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TRANSPORT INFRASTRUCTURE NEEDS ASSESSMENT IN CENTRAL AND EASTERN EUROPE










Draft F I N A L REPORT

JUNE 1999

DRAFT TINA FINAL REPORT

TINA

a Common Transport Infrastructure Needs Assessment in the candidate countries for accession

Identification of the network components for a future Trans-European Transport Network in Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia

Drafted by the TINA Secretariat
on the basis of the work done by the TINA Groups

June 1999

Draft Final TINA Report

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IMPRESSUM

This Report has been written, compiled and edited by the TINA Secretariat, using data collected by various Ministries and other Authorities in the eleven acceding countries, with contributions from DGVII, and reflecting the opinion of the TINA Senior Officials Group and the three regional TINA subgroups.

The report is complemented by a data base using tools of a geographical information system.

This report is designated to the TINA Senior Officials with the intention to obtain the Group's endorsement of it as the Group's final report concerning the identification of the network components for a future Trans-European Transport Network in the candidate countries for accession namely those quoted in the title of the report.

1 INTRODUCTION

1.1 TRANSPORT INFRASTRUCTURE NEEDS ASSESSMENT (TINA) IN CENTRAL EUROPE

1.1.1 PREAMBLE

In April 1997, the European Commission proposed a structure for European transport networks serving the entire continent to the Third Pan-European Transport Conference at Helsinki 1997, in which the Trans-European Transport Network of the European Union, and its extension to the future new Members in Central Europe plays a prominent role. (Reference COM 97(172). This structure was eventually included into the declaration of the Helsinki Conference.

In Agenda 2000, the Commission identified the importance of transport for the Union's pre-accession strategy. It proposed therefore that substantial funds be allocated for transport infrastructure investments in the candidate countries in Central Europe.

Central Europe constitutes both a new component of the enlarged Union, and also the main connection between Western Europe and the New Independent States in Eastern Europe as well as the littoral countries of the Mediterranean. The elements of the European Transport Infrastructure Networks in this region are vital to competitiveness, economic growth and employment throughout Europe, and in the European Union in particular.

Central Europe is already one of the most dynamic regions in the world, and travel has become both a major component of lifestyle and a crucial element for economic growth. Between 6 and 9% of GDP is produced in the transport sector. This constitutes a market for services and investment worth EURO 500-700 billion annually, of which Central Europe's share would be of the order of EURO 25 billion.

The reinforcement of relations between all European countries generates continuous growth in traffic between the countries and regions of Europe and the Mediterranean basin, and in particular in Central Europe. It will be important that this development is consistent with the principle of sustainable mobility, bringing together the economic and social goals of efficiency, safety and minimisation of environmental damage. This will require the development of a multi-modal network for the whole of Europe, adapted to present and future traffic needs, which allows each mode to be used according to its comparative advantage. In this respect, the extension of the Trans-European Transport Network as a result of the enlargement of the European Union has a particular important role.

1.1.2 EXTENDING THE TRANS-EUROPEAN TRANSPORT NETWORK (TINA AND THE ENLARGED EU)

In July 1996, the European Parliament and Council adopted, on the basis of Article 129c of the Treaty, a Decision on guidelines for the development of the Trans-European Transport Network[1]. This contains outline plans for the land transport networks and criteria for network nodes as airports or seaports. The guidelines constitute a declaration of intent by the Community for the development of a single multi-modal transport network to meet the needs of the transport sector.

[1] Decision 1692/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network, OJ L228 9 September 1996

As it stands now, the Union's TEN-Tr comprises roughly 75.000 km of roads and railways respectively, 20.000 km of inland waterways and 300 airports, together with indications on sea and inland ports. The guidelines identify "projects of common interest", requiring investments of more than EURO 400 billion up to 2010.

The first Structured Dialogue between the Transport Council and the Transport Ministers of the associated countries, in September 1995, recommended inter alia undertaking a Transport Infrastructure Needs Assessment (TINA) for the candidate countries for accession. On the basis of this recommendation, the Commission launched the TINA process, with a view to defining the future Trans-European Transport Infrastructure Network in the enlarged European Union, using the criteria of decision 1692/96EC. The Commission has throughout ensured that this multilateral process remained consistent with the overall pre-accession strategy, notably the Accession Partnerships and the National programmes for the Adoption of the Acquis.

To advance and to monitor the TINA process, the Commission established a Group of Senior Officials (The TINA Senior Officials Group) with representation from all Member States and from the 11 candidate countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Cyprus).

At operational level, the TINA Group worked in three geographically oriented subgroups: the Baltic Sea, the Central European and the Southern Central European Area. Germany, Austria and Greece chaired these three subgroups.

The TINA Secretariat, which has been set up as a technical support unit in Vienna, supports the TINA process; this is a project under the PHARE Multi-Country Transport Programme. The tasks of the TINA Secretariat include:

- support for the Senior Officials' Group in identifying the network elements for a future TEN-Tr in the candidate countries (also called the TINA network);
- the elaboration of a methodology for common assessment of this network and the required projects to realise it;
- the development of a Geographical Information System (GIS) for the TINA Network

1.1.3 Financing infrastructure in Central Europe

The main financing sources for infrastructure in Central Europe are the national budgets and loans from International Financial Institutions and other banks. The European Union only adds a small share to the necessary financial packages. The main financial efforts have to come from the countries concerned. Until end of 1999 the only significant **grant** financing from EU sources in Central Europe was the **PHARE Programme**, which has, in recent years, contributed between EURO 200 and 300 million per annum in the thirteen PHARE countries. From the year 2000 onwards, the Commission has proposed, in Agenda 2000, a new approach based on the establishment of pre-accession structural fund for transport and the environment. This new instrument "Instrument for Structural Policies for Pre-Accession" (ISPA) will start its financing from 2000 onwards, taking over from PHARE to finance transport network components which will belong to the future TENs in the acceding countries. According to the financial perspectives of the agenda 2000 this instrument will provide EURO 1 billion per year, for spending exclusively on transport and environment projects.

After the accession of new countries in the Union, their financing will switch to the Union's structural funds, where specific allocations are envisaged for the new member states.

1.2 Method of Work - The Report

The Transport Infrastructure Needs Assessment (TINA) process has been designated to initiate the development of a multi-modal transport network within the territory of the candidate countries for accession: Estonia, Latvia, Lithuania, Czech Republic, Slovakia, Hungary, Poland, Slovenia, Romania, Bulgaria, and Cyprus. This network development should comply with the principles, objectives and criteria as set out in the guidelines for the development of a Trans-European Transport Network in the territory of the European Union (Decision No 1692/96/EC of the European Parliament and of the Council on Community guidelines for the development of the trans-European transport network).

The general TINA process can be divided in two main stages: The first stage concerns the definition of the network where cost estimates play a major role. The second stage concerns the identification of investment measures by which the identified network would be brought up to a desired quality level.

The first stage was developed with the intention to define the TINA multi-modal transport network, which could be realised in the time horizon of 2015, taking into consideration the expected economic development of the countries concerned. In this respect, all the necessary parameters that play a role while designing a network were identified and investigated. The political vision, the economic framework, the cost of the investment measures, the existing financing opportunities, the traffic forecast and the efficient operation of the network were amongst the factors which were investigated in the process of defining the TINA network.

The second stage concerned possible investment measures. The reported measures were analysed comparing costs estimates of the different countries with unit cost estimates provided by an independent consultant . This analysis led to a fairly solid base of the cost estimates for the network.

The present draft Final Report concludes this work, and sets the basic reference framework for future project assessment. This project assessment, to be done in the context of future TINA work and in ISPA will generate a dynamic list of projects in order of their priority for the development of the network. The TINA process will eventually lead to the identification of viable investment projects, which will, in the future extended TEN-Tr, be candidates for projects of common interest. In the context of pre-accession financing the ISPA team will, on the basis of the TINA findings, perform a more detailed project analysis of all projects which it will consider for financing.

The general steps of the process, as they are analysed in this draft Final Report, were:

(a) to set the main rules on which the hypothesis of constructing the network should be built
(b) to identify a multi-modal backbone network using global criteria, such as those which led to identify the Crete Corridors and their adjustments as endorsed at the third Pan-European Transport Conference of Helsinki
(c) to identify those additional network components (i.e. links (rail, road, inland waterways) and nodes (airports, ports, terminals)), which are necessary to transform the Helsinki's "Corridor approach" into a real transport network, with similar attributes to those described in the Decision No 1692/96/EC for the TENs
(d) to identify all possible investment measures which contribute to develop the TINA network as defined in the previous steps; to make an estimation for their cost

(e) to report on the network development in certain years (2000, 2005, 2010 and 2015)
(f) To develop a GIS for the TINA network linking geographical, economic and traffic information

In more detail:

1.2.1 THE MAIN ASSUMPTIONS

The definition of the TINA network was based on a certain number of assumptions:

- the network should be in line with the criteria laid down in the EU guidelines for the development of the TENs (Council decision 1692/96/EC);
- the technical standards of the future infrastructure should ensure consistency between the capacity of network components and their expected traffic. To achieve this, it was accepted that these standards should be in line with the recommendations of the UN/ECE Working Party on Transport Trends and Economic (WP.5) on the definition of transport infrastructure capacities (Trans/WP5/R.60);
- the time horizon for achievement of the network should be 2015;
- the cost of the network should be consistent with realistic forecasts of financial resources, so that average costs should not exceed 1.5% of each country's annual GDP over the period up to 2015.

*For more details about the economic framework concerning the TINA process, see **Chapter 2***

1.2.2 THE BACKBONE NETWORK

The backbone network was the starting point of the TINA process for a differential network design. This network was defined by the Commission as to be identical with the links and nodes of the ten multi-modal Pan-European transport corridors on the territory of the TINA countries, as endorsed at the Third Pan-European Transport Conference at Helsinki, June 1997. In Estonia and Latvia the backbone network also included one major East-West link from Corridor I towards Corridor IX in each country. The routing of the Crete/ Helsinki Corridors was provided by the TINA Secretariat, using relevant information from the Steering Committees or other Working Parties of the Crete/ Helsinki Corridors, consulting TEM and TER, etc. The alignment of the backbone network was endorsed by the TINA Senior Officials Group in their June 1998 meeting in Vienna. For certain corridors the respective Steering Committees might still adopt adjustments which should be assessed by the Group upon their appropriateness for the TINA network.

1.2.3 ADDITIONAL NETWORK COMPONENTS

Further to the backbone network, during the TINA process additional network components were proposed to be included in the final TINA-Network. Special consideration was given to the continuation of the existing Trans-European Transport Network beyond the present borderlines. First candidates for additional network components, subject to the assessment of the Group and the subgroups, were the proposals for corridor adjustments assigned to the TINA Group by the ad hoc Group for the preparation of the Helsinki Conference. Every proposal was accompanied by adequate information on its economic viability. The network components were proposed by the delegates of the TINA subgroups, the TINA Secretariat and the Commission. The proposing country or body or both, was responsible to submit -together with the proposal- all the relevant information.

The additional network components should:

- be in line with the given financial framework;
- give priority, where possible, to the better use of existing infrastructure;
- be able to comply with the set time-period for the development of the network (2015);
- all the proposed additional network components, together with the backbone network, should be able to form a network which will be in line with the criteria laid down in the EU guidelines for the TENs.

All the proposals were discussed in the three regional subgroups' meetings; the TINA Secretariat compiled all these proposals into one, and incorporated it to the TINA Network that was addressed by the TINA Group in June 1998.

The backbone network and the additional network components form the total TINA network, which is going to form the basis of the proposal for the extension of the TENs, in the enlarged Union.

The first TINA Progress Report (endorsed by the TINA Senior Officials Group at Vienna, 25/26 June 1998) contains the outline of the TINA network. Although the network was almost completely defined since June 1998, there were some incomplete aspects and there also remained some minor inconsistencies concerning the links, which required further work.

Those minor changes in the alignment of the network are reported in the present draft Final Report, as a result of relevant discussions in the three TINA regional subgroups and discussions between the countries, the TINA secretariat and the European Commission. In addition, more information has been collected and presented regarding the total TINA database, including inland waterways and the nodes of the network.

The TINA network is an integrated multi-modal network, having been designed to cover the essential transport needs of the candidate countries for accession, in the environment of the enlarged Union.

As a final result of the TINA process, the total network is proposed for implementation in the time horizon of 2015. However, the backbone network is seen as that part of the network, which -in principle- should have a certain priority in its construction.

