Candidate Countries for Accession.

Performance indicators identified are quantifiable at the spatial transport network level of **corridors**, **main sections** (links), and **nodes** (terminals) on the TEN-T network. Global and regional data are only used in the context of weighing or adjusting the indicators to clearly reflect the variety of transport environments.

Project Approach

The specifications called for development of a consistent performance-monitoring framework taking into account technical, institutional, legal and contractual aspects to evaluate trans-European transport. The indicators proposed by the project refer to the implementation of the Decision 1692/96/EC (TEN-T guidelines) and the amendments and proposed revisions. As seen in Figure I, the approach for INDICATORS incorporates the following 5 tasks:

- Task 1: Development of indicators to measure the performance of individual projects, corridors, infrastructure programmes or the network.
- Task 2: Detailed classification, assessment and selection of indicators:
- Task 3: Assessment of the indicators' usefulness by means of 'real life' case studies.
- Task 4: Study of the operational and organisational aspects of the functioning and administration of the monitoring system,
- Task 5: Refinement of the list of indicators and to set out final recommendations in view of the establishment of the monitoring system.

¹ TINA: Transport Infrastructure Needs Assessment

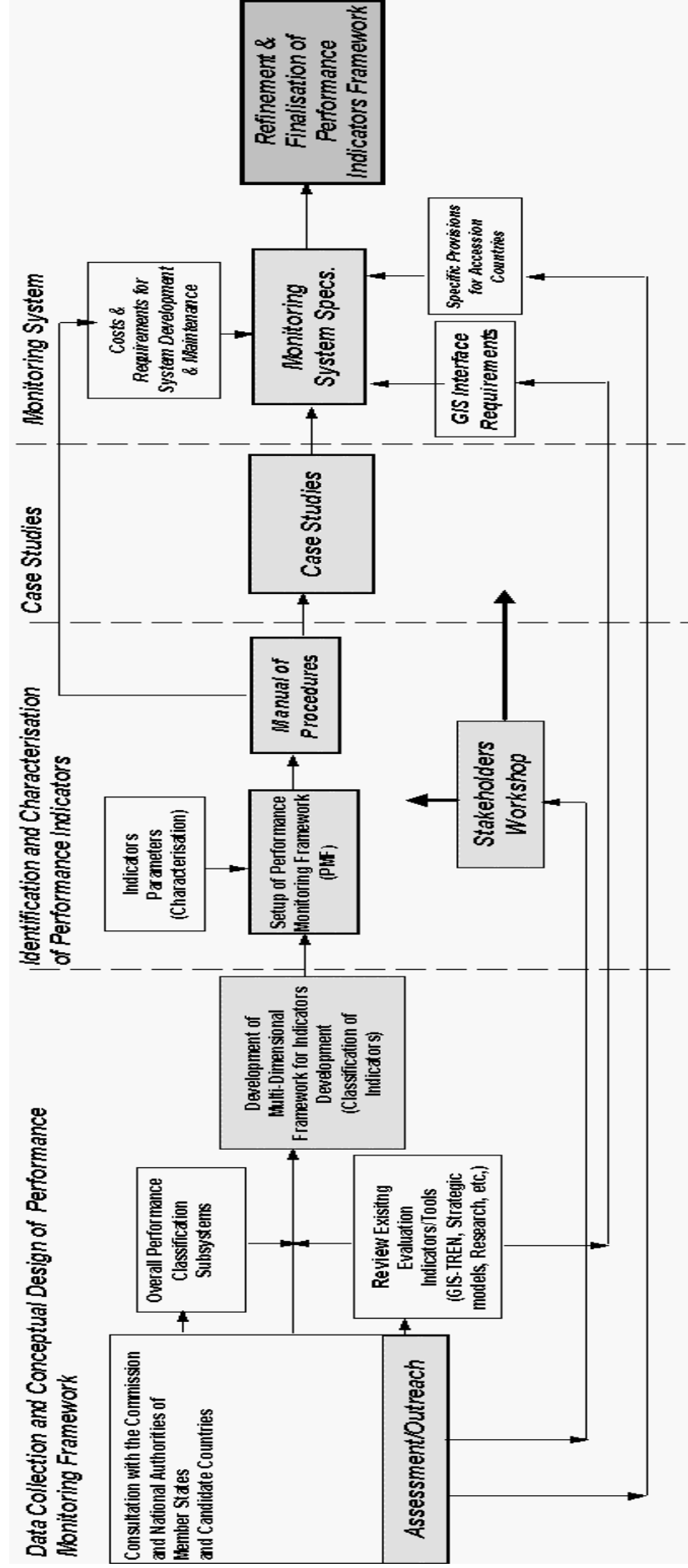


Figure 1: The INDICATORS Workplan

Performance indicators need to reflect European policy objectives in measurable terms to provide relevant criteria to monitor and measure the performance of the TEN-T. The development of goals and objectives is one of the most time-consuming of processes. Added to that, the process of defining ‘trans-European’ goals that directly relate to European priorities including those of Member States, then the process becomes extremely difficult and time-consuming, requiring a broad consensus.