For a complete -updated- description of the TINA Network, see ***Chapters 3.1 and 3.2***

1.2.4 THE INVESTMENT MEASURES - COST OF THE NETWORK

For the cost estimation of the network, possible investment measures had to be identified by which the existing infrastructure is brought to a level which complies with the UN-ECE recommendations (WP 5) relating technical standards and features of infrastructure with capacities and expected traffic on the network. Each country reported its proposals for such possible investment measures. In some cases the investment measures as proposed by the countries, are designated to satisfy national strategic interests, not always coinciding with the European perspectives. Seeing the TINA network as the future extension of the TENs in an enlarged Union, one should always recall the TEN-Tr guidelines requirements, about the criteria which refer to "projects of common interest". In this respect, and in order to apply the Decision's 1692/EC requirements, the European

Commission has to identify those possible investment measures that are of particular interest for the Union as a whole.

The cost of the entire network results from the addition of all the reported individual measures. A first estimation for the cost of the network was presented in the first TINA Progress Report; this estimate of cost was of the order of EURO 90 billion up to 2015, with the completion of the backbone network constituting about three-quarters of the total. In the present draft Final Report, a new estimate appears (EURO 86.5 billion), based on new information, updated by the countries. From the results of a PHARE Study[2] concerning the construction unit costs in the acceding countries, an independent indication for this cost was derived (according to the results of this Study, the costs of the railway and road components of the network might be reduced from EURO 77 billion to approximately EURO 50 - 60 billion).

*For the cost of the TINA network, see **Chapter 3.3***

*For the general financial perspectives to construct the TINA network, see **Chapter 3.4***

Working for the design of the TINA network, the countries made their proposals identifying a number of measures, which contribute to the realisation of an infrastructure, which should have standards and technical characteristics according to their wishes. However, in case of common financing, these proposals should be also looked under the light of the recommendations of the UN-ECE Working Party on Transport Trends and Economics (WP.5) on the definition of transport capacities, taking into consideration the future traffic forecast. Ambitious plans may be useful for the countries and the future users, but the failure of investment in transport infrastructures to keep up with growth in demand for mobility can have severe economic and social consequences. In the TINA process, the future demand should define the needs of the infrastructure to be constructed. This future demand was investigated for all modes, from the results of a relevant PHARE Study[3]. The present draft Final Report bases some conclusions on the network design on the preliminary results of this Study, using a first, reference traffic scenario. When the final traffic forecast will become available (July 1999) for a number of additional scenarios (based on various considerations on GDP development, function of the corridors, etc.), possible variations on the conclusions for the network design's standards might be also considered.

*For the traffic forecasts, see **Chapter 4.1***

*A reference on the work of the UN/ECE/WP.5 on the methodological basis for the definition of common criteria regarding bottlenecks, missing links and quality of service of infrastructure networks (Trans/WP.5/R.60), which finally provides a measure for future needs, is provided in **Chapter 4.2***

The process should continue with the identification of viable investment projects, which for the future TEN-Tr will be candidates for projects of common interest. Those investment measures identified as necessary for the realisation of the network will be ultimately developed to mature projects ready for financing. This is the task of the responsible authorities, which consider the possible financing/ funding of viable projects (like the European Commission, IFIs, etc.).

*For a theoretical approach of how we can proceed from potential investment measures to concrete projects, see **Chapter 4.3***

[2] Updating of Transport Unit Costs in Acceding Countries, COWI Consult

[3] Traffic Forecast on the ten Pan-European Corridors of Helsinki, NEA

Before any decision on financing/ funding individual projects is taken, the proposed for implementation projects should be subject to a socio-economic assessment.

The TINA Group has recommended establishing a common method for socio-economic project assessment, which the funding and financing institutions would endorse. In addition, environmental assessment needs to be incorporated into this socio-economic appraisal at both network and project level. A relevant proposal for a common methodology has been elaborated by the European Commission and the TINA Secretariat, using the expertise of the main IFIs (World Bank, EIB and EBRD) and people from the Academic Community. The proposed guidance for projects appraisal will be an Annex to the Final Report.

*For the process and the main steps to achieve this common methodology, see **Chapter 4.4***

All the identified projects of common interest are considered as necessary for the construction of the network, in the horizon of 2015. However, the question on priorities is still open. The maturity of a project is an essential factor for its selection for European funding. Other main parameters that can influence the priority of a project are whether the project contributes towards

- increase of capacity - elimination of bottlenecks;
- development of links towards not well developed areas;
- development of links to the TENs;
- better functioning of the network - increase of its attractiveness ;
- completion of an already started program;
- lower operating costs;
- etc.

The relevant application form, developed for ISPA, provides a scope of the required data and information to be furnished so that funding and other financing organisations can thoroughly assess the investment potential. The description of every project should provide clear indications for its socio-economic and financial viability, plus information concerning its environmental effects, following the instructions set out in the relevant EU regulations.

1.2.5 FUTURE NETWORK DEVELOPMENT

The TINA network, in its current status, includes a certain variety of road and railway lines categories (motorways, 2-lanes roads, double and single railway lines, electrified or not, etc.). The future perspective for this network is its upgrade, in order to comply with the European standards, and in conformity with the guidelines of the UN/ECE (WP.5) concerning the relation of the necessary road and rail infrastructure versus traffic. The development of the network towards its final shape (horizon 2015) should normally follow the national plans for the network upgrade. This expected development for the years 2005, 2010 and 2015 is reported in this present Report, based on the information received from the countries. From the other hand, when planning future infrastructure, the consideration of the future traffic on the network must be also taken into account, even if sometimes this future traffic is in contradiction with the national intentions.

*For more details about these deficiencies, see **Chapter 4.5***

In addition to the general status of the network, its detailed design standards should be in conformity with a number of other parameters, resulting from interoperability, environmental protection and safety requirements.

*For more details about the interoperability, environmental protection and safety aspects, regarding the design of the TINA network, see **Chapter 4.6** and especially, **Annex XI***

In the new pan-European environment (where no political borders interrupt the traffic), the countries of Central and Eastern Europe incorporate the most significant transport routes for the East-West, North-South connections. The central position of these countries, between the Western European countries and the Commonwealth of Independent States and between Scandinavian and Balkan countries, generates the necessity of creating and exploiting an effective network of transport infrastructure and transport services, adapted to the European standards. The aim of these countries to increase the links with EU also pushes for the creation of this dual network (infrastructure plus services). In this context, the existing serious problems regarding the legislative - institutional framework established on the network, should be overhauled. In addition, the use of the various Intelligent Transport Systems (ITS) on the TINA network should be encouraged, in order to achieve its maximum efficiency.

*For more about these aspects, see **Chapter 5***

1.3 TINA GIS

The TINA network is described through a specific database specially designed and developed for the TINA process (see also the impressum).This database has been developed by the TINA Secretariat, and is still evolving. It operates under the environment of a Geographical Information system (GIS). The database will become part of a network of databases held and operated at different locations in Europe under the supervision of different international and European institutions. The European Commission will promote this database network and the necessary co-operation between the different operators, ensuring that no unnecessary duplication of works occurs.

The main goal of an information system should be empowering planners and experts by providing them with relevant information and software tools to manage it according to their needs, in other words, providing those indispensable tools to experts to make them able to generate knowledge and therefore assess policy decisions.

The purpose of the TINA Information system (TIS) is to provide a display and query tools as well as information management capabilities for the TINA process. Using the system, the users can maintain and review both graphical and textual transport database and perform simple analyses and reports. The system offers tools for creation, editing, management, analysis, display and mapping of technical transport information on personal computer. It includes a high quality map and transport database for the entire TINA territory out of which the countries' data can be extracted. The system supports data collection and is used to create transport maps, analyses and reports. It can save, update, elaborate and retrieve the received information and print various reports. The user can review networks based on actual transport infrastructure and traffic data, and generate overview maps, statistical reports and technical analyses.

The system is a combination of four main components: data management application, commercial software and two transport databases.

The role of the management system is to support the maintenance of the databases by improving the integrity and accuracy of data elaboration. It also provides an easy access to the databases, presenting the data and performing various analyses and reports

The (first) textual database stores detailed information for the transport infrastructure, future projects and traffic data. The (second) graphical database consists of detailed cartographic data for the TINA countries.

The commercial software is used mainly as a map production tool.

The system made use of the existing graphical GISCO database; the textual database was created exclusively for the system. Once the data are entered, the system provides a user-friendly interface that allows to view, browse, explore and analyse the transport data.

The design of TIS is modular so as to be able to accommodate any specific requirements of further work The software architecture makes easy to add new capabilities whenever necessary. In the future, these optional extensions can provide additional modelling, analysis, graphic and data managing capabilities.

The TIS system contains data for all transport modes:

- roads
- railways
- inland waterways
- river ports
- seaports
- airports
- terminals

The system is based on a specific concept with the same functionality used for all transport modes. Designed to improve the data collection, it also gives the access to a variety of services as:

- data management
- mapping
- analysis
- reporting

1.3.1.1 DATA MANAGEMENT

The data management subsystem is used to collect, modify, manage and review the transport data. The relevant database is subdivided in three main categories: sections (both linear sections and nodes), projects and geographical data.

1.3.1.2 MAPPING

The mapping feature creates geographical maps, linking linear sections and nodes with actual spatial information for the area. It can provide solid, reliable background for integrating data, performing expert analysis on key issues, and visualising results on good quality maps and data displays.

1.3.1.3 ANALYSIS

The system can currently perform a number of analyses, showing the existing infrastructure, the projects, the traffic flows and the possible future bottlenecks on the network. The flexibility of the system permits the development of more analysis features in the future.

1.3.1.4 REPORTING

The system can produce two different types of reports: detailed reports for each section (linear sections and nodes) of the network and summary tables, indicating total results per country, mode or corridor. All the reports can be produced either on paper or as an HTML file, allowing publishing them immediately on Internet.

In the future, the system can include tools to administer mapping services and data distributed across different data servers in an Intranet or Internet and create a fully operational Web mapping application. More than simply viewing static maps, users will be able to browse, explore and query active geographical data

With the data available, international experts and institutions (also from outside TINA countries) will be able to take advantage of the provided capabilities.

1.3.1.5 AVAILABILITY OF DATA

The final database will exist in two copies one at the TINA secretariat at Vienna, who acts as data manager the other at the Commission's General Directorate for Transport.

The data in the database are owned by their respective authors. They were and are used, complemented and modified as appropriate by the TINA secretariat as acting database manager for the purpose described in the present terms of reference of the Group.

The database as developed in the course of the TINA contract will be sent as well to the Commission services namely DGVII for their usage.

Parts of or all data, held by the TINA secretariat, if not stated otherwise by the authors, maybe integrated into a Reference database held at the Commission, which will be accessible to any contractor of the Commission and the administrations co-operating with the Commission. The Commission will be responsible for the integrity of this reference database and possible intellectual property rights involved.

For better communication concerning the TINA process and its achievements, TINA Secretariat created and maintains a special page on the Internet, under the address:

www.tinasecretariat.at

2 THE ECONOMIC FRAMEWORK

2.1 GDP DEVELOPMENT

The basic economic data about the eleven countries for the base year 1995 were provided by the NEA study on "Traffic forecast on the 10 Pan-European Corridors and the TINA network" taking Agenda 2000 and the economic survey of OECD as data source. The following table 2-1 contains this data. Later in this report other indicators are also presented, which address specific transport network features.

Economic data for the year 1995			
	population	GDP/c	GDP
		GDP in prices and exchange rates of the year 1995	
		1995	1995
	Mio	**EURO**	**Billion EURO**
Bulgaria	**8.4**	1,200	10.1
Cyprus	**0.6**	10,570	6.8
Czech Republic	**10.3**	3,490	35.9
Estonia	**1.5**	1,850	2.8
Hungary	**10.2**	3,340	34.1
Latvia	**2.5**	1,370	3.4
Lithuania	**3.7**	1,225	4.6
Poland	**38.6**	2,360	91.1
Romania	**22.7**	1,200	27.2
Slovak Republic	**5.4**	2,470	13.3
Slovenia	**2.0**	7,240	14.5
TINA-countries	**105.9**	**2,302***	**243.8**
EU15	**372.1**	**17,237***	**6,414.0**
TINA/EU15	**28.5%**	**13.4%**	**3.8%**

Table 2-1: Economic data in the CEECs for the year 1995 according to AGENDA 2000, Economic data for Cyprus based on countries information

In 1995, the eleven candidate countries had a population of 106 million people, slightly more than a quarter of the population of the European Union. They had an average per capita gross domestic product about EURO 2,300, which represents only 13.4% of the average per capita GDP of the EU in terms of purchasing power parity.

These data constitute a starting point for extrapolations for the future. The most important assumptions relate to economic growth in the countries. The following graph shows a moderate scenario on growth rates until the year 2015.

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* average

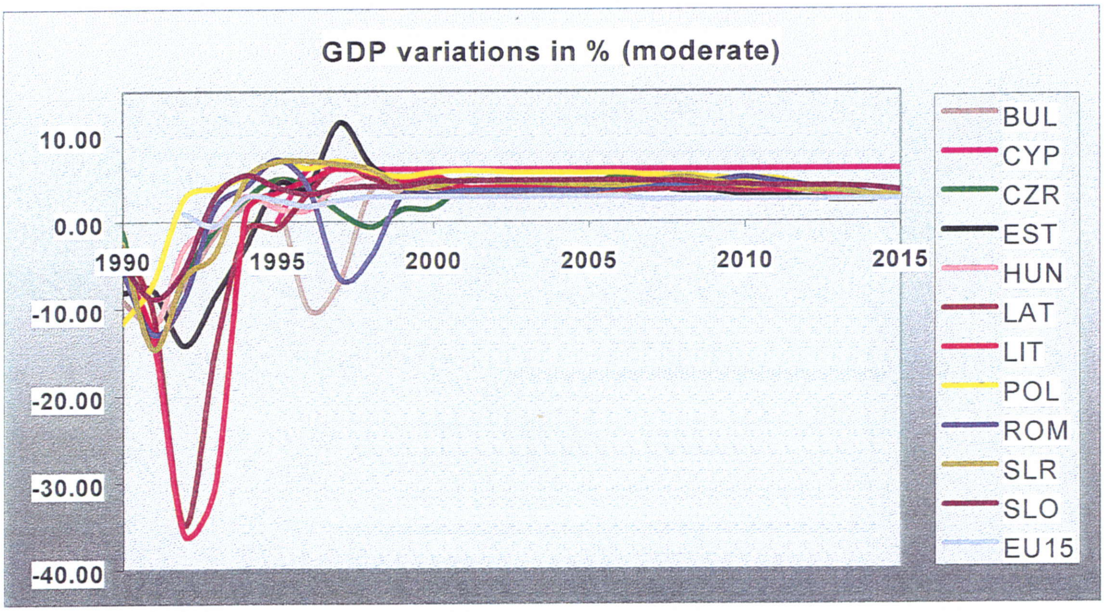

Diagram 2-1: GDP development 1998 - 2015

Following these assumptions the total produced GDP in the candidate countries in the period 1998 to 2015 is about EURO 7.330 billion. Out of this, Poland will have a share, which is about EURO 3.150 billion representing more than 43% of the total, followed by Hungary (13,4%) and Czech Republic (12,6%). The added share of Estonia, Latvia, Lithuania, Bulgaria and Cyprus of the total produced GDP is less than 11%.

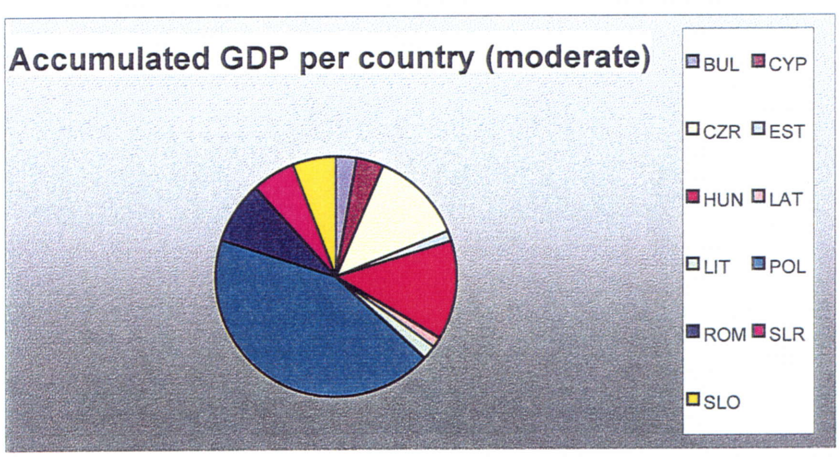

Diagram 2-2: Countries distribution of the total produced GDP

Extrapolations to the future years are made under the assumption that growth rates gradually converge with average growth rates in the Union. However, it is assumed that they are always larger than the growth rates of the EU. With this assumption it is likely that the GDP in all acceding countries will more than double between now and the year 2015 – the factor of increase is about 2.3.

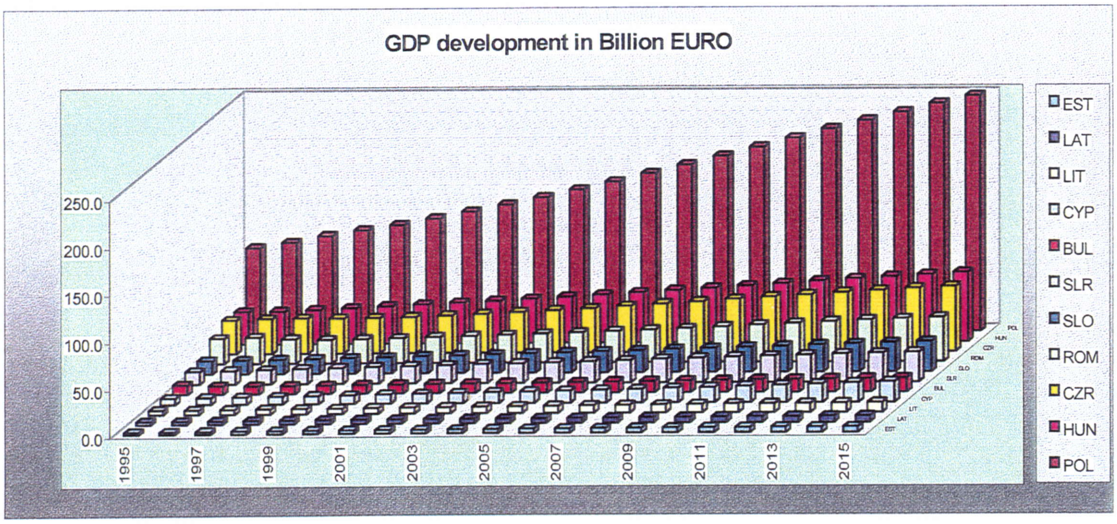

Diagram 2-3: Annual GDP development in billion EURO

An optimistic scenario assumes that average growth rates in the acceding countries will reach levels of 6 to 7% and maintain this level until 5 years after accession and will then slowly converge with EU levels which will keep a level of between 3 and 4% growth rates. This would result in almost a tripling of annual GDP by 2015. The optimistic scenario is based on the assumption that on one hand the accession process will follow the optimistic plan of the European Commission and on the other hand, that the countries themselves will have a strict policy of structural reforming and direct foreign investments are increasing.

A more negative scenario would assume that GDP growth rates would be equal to or slightly less than the EU average growth rate of 2.5% expected for the next 15 years. This very negative assumption would imply that the acceding countries would not benefit at all from the accession process, a fairly unlikely scenario.

Nevertheless the differences between the optimistic or the pessimistic scenario vis a vis the moderate scenario in average do not exceed 10 %. The pessimistic scenario will sum up to about 90% of the moderate one, the optimist scenario will in total only be 8% higher than the moderate scenario.

Growth	***BUL***	***CYP***	***CZR***	***EST***	***HUN***	***LAT***	***LIT***	***POL***	***ROM***	***SLR***	***SLO***	***11 acc***
Low	3.0	3.3	12.3	1.3	13.4	1.4	2.1	42.1	7.8	6.1	5.9	113.4
Moderate	3.2	3.8	13.9	1.3	14.8	1.5	2.1	47.4	9.5	6.3	6.4	128.0
High	3.8	4.5	14,7	1,6	17.2	1.7	2.5	49.3	10.3	6.8	6.7	143,5

Table 2-2: Accumulated GDP 1998 - 2015 in BEURO

The most important conclusion from these tables is that differences in growth rates affect the absolute value of the total GDP over 18 years, by only around 25%. Since this variation falls within the margin of accuracy of any forecasting method, and given that economic development in the acceding countries is dependent on factors other than the variations in GDP growth presented here, it appears justified to take, as a working hypothesis for the TINA process, the forecast figures derived from the moderate growth scenario.

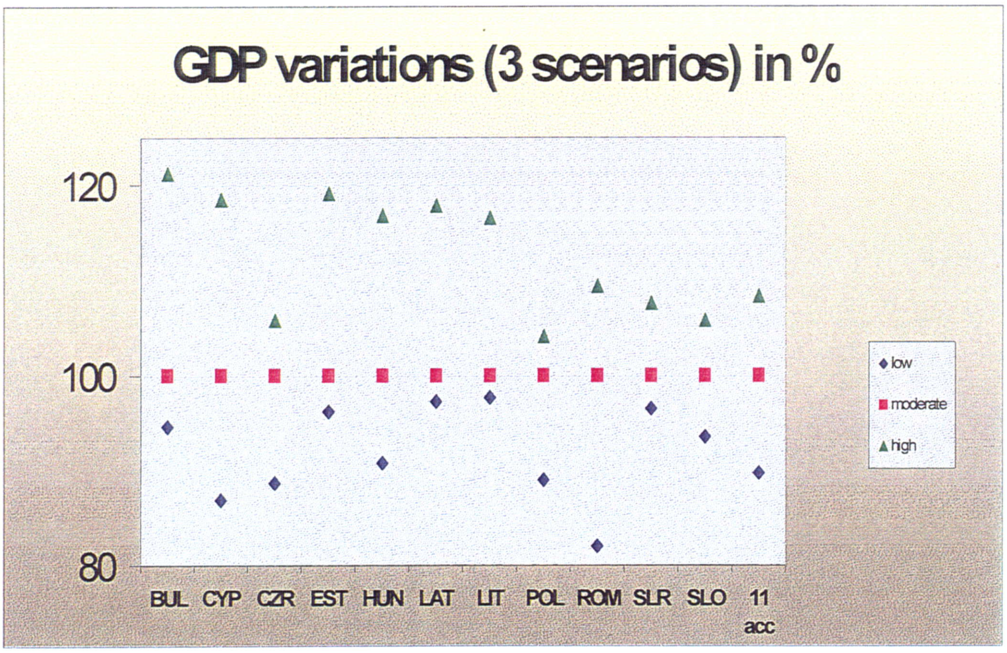

Diagram 2-4: Variations of GDP growth for 3 scenarios

In the past the Group has discussed how infrastructure investments should relate to the GDP. EU Member States invest between slightly under 1% and up to 2% of GDP in Union-relevant infrastructures. On average the level was 1.2% of GDP in the period from 1980 to 1992; this figure does not however concern Union-relevant infrastructure alone, but also infrastructure of solely national importance. The discussions also confirmed however that the acceding countries needed to do somewhat more. In the EU most of the investments have already been made, while in the acceding countries major upgrading is required over the coming years. On the other hand an overly high share of GDP would probably be considered unrealistic, since infrastructure investments are only one of the many investments the acceding countries have to undertake. The group agreed to accept, as an indicator for the affordability of planned infrastructure investments, that their cost should not on average exceed 1.5% of the GDP in the coming years.

Assuming that transport ministers would like to achieve this level, this would give an infrastructure investment bracket for each country based on the different growth scenarios between now and 2015 (see Chapter 3.4 , table 3-16: 1,5% of... on page 68 and diagram 3-7: estimated construction.... on page 69)

3 THE TINA NETWORK

3.1 THE TINA NETWORK

The TINA process is designated to initiate the development of a multi-modal transport network within the territory of the candidate countries for accession: Estonia, Latvia, Lithuania, Czech Republic, Slovakia, Hungary, Poland, Slovenia, Romania, Bulgaria and Cyprus.

The design of the network followed two main steps (Methodology paper, **TINA-10/97**):

- The definition of the alignment of a backbone network, which is the network proposed by the European Commission - and accepted in the TINA process - as the starting point for a differential network design, identical with the links and nodes of the ten multi-modal Pan-European transport corridors of Helsinki, on the territory of the TINA countries;
- The definition of the additional network components, proposed by acceding countries and the three TINA regional subgroups and approved by the TINA Group, after having assessed the relevant proposals.

3.1.1 BACKBONE NETWORK

Defining the backbone network and estimating its cost were the main tasks of step one of the TINA process. In order to link the development of the Pan-European Transport Network, which was outlined at the third Pan-European Transport Conference in Helsinki (June 1997), with the necessary developments in the acceding countries, the Commission proposed to use the results of the Conference as basis for the backbone network definition: the ten multi-modal Pan-European transport corridors. It was understood that all parties concerned agreed on the need for the corridors so that further economic or financial justifications were not required.