Although, most national and European authorities have already developed goals for their planning activities through national Guidelines and Master Plans, performance indicators require transport authorities to sometimes take a closer look and refine (or clarify) their goals into a more quantitative and methodical process. This would make them more operational in terms of monitoring, planning, and funding as well as providing a relevant context for developing performance indicators.

The task of the INDICATORS Study has been to work in the linking of goals and objectives to the process of developing relevant performance indicators. The definitions of ‘**goals**’ and ‘**objectives**’, as well as the terminology used to describe them (such as ‘policies’, ‘priorities’, ‘strategies’ and ‘recommendations’) vary widely across Europe and usually not clearly defined in measurable terms.

Recognising the differences in transport policy objectives and priorities between Member States due to different environmental, population, and socio-economic contexts, no particular priority is given to certain goals or corresponding objectives. Objectives proposed have been classified into eight categories according to the following trans-European policy **themes**:

- Mobility,
- Accessibility,
- Optimal use of capacities,
- Safety,
- Intermodality and interoperability,
- Economic viability ,
- Environment,
- Modal balance.

Based upon the material collected from the European Commission and Member State authorities, the INDICATORS team undertook a pragmatic approach to develop and continuously refine a typology of goals and objectives, establishing relationships between the goals, objectives, and measurements of transportation system performance (see Figure II).

The purpose of the typology is to clarify how the selection of appropriate performance measures is a function of the particular goals and objectives, and furthermore, how the data needs are in turn driven by the goals, objectives, and measures. The linkages between these elements of the process, and the feedback loops integrated into the process, are the defining features of a performance-based planning process. The objectives should not be seen as final, but as **illustration** of how performance-based planning can translate general European policy goals into specific indicator measures to monitor and plan the Trans-European Network.

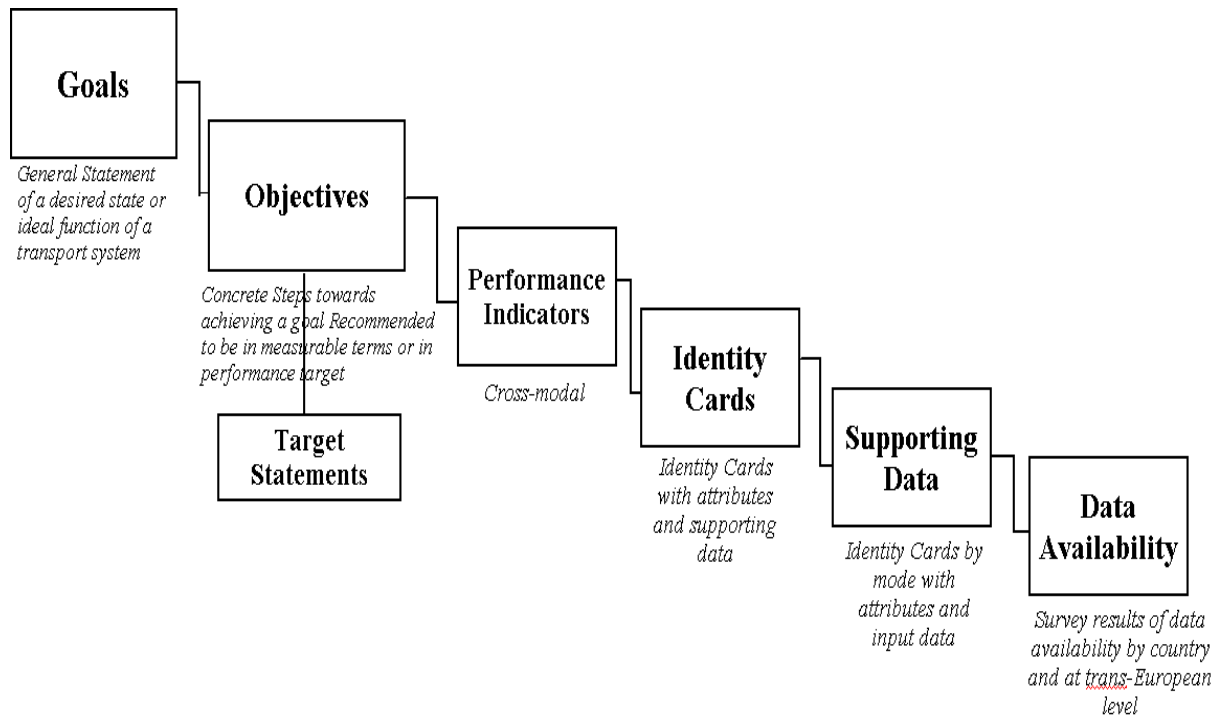


Figure II: Typology of Goals-Objectives-Performance Indicators

The two main principles at stake are **usefulness of the indicators** for TEN-T monitoring (primarily to the EC, but also to other bodies at a European and national level in relation with transport policies) and the **speed and ease of which they can be implemented** (by national or regional authorities).

Thus it was essential to derive indicators using a combination of a **top-down process** (what are the policy goals at European level, what needs to be measured?) and a **bottom-up process** (what data is already collected in each country, how homogenous is this data, can new indicators be implemented speedily and cost-effectively?)

For these reasons, the long “wish list” needed to be reduced to a set of indicators which:

- are relevant to TEN-T goals and focused on objectives;
- are robust and well defined;
- have data readily available at national level;
- are useable and implementable in a short time-scale;
- are cost-effective;
- are comparable (between countries and, where possible, between transport modes);
- can be used to measure progress towards defined targets or measure quality against defined benchmarks; and,
- can be integrated into regular procedures

Consultation, Case Studies and GIS² Review

The bottom-up approach has demonstrated pragmatism by including research into existing data sources and availability at European level. To this end, a **review of studies** pertaining to performance indicators and strategic transport policies and priorities at the European, national, and international levels was made. **Consultation** was undertaken with DG TREN and other organisations, including Eursotat, UN/ECE, UIC, and WERD, to define the priorities and plans for the TEN-T guidelines revision and to assess their opinion regarding factors and indicators used for project appraisal and selection. In particular, Eurostat, being the statistical arm of the Commission, provided valuable input regarding their data collection practices in response to various Directives and voluntary exercises and their plans for development, in view of the inputs from the Member States.

A **national questionnaire** of all EU Member States, together with EFTA countries and Candidate Countries for Accession was conducted. This questionnaire allowed the project team to determine:

- what data is currently collected and what time and space scales;
- what indicators are currently or potentially used;
- how relevant the national administrations consider various indicators to be trans-European relevant.

A key link between the national governments and the EC is the **TEN-T Committee**, an EU body composed of a representative from each Member State, with the mission to monitor, refine and validate EU transport policy, priorities and implementation on the Trans-European Transport Networks (all modes). Concerning the INDICATORS project, the TEN-T Committee members provided a first point of official contact with the EU Member States for the co-ordination of questionnaire responses.

The INDICATORS project also included analysis and application of the proposed framework in two **case studies**, in order to demonstrate and validate the use of the indicators, using real data. The aims of these case studies were firstly to test the availability and robustness of data required for the indicators and secondly to test the use of the indicators themselves, providing feedback on their applicability and utility. The first was a **TEN-T European case study**, concentrating on using the set of performance indicators to identify bottlenecks and other level of service issues on the Trans-European road and rail networks. This study made use only of data available in the European Commission TREN-GIS database. The second study covered the **Pyrenees crossings** using data gathered locally from Spanish and French transport authorities. This study was also limited to the road and rail modes (as per the project contract).

As necessary tools for computerised monitoring and performance analysis of the TEN-T network, the INDICATORS team conducted a technical audit of the available database tools and models available in DG TREN including the GIS database tool currently in use in DG TREN and provided recommendations on how to upgrade and develop the tools for efficient network performance assessment and monitoring, in line with the framework proposed.

The European Commission (DG TREN) held an INDICATORS workshop on 15 November 2001 with the purpose of presenting the draft list of indicators and discussing these, together with other TEN-T performance monitoring issues. This was an important part of the INDICATORS validation process and considerable feedback was received. The key stakeholders taking part in the workshop were the national authorities (transport departments of the EU Member States, EFTA and Accession Countries), the European Commission (DG TREN) and invited European institutions and organisations. Feedback from the Workshop and from follow up discussions with stakeholders pointed to the importance of demonstrating

² GIS: Geographical Information System

a clear linkage between objectives and indicators. The uses and application scope of the various indicators were clarified. Recommendations for the gradual adoption and development of the reporting framework take into consideration the various constraints available and the evolving needs. Specific provisions for Accession Countries were also recognised.

Key Results

The current **Infrastructure Reporting mechanism** to report on the status of the TEN-T network forms the starting point for development of a full-scale **monitoring mechanism**. Basic infrastructure data, currently collected, through biannual surveys of Member States can be expanded to include data required for the estimation of Performance indicators required for a better picture and assessment of the TEN-T and the degree of achievement of trans-European objectives and priorities. The use of performance indicators would provide needed depth to assess investment priorities and gaps in the network. In the particular case of the interim TEN-T guidelines currently being reviewed and the new TEN-T guidelines expected to come out in 2004, the need is greater for a consistent reporting and monitoring mechanism for the TEN-T.

The project confirmed that **collecting and maintaining data** to support performance-based planning programs in Europe is a critical obstacle. The vast majority of national transport authorities surveyed indicated that their data collection resources are limited. In the area of freight movements, these constraints are even more apparent. Freight shipments are more varied in content, and vary more over time, than passenger movements, so accurate data collection is a complex, costly process. Co-operation from the private sector or operators in various modes is sometimes limited due in part to concerns about competitiveness and security reasons.

Key issues facing Candidate Countries for Accession include the environment, financing of the transport sector, recent organisational restructuring of the transport sectors (especially the railways) and the rapidly decreasing share of environmentally friendly modes of transport. The restructuring of the transport sectors in most Candidate Countries for Accession seems to lag behind the development of the transport sector in EU countries. Thus, these countries have an even greater need for a more precise definition of transport networks and performance targets at the short- and long-term scales so that scarce funding should be used as efficiently as possible.