3.1.2 ADDITIONAL NETWORK COMPONENTS

Following the provisions of Step 2 of the Methodology, during the TINA process additional network components were proposed for inclusion in the final TINA network. These network components were proposed by the countries and were discussed in several meetings of the TINA groups. The countries were asked to submit -together with their proposals - all the necessary information on economic viability and other aspects (construction cost, future traffic forecast, etc.). The TINA Secretariat collected the information and made the necessary elaboration, as well as preparing maps for all the TINA countries showing the network. The additional network components are the result of many discussions, which were held at the TINA Group and the subgroup meetings, as well as in bilateral meetings between the TINA countries and the TINA Secretariat, and between neighbouring countries in the TINA region.

The main criteria for defining the additional network components and the total network were:

- the continuity of the links at the borders between two TINA countries;
- the continuity of the links at the borders of the TINA countries with the Newly Independent States;
- the continuity of the links at the borders of the TINA countries with EU countries (compatibility with the existing TEN-Tr);

- the general consistency of the network structures (i.e. no missing links in the total TEN - TINA network);
- to reach a network density and structure similar to that of the network in the EU countries (TEN-Tr);
- the financial capacity of the country to realise the network.

For a detailed reference on the work undertaken to define the backbone network and the additional network components, see the First TINA Progress Report, August 1998.

The final, total network - as shown in the present report, see relevant maps in **Annex I**- is the result of the discussions held in the TINA subgroups and the Senior Officials Group, as well as the various bilateral or multilateral discussions, held between the various actors in the TINA process.

In its final shape, the TINA network is meant as one entity, without any differences between its two components, in the horizon of 2015. However, in the construction process, the elements of the TINA network belonging to the backbone network, may have a better priority against the rest of the network.

The TINA network comprises 18,587 km of roads, 20,710 km of railway lines, 4,131 km of inland waterways, 40 airports, 15 seaports, 52 river ports and 84 terminals (out of which, 16 are situated in seaports and river ports, and 68 stand alone).

As it was requested in the TINA terms of reference, the final network continues the alignment of the existing TENs in the acceding countries. This is shown in the two maps in **Annex II**. The extension of the TINA network to third countries (Russia, Ukraine, Belarus, Croatia, etc.) should be an issue for future negotiations with these countries on the basis of the ten Pan-European Transport corridors agreed at Helsinki in 1997 and, where appropriate, the Pan-European transport areas. This process has already begun.

3.2 DESCRIPTION OF THE NETWORK

A full description of all the links with their section definitions and nodes of the network exists in the TINA Secretariat's database[4].

In the same database, there are short descriptions of all the investments related to the development of the network, as reported by the countries (by section and by mode). The cost estimates for these investments - as reported by the countries -, traffic forecast, etc. are also elements of the database.

The outline TINA Network has now been defined, subject to the endorsement by the Group of TINA Senior Officials; however, minor changes in its shape might occur, if future studies prove this necessity. Furthermore, for these cases where there is still an uncertainty, the routing of the Pan-European Transport Corridors is subject to final decisions of their Steering Committees.

More precisely, the remaining problems in the TINA network are as follows:

- the future alignment of Corridor IV between Romania and Bulgaria (bridge over the Danube);
- the alignment of the railway network and between Hungary and Romania (connection Szeged to Arad);
- according to the TEN-guidelines (Decision No. 1692/96/EC) the Czech proposals of additional road components on the stretches "Praha – Ceske Budejovice – Dolni Dvoriste (border to Austria)" and "Brno – Pohorelice - (border to Austria)" have no continuation on Austrian side. In Austria no relevant motorway connections are planned. This is an item for clarification.

Another problem with the network could be the density of some of its elements in certain areas. However, this density results from two factors:

- in some areas the network includes both existing and future infrastructure, the latter of which will replace the current alignments at a later stage of development but still within the time horizon of the outline plan.
  This is the case for road Corridor VI/branch to Brno, between Czestochowa in Poland and Lipnik in Czech Republic, where two alignments comprise the backbone network: The existing road "Czestochowa-Katowice-Bielsko Biala-Lipnik" and the future motorway "Czestochowa-Katowice-Gorzyczki-Ostrava-Lipnik".
- for the railways, there are sometimes separate tracks, serving only freight traffic
  This is the case for the following sections in Poland:
  - Lowicz-Lukow (Warsaw bypass)
  - Tczew-Gliwice
  - Wroclaw-Katowice

Table 3-1 shows the length of the road and rail TINA Network by country. Diagram 3-1 illustrates the length of Rail and Road Network for all countries.
All the eleven national maps with the TINA Network are shown in **Annex III**.

[4] In May 1999, the Secretariat had in its records the latest updated (April 1999) information concerning all the countries, except of: Cyprus roads, Romania rail, Hungary rail, Slovakia nodes. Consequently, the present report reflects only the 1998 relevant information for these countries and modes. The Final TINA Report, to be issued in October 1999, will include the updated for 1999 information for all the eleven candidate countries.

	Rail Network	Road Network
Bulgaria	2095 km	2113 km
Cyprus	-	342 km
Czech Republic	2350 km	1842 km
Estonia	570 km	1000 km
Hungary	2719 km	1438 km
Latvia	1338 km	1520 km
Lithuania	1021 km	1617 km
Poland	5493 km	4666 km
Romania	3155 km	2534 km
Slovakia	1400 km	949 km
Slovenia	569 km	566 km
Total	20710 km	18587 km

Table 3-1: Length of the TINA Network per mode and country in 2015

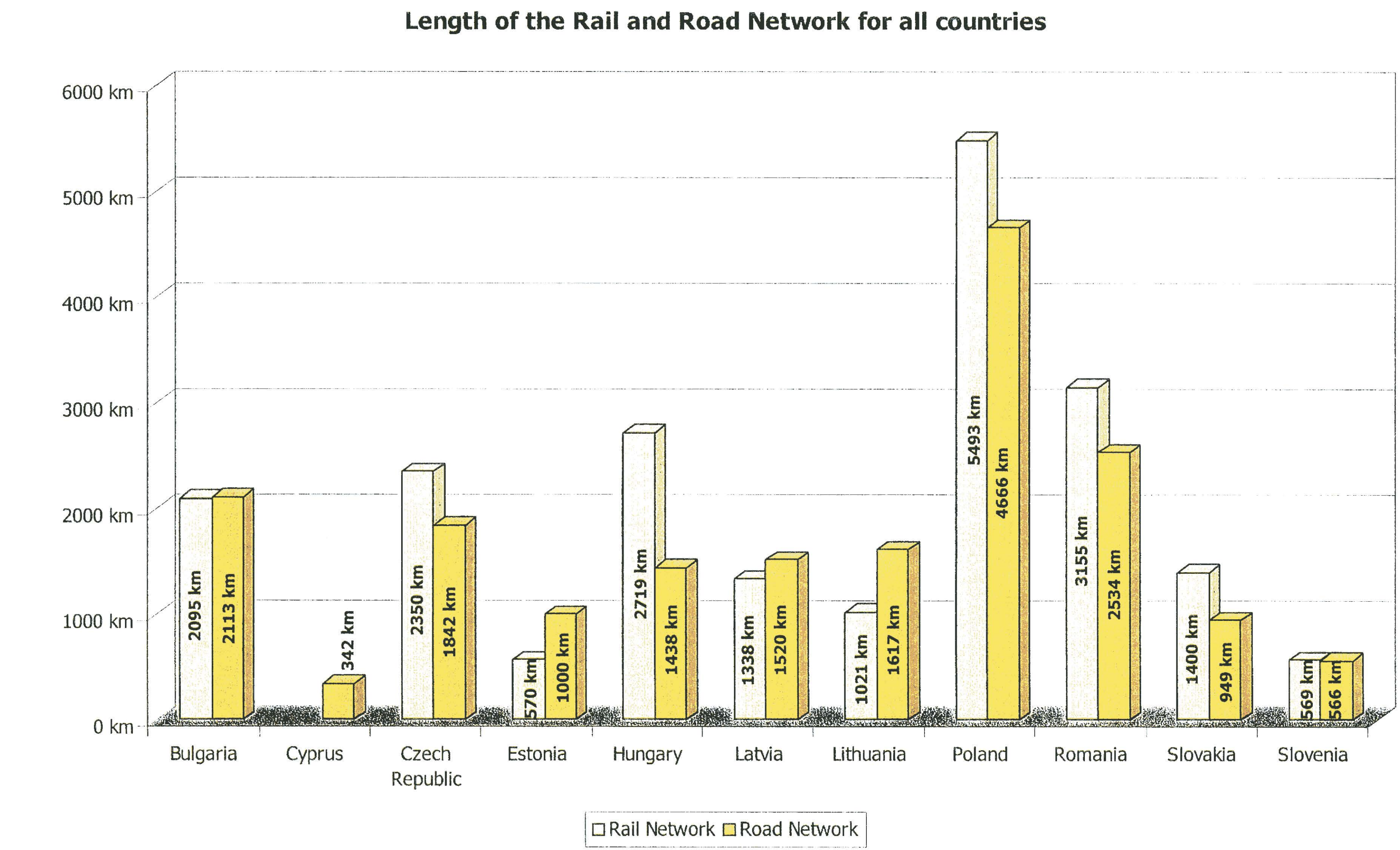

Diagram 3-1: Length of the Rail and Road Network for all countries

3.3 CONSTRUCTION COST OF THE NETWORK

3.3.1 REPORTED COSTS

As indicated in the Methodology for the TINA process (document **TINA-10/97**), the construction cost of the TINA network is a critical parameter for the overall planning of the network. A total cost of EURO 86,547 million has been resulted, out of which

- EURO 45,805 million for investments on the road network
- EURO 31,241 million for investments on the railway network
- EURO 1,795 million for investments on the inland waterways network
- EURO 4,138 million for investments on airports
- EURO 2,985 million for investments on seaports
- EURO 298 million for investments on river ports
- EURO 286 million for investments on terminals

The cost of realising the network has been resulted from the TINA countries' estimations. They are correlated to necessary investments, which were identified and briefly described by the countries. All the investments – and consequently the costs – have been listed in the TINA Secretariat's database by corridor, section, country and mode.

Table 3-13 at the end of this section shows the estimated cost of the required investments by country and mode.

Table 3-14 shows the allocation of this money between the time periods 1998 to 2005, 2005 to 2010 and 2010 to 2015, according to the national plans of the TINA countries.

The five diagrams at the end of the section give a visual presentation of the results of Table 3-13:

- Diagram 3-2 Estimated construction cost per country
- Diagram 3-3 Total estimated construction cost per mode for all countries
- Diagram 3-4 Total estimated construction cost per mode for the Czech Republic, Poland and Romania
- Diagram 3-5 Total estimated construction cost per mode for Bulgaria, Hungary, Slovakia and Slovenia
- Diagram 3-6 Total estimated construction cost per mode for Cyprus, Estonia, Latvia and Lithuania

The eleven following Tables (3-2 – 3-12) show the detailed cost estimations by corridor, country and mode. All the data, elaborated by the Secretariat, was provided by the countries.

<u>General remark:</u>

Sections, which belong to two (or in general, to more than one corridors or links) were taken into account only once in the calculation of the total length and cost.

Bulgaria

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Vidin - Vraca - Mezdra - Sofija - Plovdiv - Krumovo - Dimitrovgrad - Svilengrad	590 km	€ 840.00 million
IV (to Thessaloniki)	Sofija - Zah. Fabrika - Batanovci - Radomir - Dupnica - Gen. Todorov - Kulata	211 km	€ 50.00 million
VIII	Gjuesevo - Radomir - Batanovci - Zah. Fabrika - Sofija - Plovdiv - Skutare - Mihailovo - Stara Zagora - Kalitinovo - Bezmer - Jambol - Zimnica - Karnobat - Burgas/Sindel - Varna	747 km	€ 780.00 million
IX	Giurgiu N. - Ruse - Gorna Oriahovitsa - Dabovo - Tulovo - Stara Zagora - Mihailovo - Gita - Dimitrovgrad - Svilengrad - Ormenion	390 km	€ 569.00 million
X (to Nis)	Kalotina - Volujak - Sofija	57 km	€ 80.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Mezdra - Pleven - Gorna Oriahovitsa	206 km	€ 50.00 million
Ruse - Kaspican - Sindel	187 km	€ 150.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Vidin - Montana - Botevgrad - Sofija - Plovdiv - Orizovo - Haskovo - Svilengrad - Kap. Andreevo	612 km	€ 706.00 million
IV (to Thessaloniki)	Sofija - Tzarkva - Kulata	216 km	€ 564.00 million
VIII	Gjuesevo - Radomir - Pernik - Tzarkva - Sofija - Plovdiv - Orizovo - Stara Zagora - Vetren - Burgas/Priselci - Varna	649 km	€ 961.50 million
IX	Ruse - Bjala - Veliko Turnovo - Gabrovo - Stara Zagora - Haskovo - Makaza	389 km	€ 441.00 million
X (to Nis)	Kalotina - Sofija	75 km	€ 45.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Botevgrad - Pleven - Bjala	201 km	€ 38.00 million
Ormenion - Svilengrad - Burgas	178 km	€ 69.00 million

Inland Waterway Network

Alignment	Length	Cost estimation
Danube (Bregovo - Vidin - Lom - Orjahovo - Somovit - Svishtov - Ruse - Tutrakan - Silistra)	469 km	€ 0.00 million

Airports

Location	Number	Cost estimation
Sofija; Plovdiv; Burgas; Varna	4	€ 59.40 million

Riverports

Location	Number	Cost estimation
Vidin; Lom; Ruse	3	€ 54.90 million

Seaports

Location	Number	Cost estimation
Burgas; Varna	2	€ 489.10 million

Terminals

Location	Number	Cost estimation
Sofija; Dimitrovgrad	2	€ 73.00 million

Summary for Bulgaria

Infrastructure lines	*Length*	*Cost estimation*
Railways	2095 km	€ 2,130.00 million
out of which Backbone	*1702 km*	*€ 1,930.00 million*
out of which Additional	*393 km*	*€ 200.00 million*
Roads	2113 km	€ 2,773.50 million
out of which Backbone	*1734 km*	*€ 2,666.50 million*
out of which Additional	*379 km*	*€ 107.00 million*
Inland Waterway	469 km	€ 0.00 million
Infrastructure nod	*Number*	*Cost estimation*
Airports	4	€ 59.40 million
Riverports	3	€ 54.90 million
Seaports	2	€ 489.10 million
Terminals	2	€ 73.00 million
TOTAL		**€ 5,579.90 million**

Table 3-1: Construction cost for the Network - Bulgaria

Cyprus

Road Network

Alignment of the Network

Alignment	Length	Cost estimation
Polis - Pafos - Avdimou - Lemesos - Kofinou - Alampra - Lefkosia - Strovolos - Kokkinotrimithia - Astromeritis Alampra/Kofinou - Larnaka - Aradippou - Dekeleia - Paralimni - Protaras - Ammochostos	342 km	€ 302.76 million

Airports

Location	Number	Cost estimation
Larnaka; Pafos	2	€ 211.20 million

Seaports

Location	Number	Cost estimation
Lemesos; Larnaka	2	€ 270.00 million

Summary for Cyprus

Infrastructure lines	*Length*	*Cost estimation*
Roads	342 km	€ 302.76 million
Infrastructure nod	*Number*	*Cost estimation*
Airports	2	€ 211.20 million
Seaports	2	€ 270.00 million
TOTAL		**€ 783.96 million**

Table 3-2: Construction cost for the Network - Cyprus

Czech Republic

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Decin - Usti n. Labem - Praha - Kolin - Chocen - Usti n. Orlici - C. Trebova - Brno - Breclav - Hohenau/Brodske	461 km	€ 979.66 million
IV (to Nürnberg)	Schirnding - Cheb - Marianske Lazne - Plzen - Zdice - Praha	231 km	€ 483.50 million
VI (to Breclav)	Zebrzydowice - Petrovice u Karvine - Detmarovice - Bohumin - Ostrava - Polanka n. Odrou - Hranice na Morave - Prerov - Breclav	206 km	€ 666.81 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Praha - Benesov - Tabor - Veseli n. Luz. - C. Budejovice - Horni Dvoriste	219 km	€ 493.00 million
Veseli n. Luz. - C. Velenice	56 km	€ 71.60 million
Plzen - Nepomuk - Horazdovice - Protivin - Cicenice - Zliv - C. Budejovice - C. Velenice	185 km	€ 60.90 million
Plzen - Domazlice - C. Kubice	70 km	€ 152.10 million
Cheb - Karlovy Vary - Kadan - Chomutov - Most - Usti n. Labem	182 km	€ 146.60 million
Decin - Usti n. Labem Strekov - Lysa n. Labem - Kolin - Kutna Hora - Havlickuv Brod - Brno	350 km	€ 170.10 million
Usti n. Orlici - Letohrad - Lichkov	35 km	€ 14.67 million
C. Trebova - Prerov	99 km	€ 332.52 million
Hranice na Morave - Horni Lidec	63 km	€ 170.80 million
Polanka n. Odrou - Cesky Tesin	46 km	€ 166.30 million
Bohumin - Chalupki	5 km	€ 0.00 million
Prerov - Nezamyslice - Velesovice - Brno	88 km	€ 29.35 million
Detmarovice - Cesky Tesin - Mosty u Jabluakova	54 km	€ 0.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Cinovec (Krasny Les) - Lovosice - Doksany - Nova Ves - Praha - Mirosovice - Brno - Breclav - Lanzhot	410 km	€ 840.96 million
IV (to Nürnberg)	Rozvadov - Sulkov - Ejpovice - Praha	168 km	€ 343.50 million
VI (to Breclav)	Cesky Tesin - Rychaltice - Belotin - Lipnik - Hulin - Vyskov - Brno *planned new motorway:* Gorzyczki/Vernovice - Bohumin - Ostrava - Belotin	253 km	€ 1,202.62 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Praha - Podebrady - Hradec Kralove - Jaromer - Lubawka	146 km	€ 626.88 million
Mirosovice - Tabor - C. Budejovice - Dolni Dvoriste	163 km	€ 630.00 million
Praha - Velka Dobra - Nove Straseci - Kolesov - Karlovy Vary - Sokolov - Jesenice - Cheb - Pomezi n/O	166 km	€ 681.28 million
Praha - Turnov	70 km	€ 0.00 million
Hradek n. Nisou - Liberec - Turnov - Ulibice - Ostromer - Hradec Kralove - Vysoke Myto - Moravske Trebova - Mohelnice - Olomouc	260 km	€ 693.71 million
Moravska Trebova - Sebranice - Kurim - Brno	70 km	€ 286.89 million
Brno - Pohorelice - Mikulov (Novy Prerov)	46 km	€ 78.95 million
Hulin - Otrokovice - Uherske Hradiste - Breclav	91 km	€ 312.78 million
Lipnik - Velky Ujezd - Olomouc - Vyskov	69 km	€ 131.58 million

Inland Waterway Network

Alignment	Length	Cost estimation
Labe (brd. Germany - Usti n. Labem Strekov - Melnik - Pardubice)	234 km	€ 247.80 million
Vltava (Melnik - Trebenice)	92 km	€ 5.30 million
Odra (brd. Poland - Ostrava)	9 km	€ 145.00 million
Morava (Devin - Hodonin)	80 km	€ 302.00 million

Airports

Location	Number	Cost estimation
Praha; Ostrava; Brno	3	€ 231.00 million

Riverports

Location	Number	Cost estimation
Decin; Usti n. Labem; Lovosice; Melnik; Praha Holesovice; Praha Liben; Praha Smichov; Praha Radotin; Kolin, Chvaletice; Pardubice	11	€ 24.70 million

Terminals

Location	Number	Cost estimation
Brno; Lovosice; Lovosice II; Praha Uhrineves; Praha Zizkov; Praha Holesovice; Decin; Usti n. Labem; Kolin; Pardubice; Beroun; Melnik; Plzen; Ostrava;	15	€ 8.50 million

Summary for Czech Republic

Infrastructure lines	*Length*	*Cost estimation*
Railways	2350 km	€ 3,937.91 million
out of which Backbone	*902 km*	*€ 2,131.23 million*
out of which Additional	*1448 km*	*€ 1,806.68 million*
Roads	1912 km	€ 5,829.15 million
out of which Backbone	*831 km*	*€ 2,387.08 million*
out of which Additional	*1081 km*	*€ 3,442.07 million*
Inland Waterway	415 km	€ 700.10 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	3	€ 231.00 million
Riverports	11	€ 24.70 million
Terminals	15	€ 8.50 million
TOTAL		**€ 10,731.36 million**

Table 3-3: Construction cost for the Network - Czech Republic

Remark:

The length of the road backbone network in Czech Republic will be reduced by 70 km in 2015, when new infrastructure will replace the existing (section Belotin – Cesky Tesin).

Estonia

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Tallinn - Ulemiste - Lagedi - Aegviidu - Tapa - Tartu - Valga; Ulemiste/Lagedi - Maardu - Muuga	297 km	€ 96.72 million
West/ East link	Tallinn - Ulemiste - Lagedi - Aegviidu - Tapa - Narva; Ulemiste/Lagedi - Maardu - Muuga	234 km	€ 129.05 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Tartu - Koidula	86 km	€ 56.30 million
Tallinn - Saue - Paldiski; Saue - Männiku	54 km	€ 19.78 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Tallinn - Saue - Pärnu - Ikla	192 km	€ 41.63 million
West/ East link	Tallinn - Väo - Johvi - Sillamäe - Narva	212 km	€ 72.66 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Tallinn - Juri - Tartu - Kanepi - Voru - Luhamaa	289 km	€ 116.48 million
Valga - Tartu - Mustvee - Johvi	220 km	€ 20.93 million
Väo - Juri - Saue - Keila - Paldiski; Tallinn - Keila	87 km	€ 38.23 million

Airports

Location	Number	Cost estimation
Tallinn	1	€ 35.70 million

Seaports

Location	Number	Cost estimation
Tallinn	1	€ 15.00 million

Summary for Estonia

Infrastructure lines	*Length*	*Cost estimation*
Railways	570 km	€ 259.29 million
out of which Backbone	*430 km*	*€ 183.21 million*
out of which Additional	*140 km*	*€ 76.08 million*
Roads	1000 km	€ 289.93 million
out of which Backbone	*404 km*	*€ 114.29 million*
out of which Additional	*596 km*	*€ 175.64 million*
Infrastructure nodes	*Number*	*Cost estimation*
Airports	1	€ 35.70 million
Seaports	1	€ 15.00 million
Terminals	0	€ 0.00 million
TOTAL		**€ 599.92 million**

Table 3-4: Construction cost for the Network - Estonia

Hungary

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Rajka (Nickelsdorf -) - Hegyeshalom - Györ - Komarom - Tatabanya - Budapest - Cegled - Szolnok - Szajol - Bekescsaba - Lököshaza; Szob - Vac - Budapest	471 km	€ 470.00 million
V	Hodos - Zalalövö - Zalaszentivan - Boba - Szekesfehervar - Budapest Hatvan - Füzesabony - Miskolc - Mezözombor - Nyiregyhaza - Zahony	589 km	€ 161.60 million
V (to Rijeka)	Gyekenyes - Kaposvar - Dombovar - Pincehely - Pusztaszabolcs - Budapest	265 km	€ 21.50 million
V (to Ploce)	Magyarboly - Pecs - Dombovar	107 km	€ 12.00 million
X (to Beograd)	Budapest - Kunszentmiklos-Tass - Kiskunhalas - Kelebia	163 km	€ 110.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Budapest - Ujszasz - Szolnok	84 km	€ 150.00 million
Szajol - Püspökladany - Debrecen - Nyiregyhaza	170 km	€ 65.00 million
Gyekenyes - Murakeresztur	15 km	€ 0.00 million
Murakeresztur - Nagykanizsa - Siofok - Szekesfehervar	168 km	€ 12.20 million
Györ - Papa - Celldömölk - Boba - Nagykanizsa	141 km	€ 0.00 million
Miskolc - Hidasnemeti	81 km	€ 0.00 million
Sopron - Györ	85 km	€ 0.00 million
Szentgotthard - Szombathely - Celldömölk	99 km	€ 0.00 million
Biharkeresztes - Puspukladany	51 km	€ 0.00 million
Szekesfehervar - Borgond - Pusztaszabolcs - Adony - Cegled	107 km	€ 0.00 million
Cegled - Kecskemet - Szeged - Röszke	133 km	€ 0.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Rajka (Nickelsdorf -) - Hegyeshalom - Györ - Tatabanya - Budapest - Kecskemet - Szeged - Nagylak	387 km	€ 840.00 million
V	Tornyiszentmiklos - Becsehely - Nagykanizsa - Balatonszentgyörgy - Zamardi - Balatonaliga - Szekesfehervar - Budapest - Gyöngyös - Füzesabony - Nyekladhaza - Polgar - Nyiregyhaza - Zahony/Barabas	591 km	€ 2,385.00 million
V (to Rijeka)	Letenye - Becsehely	7 km	€ 30.00 million
V (to Ploce)	Udvar/Illocska - Mohacs - Szekszard - Dunaujvaros - Budapest	186 km	€ 740.00 million
X (to Beograd)	Budapest - Kecskemet - Kiskunfelegyhaza - Szeged - Röszke	148 km	€ 380.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Polgar - Debrecen - Artand	116 km	€ 340.00 million
Sahy - Vac - Budapest	80 km	€ 160.00 million
Tornyosnemeti - Miskolc - Nyekladhaza	84 km	€ 340.00 million