In the short-term, infrastructure investments to extend and improve the quality of the networks in the Accession Countries are a key priority. Total investment needed to maintain and develop the transport system infrastructure to EU standards is at least €90 billion. More than half of the amount foreseen for road networks, and around €30 billion for the rail network. In the longer term, the Commission has estimated that €258 billion would be needed to enhance transport networks to acceptable standards.

On the basis of the approach used in INDICATORS, the following table outlines a **summary of the performance indicators** categorised according the European policy goals and objectives and applicability based upon data availability at the national and trans-European levels.

Table I: Summary of Key Indicators

	Objective	Performance Indicator	Description	Applicability*
Mobility	1. Improve Level of Service on TEN Infrastructure	- Weighted Level of Service Index	Level of service for TEN links and nodes comprising a composite indices of volumes, capacities, speeds, travel time, delays, and service frequency.	Long-term requiring harmonisation and accepted set of threshold standards
	2. Eliminate bottlenecks Optimise capacity on existing infrastructure	- Actual Demand/Capacity (%) for each mode - Days per year where capacity limits are exceeded	Capacity utilisation for each mode Proportion of time TEN link or node has a traffic demand close to design capacity	Short-term
	3. Optimise modal split along international corridors for road and rail	- Actual Demand/Capacity (%) for road and rail on corridors - % of passenger and freight traffic by road and rail per major corridor	Comparison of capacity utilisation across modes for each corridor Freight and passenger modal split for each corridor	Short-term (but % of traffic per major corridor may be long term, as additional data collection is needed)
	4. Ensure infrastructure investment according to trans-European guidelines	- €/section and km completed on the TEN-T links	Level of investment on the TEN-T network	Short-term
	5. Reduce cross-border delays for rail transport	- Average minutes/equivalent transport unit (split by passenger and freight rail traffic)	Traffic demand and waiting time for rail at border stations / freight yards.	Short-term

* Short-term before 2004 as part of implementation monitoring with existing TEN-T guidelines and after standardisation. Long-term after revision of TEN-T guidelines in 2004 requiring additional data collection and harmonisation efforts.

	Objective	Performance Indicator	Description	Applicability*
Optimal Use of Capacities	6. Encourage use of TEN-T as major corridors for long-distance international traffic	- Long distance international traffic units/Total traffic units on network	Proportion of traffic making journeys over a threshold distance (e.g. 200 km) on the TEN-T	Long-term, requires detailed surveys
	7. Seaports shall promote short sea and international shipping	- Equivalent transport unit (etu) by shipping type - Number of operating days per year due to climate, strikes, etc., - Demand/capacity measures for road and rail links to seaport	Utilisation of seaports Availability of seaports Quality of surface connections to seaports For seaports of Category A and B only (as defined in the TEN-T Guidelines)	Short-term
	8. Enhance the use of ITS on the TEN-T	- €/km by key ITS service - % of network covered by ITS services	Annual ITS Investment on TEN links Availability and coverage of key ITS services on TEN-T	Short-term
	9. Reduce the number of accidents	- Accidents/traffic units (billion vehicle-km) on TEN per year	Accident rate of agreed category on TEN- reduction target	Short-term for roads, long-term for other modes
Safety	10. Reduce the number of accident black spots on the overall network	- Number of black spots per 1000 km of TERN ³	Number of locations (either single points or stretches of network up to 1 km) on TERN where target number of repeated accidents occur	Long-term

3 TERN: Trans-European Road Network

	Objective	Performance Indicator	Description	Applicability*
Intermodality / Interoperability	11. Encourage unitisation and containerisation of freight	- % of container traffic/total freight	Proportion of freight that is unitised (containers, swap-bodies, piggyback) on TEN	Short-term
	12. Reduce door-to-door transit times for freight	- Mean commercial speed for containerised/unitised goods (km/h) per corridor or major O-D pair	Overall freight transit times between origin and destination terminals divided by distance on TEN	Long-term
	13. Improve accessibility to the intermodal transport system	- Number of interchanges/km or number per capita for rail - Tonne-km at interchange	Increase in number/utilisation of inter-modal interchanges per km	Short-term
	14. Increase terminal utilisation	- % increase in throughput over the previous year	Throughput in transport units transferred (a unit being a vehicle or a container)	Short-term
	15. Promote passenger multimodality	- % of multimodal travel on the TEN-T	Proportion of multimodal ticketing for inter-city/international travel Traffic demand at multimodal interchanges	Long-term
	16. Increase in interoperable rail infrastructure on the TEN.	- % of train km with compatible power supply, signalling, track gauge, loading gauge (clearance), axle weight limit.	Percentage of TEN rail network with interoperable infrastructure standards, interoperability	Short-term

	Objective	Performance Indicator	Description	Applicability*
Accessibility	17- Increase quality of surface connection of major airports	<ul style="list-style-type: none"> - Demand/Capacity measures for road and rail links to airports - Average travel time from airport to city centre by rail, bus & car - Public transport frequency from airport 	Quality of road/rail connections to airports	Short-term
	18. Minimise constraints in trip making and increase service availability to population	<ul style="list-style-type: none"> - Accessibility Index - Km/population or area 	Network size per population, composite accessibility index of population	Long-term, requires periodical studies to estimate accessibility indices
	19. Improve connectivity to island areas	<ul style="list-style-type: none"> - Demand/capacity measure of air and maritime links to island areas 	Quality of air and maritime connections to island areas Quality of land connections to ports (road and rail access, speed & reliability of interchange) Overall travel times/speeds/ frequencies from major cities to islands by land/sea and by air	Short-term