Inland Waterway Network

Alignment	Length	Cost estimation
Danube (Gabcikovo - Sap - Klizska Nema - Szob - Budapest - Szazhalombatta - Hoduna)	417 km	€ 400.00 million

Airports

Location	Number	Cost estimation
Budapest	1	€ 286.00 million

Riverports

Location	Number	Cost estimation
Györ-Gonyu; Komarom; Budapest; Dunaujvaros; Baja; Mohacs	6	€ 84.00 million

Terminals

Location	Number	Cost estimation
Bekescsaba; Budapest; Budapest Jozsefvaros; Györ; Szolnok; Budafok Haros; Miskolc; Nagykanizsa; Nyiregyhaza; Szekesfehervar; Zahony; Kaposvar; Pecs; Baja; Kiskundorozsma; Szeged; Debrecen; Sopron; Szombathely	19	€ 0.00 million

Summary for Hungary

Infrastructure lines	*Length*	*Cost estimation*
Railways	2719 km	€ 996.30 million
out of which Backbone	*1585 km*	*€ 769.10 million*
out of which Additional	*1134 km*	*€ 227.20 million*
Roads	1438 km	€ 4,775.00 million
out of which Backbone	*1158 km*	*€ 3,935.00 million*
out of which Additional	*280 km*	*€ 840.00 million*
Inland Waterway	417 km	€ 400.00 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	1	€ 286.00 million
Riverports	6	€ 84.00 million
Terminals	19	€ 0.00 million
TOTAL		**€ 6,541.30 million**

Table 3-5: Construction cost for the Network - Hungary

Latvia

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Valga - Valmiera - Ieriki - Riga - Jelgava - Meitene	248 km	€ 174.00 million
West/ East link	Ventspils - Tukums - Jelgava - Krustpils - Rezekne - Zilupe	452 km	€ 336.10 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Liepaja - Gluda - Jelgava	180 km	€ 125.00 million
Riga - Krustpils - Daugavpils - Indra	293 km	€ 204.00 million
Karsava - Rezekne - Daugavpils - Eglaine	165 km	€ 103.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Ainazi - Svetciems - Vitrupe - Baltezers - Saukalne - Salaspils -(Riga-) Kekava - Grenctale	222 km	€ 100.49 million
I (to Gdansk)	Kekava - (Riga -) Berzpils - Dalbe - Meitene	89 km	€ 12.79 million
West/ East link	Liepaja - Skulte - Berzpils - Kekava - (Riga -) Salaspils - Saukalne - Ogre - Koknese - Jekabpils - Rezekne - Terehova	547 km	€ 162.39 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Ventspils - Priedaine - (Skulte -) Babite - Riga - Baltezers - Incukalns - Valka	353 km	€ 67.04 million
Jekabpils - Nicgale - Daugavpils - Paternieki	159 km	€ 16.46 million
Grebneva - Rezekne - Daugavpils - Medums	178 km	€ 18.12 million

Airports

Location	Number	Cost estimation
Riga; Ventspils; Liepaja	3	€ 74.00 million

Seaports

Location	Number	Cost estimation
Riga; Ventspils; Liepaja	3	€ 569.30 million

Terminals

Location	Number	Cost estimation
Riga; Ventspils; Liepaja	3	€ 28.03 million

Summary for Latvia

Infrastructure lines	*Length*	*Cost estimation*
Railways	1338 km	€ 942.10 million
out of which Backbone	*700 km*	*€ 510.10 million*
out of which Additional	*638 km*	*€ 432.00 million*
Roads	1520 km	€ 373.96 million
out of which Backbone	*830 km*	*€ 272.34 million*
out of which Additional	*690 km*	*€ 101.62 million*
Infrastructure nodes	*Number*	*Cost estimation*
Airports	3	€ 74.00 million
Seaports	3	€ 569.30 million
Terminals	3	€ 28.03 million
TOTAL		**€ 1,987.39 million**

Table 3-6: Construction cost for the Network - Latvia

Lithuania

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Meitene - Siauliai - Radviliskis - Gaiziunai - Palemonas - Kaunas - Kazlu Ruda - Sestokai - Mockava	422 km	€ 554.66 million
I (to Gdansk)	Radviliskis - Pagegiai	147 km	€ 18.68 million
IX (to Klaipeda)	Klaipeda - Kretinga - Kuziai - Siauliai - Radviliskis - Gaiziunai - Kaisiadorys - Vilnius - Kena	414 km	€ 798.17 million
IX (to Kaliningrad)	Kybartai - Kazlu Ruda - Kaunas - Palemonas - Kaisiadorys	125 km	€ 111.99 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Radviliskis - Panevezys - Kupiskis - Rokiskis - Sapeliai	163 km	€ 48.90 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Salociai - Riaubonys - Panevezys - Kedainiai - Paneveziukas - Sitkunai - Kaunas - Garliava - Mauruciai - Puskelniai - Marijampole - Kalvarija - S. Radiske	273 km	€ 164.60 million
I (to Gdansk)	Kalviai - Siauliai - Kryzkalnis - Taurage - Pagegiai - Panemune	186 km	€ 77.30 million
IX (to Klaipeda)	Klaipeda - Kyzkalnis - Paneveziukas - Sitkunai - Kaunas - Vilnius - Medininkai	340 km	€ 150.80 million
IX (to Kaliningrad)	Kybartai - Vilkaviskis - Marijampole - Puskelniai - Mauruciai - Garliava - Kaunas	106 km	€ 51.10 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Palanga - Kretinga - Telsiai - Siauliai - Radviliskis - Panevezys - Ukmerge - Vilnius - Salcininkai	407 km	€ 122.75 million
Vilnius - Trakai - Prienai - Marijampole	128 km	€ 33.10 million
Klaipeda - Silute - Pagegiai	86 km	€ 21.10 million
Kaunas - Jonava - Ukmerge - Utena - Zarasai	179 km	€ 39.50 million

Inland Waterway Network

Alignment	Length	Cost estimation
Klaipeda - Jurbarkas - Kaunas	278 km	€ 0.00 million

Airports

Location	Number	Cost estimation
Vilnius; Kaunas; Palanga	3	€ 140.90 million

Riverports

Location	Number	Cost estimation
Kaunas	1	€ 0.00 million

Seaports

Location	Number	Cost estimation
Klaipeda	1	€ 551.30 million

Terminals

Location	Number	Cost estimation
Kaunas; Klaipeda	2	€ 0.00 million

Summary for Lithuania

Infrastructure lines	*Length*	*Cost estimation*
Railways	1100 km	€ 1,381.73 million
out of which Backbone	*937 km*	*€ 1,332.83 million*
out of which Additional	*163 km*	*€ 48.90 million*
Roads	1617 km	€ 614.65 million
out of which Backbone	*817 km*	*€ 398.20 million*
out of which Additional	*800 km*	*€ 216.45 million*
Inland Waterway	278 km	€ 0.00 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	3	€ 140.90 million
Riverports	1	€ 0.00 million
Seaports	1	€ 551.30 million
Terminals	2	€ 0.00 million
TOTAL		**€ 2,688.58 million**

Table 3-7: Construction cost for the Network – Lithuania

Remark:

The length of the rail backbone network in Lithuania will be reduced by 79 km in 2015, when new infrastructure will replace the existing (section Kazlu Ruda – Mockava).

Poland

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Mockava - Trakiszki - Sokolka - Bialystok - Warszawa	340 km	€ 1,047.00 million
I (to Gdansk)	Gronowo - Braniewo - Bogaczewo - Malbork - Tczew - Gdansk	141 km	€ 253.20 million
II	Kunowice - Rzepin - Zbaszynek - Poznan - Konin - Ponetow/Barlogi - Kutno - Lowicz - Warszawa - Lukow - Terespol *additional line for freight:* Lowicz - Msczonow - Pilawa - Lukow	869 km	€ 1,839.10 million
III	Wroclaw - Opole - Gliwice - Chorzow - Katowice - Myslowice - Trzebinia - Krakow - Podleze - Tarnow - Przeworsk - Przemysl - Medyka *additional line for freight:* Wroclaw - Jelcz - Opole - Kedzierzyn Kozle - Gliwice	669 km	€ 1,353.00 million
III (to Dresden)	Zgorzelec - Wegliniec - Legnica - Wroclaw	163 km	€ 416.00 million
VI	Gdynia - Gdansk - Tczew - Warszawa - Grodzisk Mazowiecki - Szeligi/Mszczonow - Idzikowice - Psary - Zawiercie - Katowice - Czechowice-Dziedzice - Bielsko Biala - Zwardon *additional line for freight:* Tczew - Inowroclaw - Ponetow/Barlogi - Zdunska Wola Karsz. - Chorzew Siemkowice - Tarnowskie Gory - Chorzow - Katowice *planned new line:* Psary - Trzebinia - Bielsko Biala	1438 km	€ 4,690.45 million
VI (to Breclav)	Czechowice-Dziedzice - Zebrzydowice	33 km	€ 72.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Wroclaw - Olesnica - Kepno - Wielun Dabrowa - Chorzew Siemkowice - Belchatow Miatso - Piotrkow Tryb. - Idzikowice	252 km	€ 1,112.00 million
Swinoujscie - Szczecin - Rzepin/Poznan - Wroclaw - Strzelin - Kamieniec Zabkowicki - Krosnowice Klodzkie - Miedzylesie	999 km	€ 2,034.72 million
Warszawa - Otwock - Pilawa - Lublin - Rejowiec - Dorohusk	267 km	€ 632.00 million
Kedzierzyn Kozle - Chalupki	54 km	€ 116.00 million
Poznan - Inowroclaw	107 km	€ 258.00 million
Podleze - Tymbark - Nowy Sacz - Muszyna	141 km	€ 658.00 million
Psary - Starzyny - Kozlow - Krakow	71 km	€ 111.20 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
I	Budzisko - Augustow - Bialystok - Ostrow Mazowiecki - Radyzim - Warszawa	339 km	€ 714.00 million
I (to Gdansk)	Grzechotki - Chrusciel - Elblag - Gdansk	114 km	€ 253.00 million
II	Swiecko - Rzepin - Swiebodzin - Tarnowo Podgorne - Poznan - Wrzesnia - Modla - Konin - Krosniewice - Lowicz - Warszawa - Siedlce - Terespol	682 km	€ 3,708.65 million
III	Olszyna - Golnice - Krzywa - Legnica - Wroclaw - Przylesie - Sarny Wlk. - Prady - Wrzoski - Nogawczyce - Gliwice - Katowice - Kosztowy - Krakow - Tarnow - Rzeszow - Lancut - Przeworsk - Radymno - Przemysl - Medyka	756 km	€ 2,893.10 million
IIIa	Zgorzelec - Jedrzychowice - Krzywa	62 km	€ 290.80 million
VI	Gdansk - Pruszcz - Grudziadz - Swiecie - Torun - Wloclawek - Krosniewice - Lodz - Tuszyn - Piotrkow Tryb. - Czestochowa - Kosztowy - Bielsko Biala - Zywiec - Zwardon *additional route via Warszawa*: Gdansk - Elblag - Ostroda - Olsztynek - Mlawa - Plonsk - Zaluski - Zakroczym - Czosnow - Warszawa - Janki - Rawa Maz. - Piotrkow Tryb.	1077 km	€ 3,367.40 million
VI (to Poznan)	Grudziadz - Swiecie - Bydgoszcz - Gniezno - Poznan	190 km	€ 375.00 million
VI (to Breclav)	Bielsko Biala - Cieszyn *planned new motorway:* Czestochowa - Gliwice - Gorzyczki	180 km	€ 1,175.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Warszawa - Garwolin - Ryki - Kurow - Lublin - Piaski - Chelm - Dorohusk	243 km	€ 364.00 million
~~Swinousjscie - Goleniow - Szczecin - Swiebodzin - Legnica - Bolkow - Lubawka~~	466 km	€ 1,805.00 million
Piaski - Krasnystaw - Zamosc - Tomaszow Lub. - Hrebenne	125 km	€ 144.00 million
Torun - Sierpc - Plonsk	146 km	€ 595.00 million
Rzeszow - Barwinek	91 km	€ 320.00 million
Piotrkow Tryb. - Wroclaw - Bolkow	300 km	€ 1,755.00 million
Kolbaskowo - Szczecin	13 km	€ 28.00 million

Inland Waterway Network

Alignment	Length	Cost estimation
Warta - Notec - Bydgoszcz Canal - Brda	306 km	€ 0.00 million
Gliwice Canal	41 km	€ 20.00 million
Wisla	184 km	€ 0.00 million
Odra	682 km	€ 416.50 million

Airports

Location	Number	Cost estimation
Warszawa; Gdansk; Poznan; Rzeszow; Katowice; Krakow; Wroclaw; Szczecin	8	€ 2,930.75 million

Riverports

Location	Number	Cost estimation
Ujscie; Krzyz; Malczyce; Wroclaw; Kedzierzyn Kozle; Opole; Bydgoszcz; Malbork; Scinawa; Glogow; Nowa Sol; Cigacice; Krosno Odrzanskie; Kostrzyn	14	€ 0.35 million

Seaports

Location	Number	Cost estimation
Gdynia; Gdansk; Szczecin; Swinoujscie	4	€ 716.61 million

Terminals

Location	Number	Cost estimation
Warszawa; Bialystok; Poznan Garbary; Poznan Gadki; Poznan Franowo; Pruszkow; Slawkow; Rzepin; Malaszewicze; Krakow; Sosnowiec; Wroclaw; Rzesow; Gliwice; Lodz; Gdansk; Gdynia; Swinoujscie; Szczecin	19	€ 176.85 million

Summary for Poland

Infrastructure lines	*Length*	*Cost estimation*
Railways	5493 km	€ 14,483.47 million
out of which Backbone	*3610 km*	*€ 9,578.67 million*
out of which Additional	*1883 km*	*€ 4,904.80 million*
Roads	4699 km	€ 17,549.95 million
out of which Backbone	*3315 km*	*€ 12,538.95 million*
out of which Additional	*1384 km*	*€ 5,011.00 million*
Inland Waterway	1213 km	€ 436.50 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	8	€ 2,930.75 million
Riverports	14	€ 0.35 million
Seaports	4	€ 716.61 million
Terminals	19	€ 176.85 million
TOTAL		**€ 36,294.48 million**

Table 3-8: Construction cost for the Network – Poland

Remark:

The length of the road backbone network in Poland will be reduced by 33 km in 2015, when new infrastructure will replace the existing (section Cesky Tesin – Bielsko Biala).

Romania

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Curtici - Arad - Simeria - Vintu de Jos - Alba Iulia - Coslariu - Copsa Mica - Brasov - Ploiesti - Bucuresti - Fetesti - Medgidia - Constanta *link to Bulgaria:* Arad - Timisoara - Caransebes - Drobeta Tr. Severin - Strehaia - Craiova - Calafat	1349 km	€ 3,091.30 million
IX	Ungheni - Cristesti Jijia - Iasi - Pascani - Bacau - Adjud - Marasesti - Focsani - Buzau - Ploiesti - Bucuresti - Videle - Giurgiu	687 km	€ 636.40 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Halmeu - Satu Mare - Oradea - Cluj Napoca - Apahida - Coslariu	411 km	€ 224.00 million
Buzau - Faurei - Braila - Galati - Reni	149 km	€ 74.10 million
Craiova - Rosiori - Videle	158 km	€ 242.90 million
Vicsani - Suceava - Pascani	104 km	€ 111.60 million
Vintu de Jos - Sibiu - Rimnicu Vilcea - Pitesti - Bucuresti	346 km	€ 0.00 million
Oradea - Episcopia Bihor	10 km	€ 0.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Nadlac - Timisoara - Lugoj - Deva - Sebes - Sibiu - Pitesti - Bucuresti - Lehliu - Fetesti - Cernavoda - Constanta - Agigea *link to Bulgaria:* Lugoj - Caransebes - Orsova - Drobeta-T. Severin - Craiova - Calafat	1213 km	€ 3,863.80 million
IX	Albita - Marasesti - Buzau - Bucuresti - Giurgiu	418 km	€ 1,077.20 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Timisoara - Moravita	73 km	€ 320.00 million
Craiova - Bucuresti	172 km	€ 0.00 million
Biharea - Oradea - Zalau - Cluj Napoca - Turda - Sebes	280 km	€ 0.00 million
Siret - Suceava - Sabaoani - Bacau - Marasesti	277 km	€ 0.00 million
Halmeu - Satu Mare - Acis - Zalau	125 km	€ 0.00 million

Inland Waterway Network

Alignment	Length	Cost estimation
Danube (Bazias - Cernavoda Port - Braila Port - Sulina Port)	1075 km	€ 97.33 million
Danube - Black Sea Canal (Cernavoda Port - Poarta Alba - Constanta Port)	64 km	€ 147.32 million
Poarta Alba - Midia - Navodari Canal Branch	28 km	€ 13.25 million

Airports

Location	Number	Cost estimation
Arad; Bucuresti Baneasa; Bucuresti Otopeni; Constanta; Timisoara; Bacau; Iasi; Suceava; Sibiu	9	€ 114.40 million

Riverports

Location	Number	Cost estimation
Tulcea (Commercial + Metalurgical); Galati (Commercial + Metalurgical); Braila; Cernavoda; Calarasi (Commercial + Metalurgical); Oltenita; Drobeta Turnu Severin; Moldova Veche; Sulina; Giurgiu	15	€ 134.50 million

Seaports

Location	Number	Cost estimation
Constanta	1	€ 373.20 million

Terminals

Location	Number	Cost estimation
Alba Iulia; Brasov; Arad; Bucuresti 16 Februarie; Bucuresti Titan; Craiova; Constanta; Deva; Medias; Ploiesti; Socola; Timisoara; Tulcea; Bacau; Buzau; Galati	16	€ 0.00 million

Summary for Romania

Infrastructure lines	*Length*	*Cost estimation*
Railways	3155 km	€ 4,303.60 million
out of which Backbone	*1977 km*	*€ 3,651.00 million*
out of which Additional	*1178 km*	*€ 652.60 million*
Roads	2534 km	€ 5,139.30 million
out of which Backbone	*1607 km*	*€ 4,819.30 million*
out of which Additional	*927 km*	*€ 320.00 million*
Inland Waterway	1167 km	€ 257.90 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	9	€ 114.40 million
Riverports	15	€ 134.50 million
Seaports	1	€ 373.20 million
Terminals	16	€ 0.00 million
TOTAL		**€ 10,322.90 million**

Table 3-9: Construction cost for the Network - Romania

Slovakia

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Brodske - Kuty - Malacky - Devinska Nova Ves - Bratislava - Petrzalka (- Kittsee) - Rusovce; Bratislava - Galanta - Palarikovo - Nove Zamky - Sturovo - Szob	252 km	€ 520.60 million
V (to Bratislava)	Bratislava - Trnava - Leopoldov - Nove Mesto n. Vahom - Puchov - Zilina - Vrutky - Strba - Poprad - Margecany - Kysak - Kosice - Cierna n. T. - Cop	544 km	€ 1,142.10 million
VI	Serafinov - Svrcinovec - Cadca - Zilina	51 km	€ 65.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Kosice - Plesivec - Jesenske - Filakovo - Lucenec - Zvolen - Hronska Dubrava - Kozarovce - Levice - Surany - Palarikovo - Nove Zamky - Komarom	404 km	€ 83.00 million
Muszyna - Plavec - Presov - Kysak	78 km	€ 0.00 million
Kosice - Cana - Hidasnemeti	17 km	€ 0.00 million
Leopoldov - Sered - Galanta	30 km	€ 92.00 million
Horni Lidec - Puchov	22 km	€ 0.00 million
Mosty u Jablunkova - Svrcinovec	2 km	€ 0.00 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
IV	Lanzhot - Bratislava - Jarovce (- Kittsee) - Cunovo	83 km	€ 98.00 million
V (to Bratislava)	Bratislava - Horna Streda - Nove Mesto n. Vahom - Chocholna - Nemsova - Ladce - Sverepec - Hr. Podhradie - Visnove - Dubna Skala - Hubova - Ivachnova - Hybe - Vazec - Mengusovce - Janovce - Jablonov - Beharovce - Presov - Budimir - Kosice - Bidovce - Dargov - Pozdisovce - Vysne Nemecke (Zahor)	546 km	€ 3,363.45 million
VI	Zwardon - Skalite - Kys. N. Mesto - Hr. Podhradie	64 km	€ 670.00 million

Alignment of the "Additional Network Components"

Alignment	Length	Cost estimation
Dubna Skala - Ziar - Zvolen - Sahy	154 km	€ 768.70 million
Vysny Komarnik - Svidnik - Presov	81 km	€ 500.00 million
Kosice - Tornyosnemeti	21 km	€ 137.10 million

Inland Waterway Network

Alignment	Length	Cost estimation
Danube (Devin - Bratislava - Sap - Klizska Nema - Szob)	172 km	€ 0.00 million

Airports

Location	Number	Cost estimation
Bratislava; Kosice; Poprad	3	€ 26.50 million

Riverports

Location	Number	Cost estimation
Bratislava; Komarno	2	€ 0.00 million

Terminals

Location	Number	Cost estimation
Bratislava; Zilina; Kosice; Cierna n. T.	4	€ 0.00 million

Summary for Slovakia

Infrastructure lines	*Length*	*Cost estimation*
Railways	1400 km	€ 1,902.70 million
out of which Backbone	*847 km*	*€ 1,727.70 million*
out of which Additional	*553 km*	*€ 175.00 million*
Roads	949 km	€ 5,537.25 million
out of which Backbone	*693 km*	*€ 4,131.45 million*
out of which Additional	*256 km*	*€ 1,405.80 million*
Inland Waterway	172 km	€ 0.00 million
Infrastructure nodes	*Number*	*Cost estimation*
Airports	3	€ 26.50 million
Riverports	2	€ 0.00 million
Terminals	4	€ 0.00 million
TOTAL		**€ 7,466.45 million**

Table 3-10: Construction cost for the Network - Slovakia

Slovenia

Railway Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
V	Sezana/Koper - Divaca - Pivka - Ljubljana - Zidani Most - Pragersko - Ormoz - Puconci - Hodos	412 km	€ 817.36 million
X	Jesenice - Ljubljana - Zidani Most - Dobova	186 km	€ 131.50 million
X (to Graz)	Sentilj - Maribor - Pragersko - Zidani Most	108 km	€ 88.80 million

Road Network

Alignment of the "Backbone Network"

Corridor	Alignment	Length	Cost estimation
V	Fernetici/Koper - Divaca - Ljubljana - Vransko - Slivnica - Maribor - Pince	347 km	€ 1,757.00 million
X	Karavanke - Vrba - Kranj - Sentvid - Ljubljana - Visnja Gora - Bic - Krska Vas - Obrezje	184 km	€ 543.00 million
X (to Graz)	Sentilj - Maribor - Gruskovje	50 km	€ 319.60 million

Airports

Location	Number	Cost estimation
Maribor; Portoroz; Ljubljana	3	€ 28.00 million

Seaports

Location	Number	Cost estimation
Koper	1	€ 0.00 million

Terminals

Location	Number	Cost estimation
Maribor; Celje; Ljubljana; Novo Mesto	4	€ 0.00 million

Summary for Slovenia

Infrastructure lines	*Length*	*Cost estimation*
Railways	569 km	€ 903.56 million
out of which Backbone	*569 km*	*€ 903.56 million*
out of which Additional	*0 km*	*€ 0.00 million*
Roads	566 km	€ 2,619.60 million
out of which Backbone	*566 km*	*€ 2,619.60 million*
out of which Additional	*0 km*	*€ 0.00 million*
Infrastructure nodes	*Number*	*Cost estimation*
Airports	3	€ 28.00 million
Seaports	1	€ 0.00 million
Terminals	4	€ 0.00 million
TOTAL		**€ 3,551.16 million**

Table 3-11: Construction cost for the Network - Slovenia

Cost estimation for the proposed measures by country and mode (all cost in million EURO)

	Rail	Road	Inland Waterway	Airport	River ports	Sea ports	Terminals	TOTAL
Bulgaria	2130.0	2773.5	0.0	59.4	54.9	489.1	73.0	5579.9
Cyprus	-	302.8	-	211.2	-	270.0	-	784.0
Czech Republic	3937.9	5829.2	700.1	231	24.7		8.5	10731.4
Estonia	259.3	289.9	-	35.7	-	15.0	0.0	599.9
Hungary	996.3	4775.0	400.0	286.0	84.0	-	0.0	6541.3
Latvia	942.1	374.0	-	74.0	-	569.3	28.03	1987.4
Lithuania	1381.73	614.7	0.0	140.9	0.0	551.3	0.0	2688.6
Poland	14483.5	17550.0	436.5	2930.8	0.4	716.6	176.9	36294.5
Romania	4303.6	5139.3	257.9	114.4	134.5	373.2	0.0	10322.9
Slovakia	1902.7	5537.25	0.0	26.5	0.0	-	0.0	7466.5
Slovenia	903.6	2619.6	-	28.0	-	0.0	0.0	3551.2
TOTAL	31240.7	45805.1	1794.5	4137.9	298.5	2984.5	286.4	86547.4