	Objective	Performance Indicator	Description	Applicability*
Economic Viability	20. Accommodate increases in demand (through capacity enhancement and modal shift along corridors)	- Forecast volume/capacity by mode along corridor	Traffic demand forecasts by mode along corridors, modal capacity along corridors, investment	Short-term, requires forecasting studies
	21. Ensuring fair and efficient infrastructure user charges	- % of cost recovery	Level of recovery of social marginal costs through user charges per mode, for freight/passenger traffic	Short-term
Environment	22. Decrease atmospheric pollution around TEN links (Better achieved by modal balance and reducing bottlenecks)	- Kg. of emissions per vehicle-km by major link	Amount of emissions at major links	Short-term
	23. Reduce energy consumption and CO ₂ emissions at network-level	- Million tonnes of oil equivalent (Mtoe) per equivalent transport unit (etu) by mode - Tonnes of annual CO ₂ emissions	Energy consumption, per etu by mode at network Level of CO ₂ emissions	Short-term
	24. Mitigate noise effects in TEN corridors	- x population exposed to a specified noise level (L _{dn} dB)	Non-user noise exposure to above 50, 60, and 65 dBA around major transport infrastructures	Long-term
	25. Minimise effects of transport in environmentally sensitive areas	- Km. passing through natural protected areas	Extent of TEN crossing natural protected areas under Directive 92/49/EC	Short-term

	Objective	Performance Indicator	Description	Applicability*
Modal Balance	26. Increase market shares of non-road modes to a competitive level shifts in selected Corridors/Areas	<ul style="list-style-type: none"> - Market share of non-roads per corridor 	Traffic demand by mode, capacity, terminal utilisation, investment per corridor	Short-term
	27. Revitalise passenger demand for railways, rail access to airports, and modal split with air travel	<ul style="list-style-type: none"> - Annual passengers-km/passenger seat-km - Change in passenger demand over previous years - Travel distance and travel time on corridors for rail and air 	Passenger load factors, demand Travel time/distance on corridors	Short-term
	28. Encourage long distance freight market share for railways and waterways	<ul style="list-style-type: none"> - Annual tonne-km by rail or waterways/total freight demand for distance > X Km - Volume/line capacity - Number of operating days on waterways 	Km of TEN where modal split less than target % for distance > X km freight Inland waterway availability	Short-term

For more details and in-depth review of each indicator in terms of units, relevance, supporting data, and spatial resolution (link, corridor, terminal, and network), the reader should refer to **Annexes 1 and 2**.

The objectives outlined are meant to provide guidance on typical specific objectives relevant to the TEN-T policy goal statements outlined in the previous section. These objectives are by no means official and reflect only the views of the INDICATORS project team. In the long-term, these objectives should be based upon a consensus process by all Member States with the European Commission to specify a common set of specific measurable objectives that can be used in a 'European Transport Master Plan'.

Indicators are classified as being applicable in the **short-term** prior to in the context of the 1998-2001 TEN-T implementation report and **long-term** following major revision of the TEN-T guidelines in 2004.

Indicators are seen as being **infrastructure-related** concerning network suppliers, and **service-related** where the performance of the network is affected by the quality of services and operations. In many cases, deficiencies cannot be corrected by infrastructure investment policies such as the TEN-T guidelines, but also by regulatory measures and efficient operation of the network.

Case Studies

The INDICATORS study included two case studies in order to demonstrate the use of the indicators proposed using real data. The aims of these case studies were firstly to test the availability and robustness of data required for the indicators and secondly to test the use of the indicators themselves, providing feedback on their applicability and utility.

The first was a case study covering the whole TEN-T. The aim was to use the Commission's TREN database to identify potential available data to be used to calculate indicators for the trans-European road and rail networks. It came out that the actual data available was rather limited and that only a very small number of indicators could be computed:

- Utilisation of road supply (capacity bottlenecks, using demand and capacity indicators)
- Utilisation of rail supply (capacity bottlenecks, using demand and capacity indicators)
- Interoperability

Figure III shows an illustration of the traffic volume of heavy duty vehicles on the road network, as available from the TREN database. Figure IV shows an illustration of the traffic volume on the rail network, as available from the TREN database. Figure V shows the signalling types on the rail network as available from the TREN database.

Figure III: Example Map showing Traffic Volumes (Heavy Duty Vehicles) on the TEN-T
 (from the DG TREN GISCO Database, as at 2002)

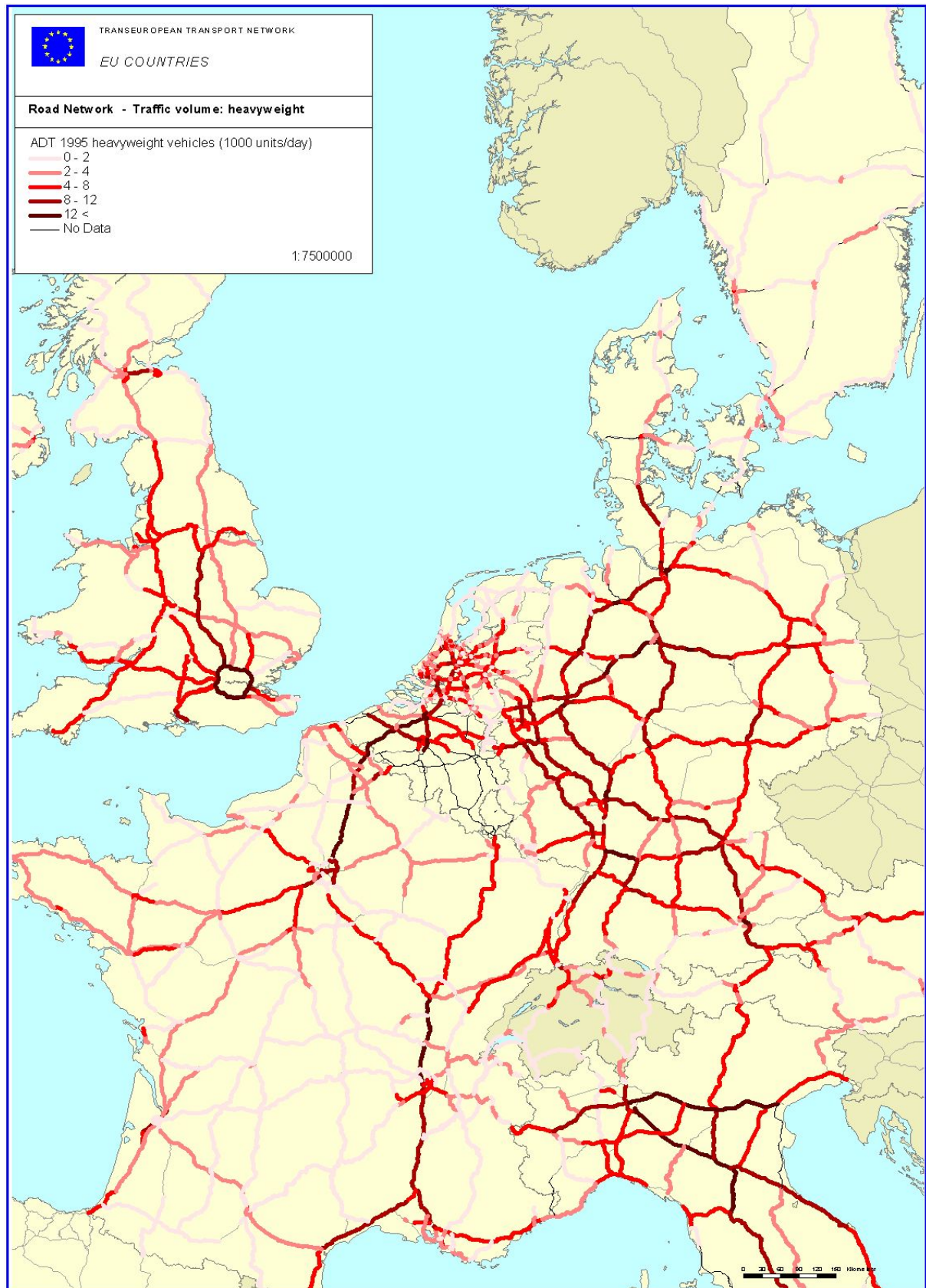
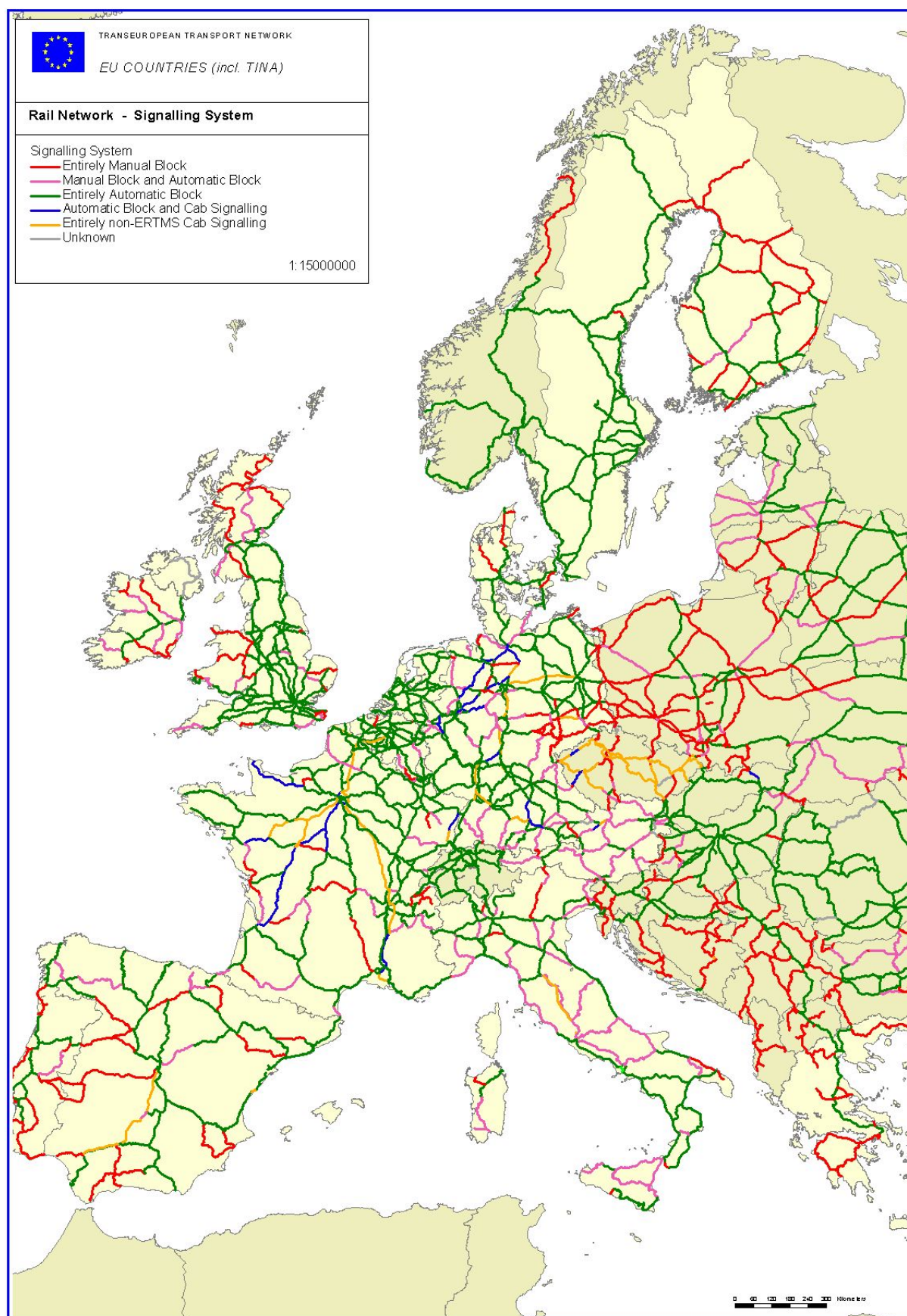


Figure IV: Example Map showing Traffic Volumes on the Trans-European Rail Network
(from the DG TREN GISCO Database, as at 2002)



Figure V: Example Map showing Signalling Types on the Trans-European Rail Network
(from the DG TREN GISCO Database, as at 2002)



Other possible service level indicators from the initial list of Performance Indicators proposed by the INDICATORS study were not suitable or could not be calculated due to absence of information on the database. In many cases there is no EU standard to pinpoint threshold values. It is therefore difficult to conclude on whether a certain indicator value constitutes a service level deficiency or not.

The second study covered the **Pyrenees crossing** using data gathered locally from Spanish and French authorities. This study was also limited to the road and rail modes contract TEN-T in an area bounded by Bordeaux, Toulouse, Béziers, Narbonne, Perpignan, Barcelona, Zaragoza, Donostia/San Sebastián and Bayonne.

The Trans-Pyrenean Traffic Observatory, which covers all modes, is a valuable source of information, however this information is generally secondary information and the work of the observatory is based on what is available. Nevertheless, major road traffic surveys on cross-border routes take place every few years.

For most of the statistics, data is available at a national level, although in Spain the situation is more complicated due to the extensive competencies of the Catalan, Basque and Navarran governments. Data on a provincial/departamental level is difficult to obtain also, particularly where it comes from an operator such as a railway or motorway, where their own subdivisions or business units do not always correspond to administrative boundaries. As this study focused on a selection of regions rather than whole countries, data was less consistent between different modes and indicator classes.

However, no organisation produces statistics that specifically relate to the TEN-T (e.g. accident statistics split by TEN-T and other roads). This is because the TEN-T is generally not used as a category by national and regional administrations (using instead their own national classifications). In some cases, data for TEN-T corridors could be identified, and in several others it could be calculated with some effort (e.g. in the case of accident statistics).

Key lessons learned from the case studies are that for the short-term estimation of indicators, the availability of data (particularly on a link or corridor level or on a regional/local authority level), and the consistency of data between different countries (and even between different regions or transport operators within the same country) are of crucial importance. This somewhat limits the number of indicators that can be used at a European level and justifies the use of a simple pragmatic approach in the short term.

In addition, a lesson from the case studies has been that the Performance Indicators needed to be more precisely detailed in terms of what data is measured, on what scale, using what units and what definitions. In the medium term, in order to obtain harmonised data, the EC needs to be more prescriptive and set down minimum data standards and benchmarks for Performance Indicators.

The main conclusion from the case study on the TEN-T is that the data currently available in the DG TREN database is far from being complete, correct and uniform, and that therefore only very simple indicators can be used in the near future. Currently the database can only reasonably be used for the location of TEN links and nodes identified by the guidelines, which was its main aim when developed five years ago.

Audit of the DG TREN GIS Database

In addition to the lack of reliability, completeness, correctness and uniformity of topology and attribute of the data, the technical audit of the database itself revealed other limitations. It revealed the database to be not sophisticated enough to facilitate the capture, storage, manipulation, maintenance, analysis and presentation of all kinds of spatially-referenced performance indicator information in the most efficient way. It mainly concerns a set of ArcView databases that can provide snapshots of simplified measures as traffic volumes or bottlenecks on the TEN road network. For a cross-modal/cross-sectoral application of

performance indicators requiring complex spatial queries and efficient data retrieval and database management, development and upgrades to the TREN-GIS database are needed incorporating relational databases.

Recommendations

Development of performance indicators is not a single ‘snapshot’ exercise. The Commission should adopt plans for the **continuous** update, refinement, and development of performance indicators. Regular updates of the indicators coupled with the development of more intricate and sophisticated levels of performance indicators, as data availability (particularly among Candidate Countries) improves, should be a priority. As the European policies and guidelines evolve and with the proposal of a major revision of the guidelines by 2004, the emphasis would be more in adopting intricate performance indicators to provide support. The importance of continuing close co-operation between European entities and organisations (in particular DG TREN and Eurostat), and Member States and Candidate Countries for Accession should be emphasised.

On the basis of the findings, the following steps are envisioned as a follow-up or a road map to apply and implement a consistent and harmonised trans-European monitoring framework.

- **Data Collection and Standardisation**

Minimum quality levels should be defined for the actual collection of the data in order to make data reliable and comparable. Definition of the quality of data-collection for the various indicators falls outside the scope of this project but needs serious attention. In cases where national authorities differ in the interpretation and estimation of performance indicators, despite the existence of available data, efforts should be made by international organisations and/or Eurostat to achieve a degree of standardisation in the development and estimation of indicators. Good examples of such indicators include road capacity values, traffic volume thresholds, infrastructure categorisations and so on.

Performance indicators identified by the project, but not adopted due to data unavailability or lack of harmonised definitions, should be accelerated and pushed forward for adoption and data collection by the Member States. It is also necessary to regularly review the performance indicators to add on to evolving priorities and monitoring schemes.

- **Pilot survey of TEN-T applying the performance indicators and supporting data**

National authorities in Member States and Candidate Countries for Accession should carefully review the identified lists of indicators and provide a critical assessment on the time period for adoption and use of each indicator in question. A pilot survey on Member States and Accession Countries to collect the data on the TEN-T and TINA networks is necessary for the estimation and validation of the recommended performance indicators. Short-term indicators with high data availability can be the basis for the pilot surveys.

A proposal might be that the survey could focus, at least in the initial stage, on a selected group of high-priority international corridors, according to certain criteria.

Interested delegates of the TEN-T Committee could start to work immediately to carry out such pilot surveys. The results can be included in the next implementation report under Article 18 of the Guidelines. At the light of the results, provisions for regular comprehensive surveys could be integrated in the next revision of the TEN-T Guidelines.

In all stages, Eurostat would play a vital role in organising the work in conjunction with DG TREN.

- **Specification of concrete target statements for trans-European transport policy**

The lack of specific target statements related to the current TEN-T Guidelines can be a source of vagueness and non-specificity of performance measures to measure the degree of relevance of investments and projects to the trans-European policies. The development of specific target statements and objectives entails extensive consensus-reaching activities of the Commission with the Member States. This is necessary in order to reach a set of evolving target statements that can be used to provide clarity and substance to the general objectives, and to facilitate a consistent approach to meeting them. For the short-term, several interim target statements can be proposed by the TEN-T Committee to test the applicability of the proposed framework.

- **Refinement and development of the performance indicators framework**

On the basis of the above work, the framework developed in the INDICATORS study can be fine-tuned and updated to reflect the current status of priorities (through target statements) and data availability (through the pilot survey) for adoption as TEN-T reporting framework within the short-term (2-3 years).

International and European organisations such as Eurostat, OECD, UN/ECE, PIARC, ECMT and UIC should be closely involved in the harmonisation work, in co-ordination with current data collection activities which take place under their auspices.

The current DG TREN database should be expanded, or one new separate database should be implemented in relation to the performance indicators framework developed. The new database system should be an external multi-user relational database management system in order to support complex spatial queries and efficient data retrieval and database management, as defined in the INDICATORS project. Users should have easy access to the required data by custom designed database access features within the GIS system.

On the basis of the interim target statements proposed, benchmarks to measure and compare the degree of attainment of the various sections of the TEN-T to the relevant objectives can be developed. International standards and target measures used by international organisations and national authorities can be used as a basis for comparison.

- **Inclusion of the Performance Indicators Monitoring Mechanism within the future revision of the TEN-T Guidelines**

As part of the major revision of the TEN-T Guidelines planned by the Commission in 2004, the framework of using performance indicators to monitor the development and status of the TEN-T multi-modal network (including Accession Countries) should be part of the Article requiring Member States to report regularly on the status of their infrastructure. Specific provisions can be made for Accession Countries, for example an interim period, to allow for the development and set-up of data reporting resources.