Table 3-12: Cost estimation for the proposed measures by country and mode

Allocation of the money for the proposed measures between three time periods up to 2015, according to national plans

Period	Total amount of money to be spent for the construction of the Network
1999 – 2005	€ 25 630 million
2005 – 2010	€ 25 240 million
2010 – 2015	€ 35 680 million

Table 3-13: Allocation of the money for the proposed measures between three time periods up to 2015, according to national plans

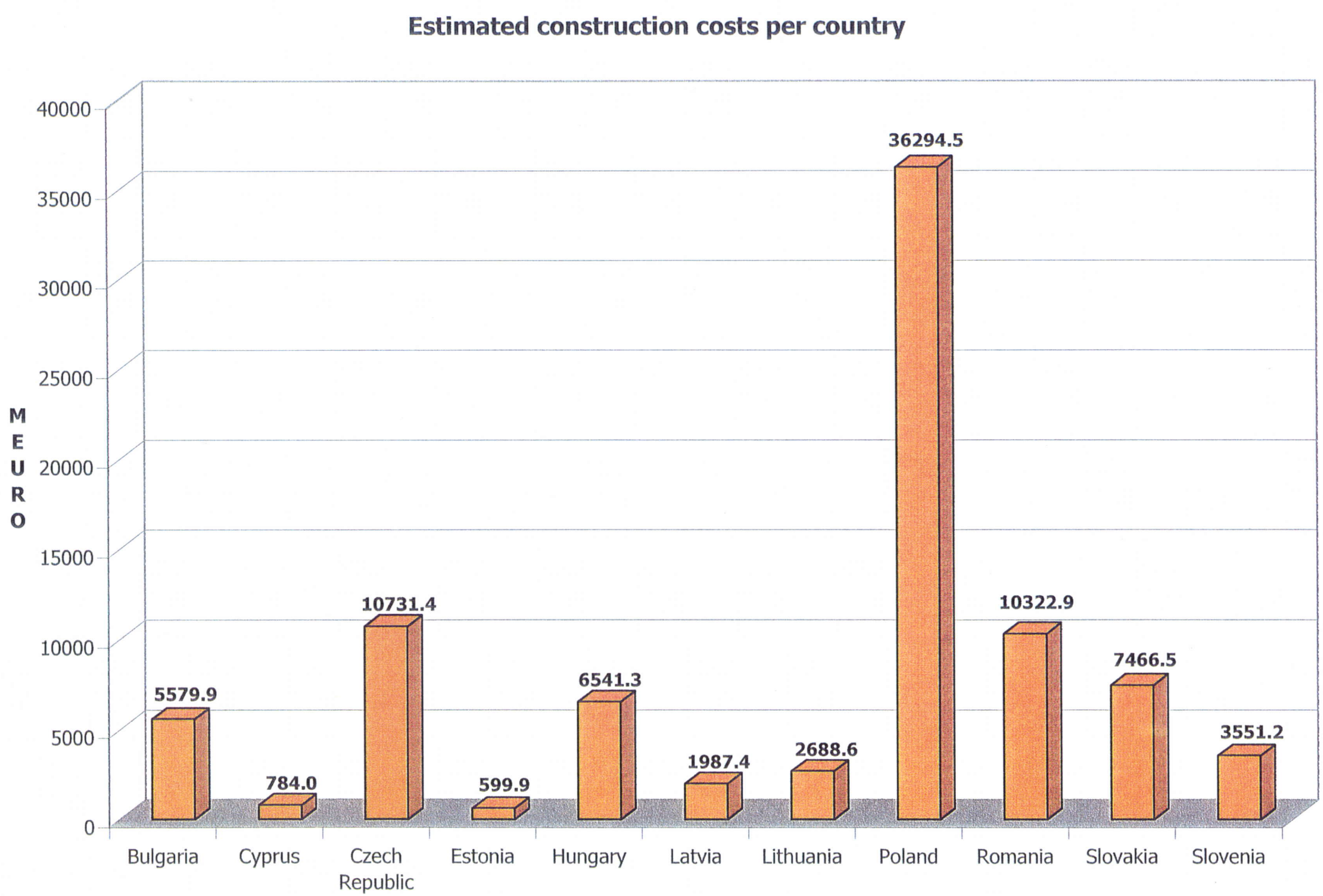

Diagram 3-2: Estimated construction costs per country

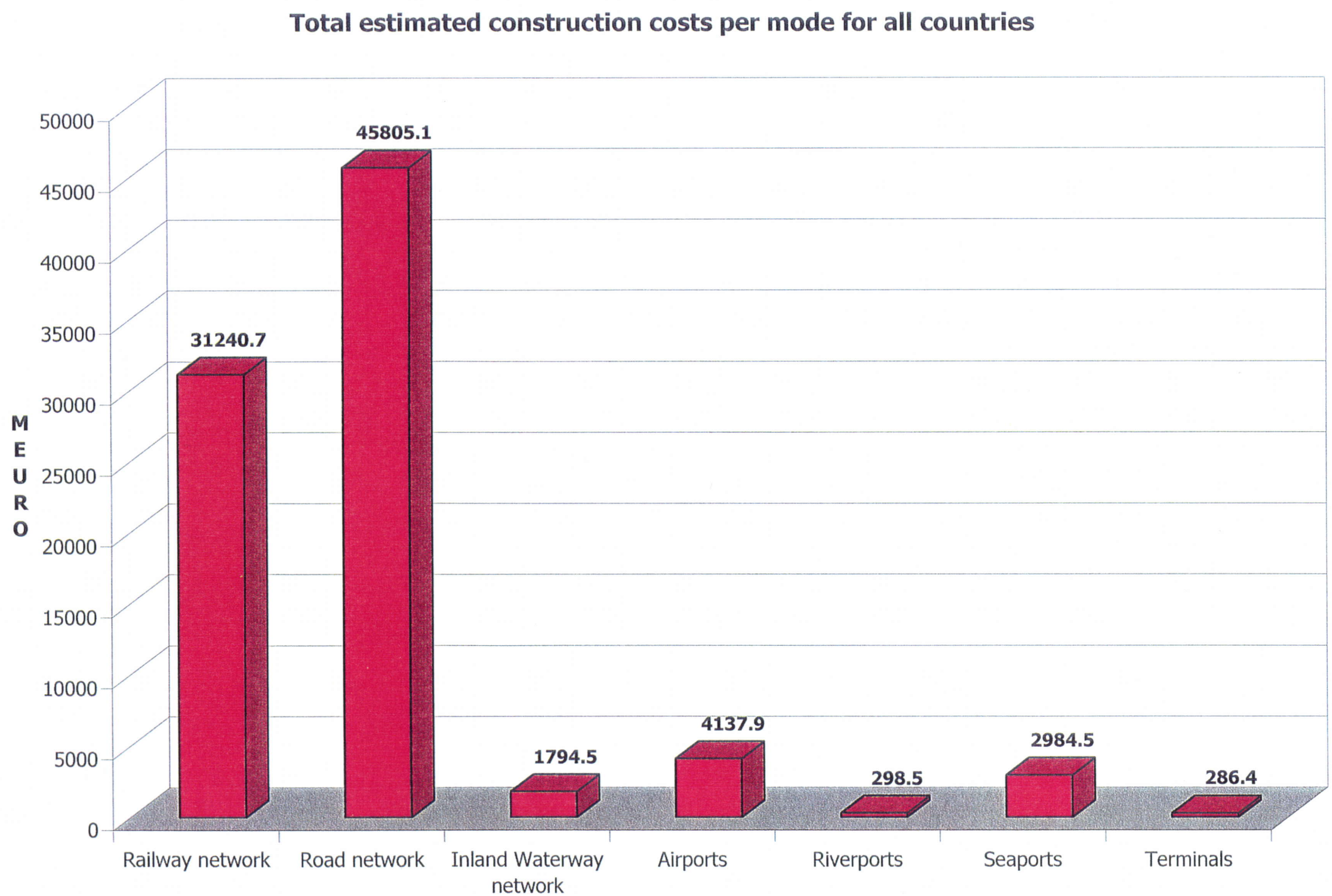

Diagram 3-3: Total estimated construction costs per mode for all countries

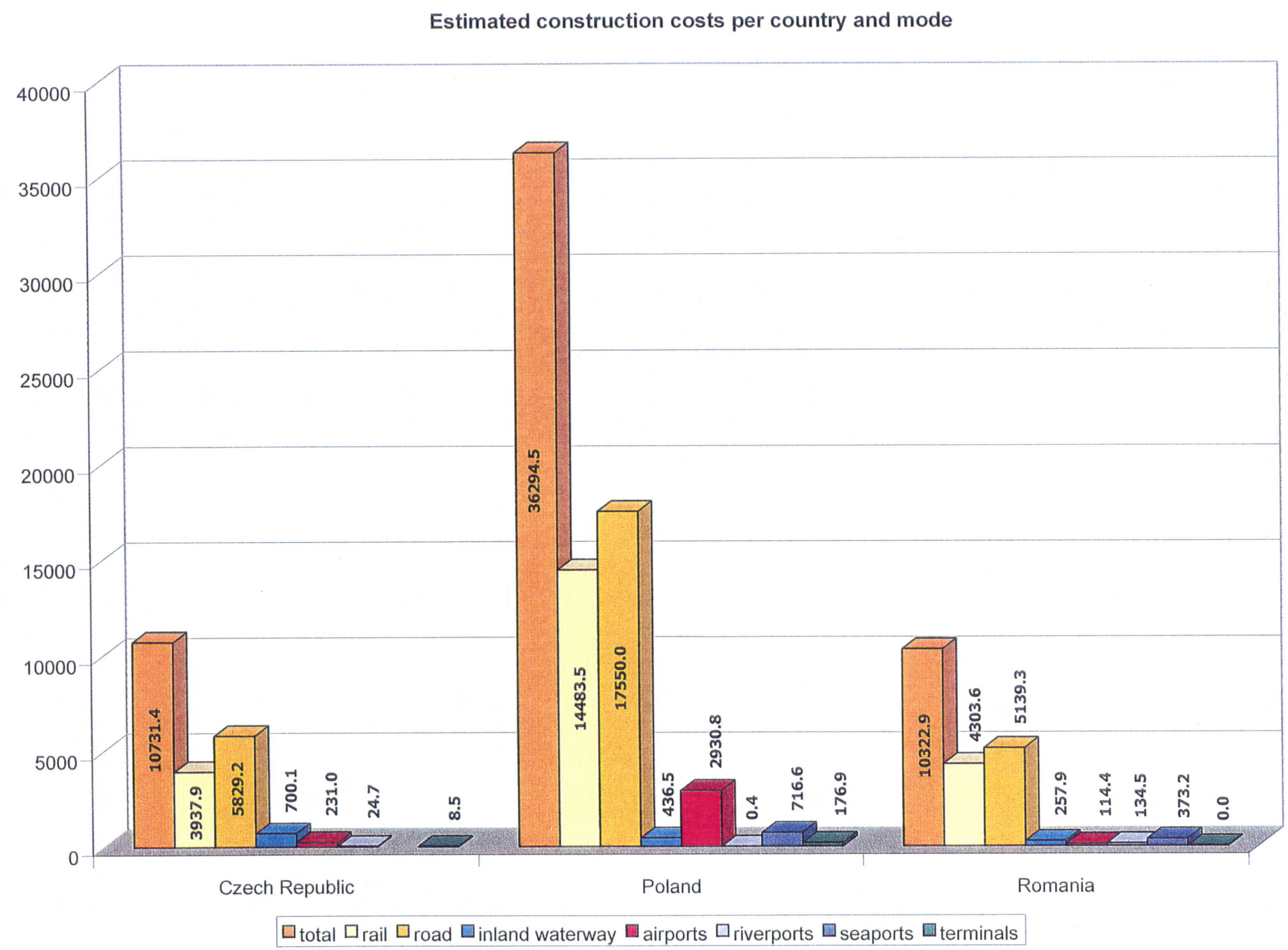

Diagram 3-4: Estimated construction costs per country and mode for Czech Republic, Poland and Romania

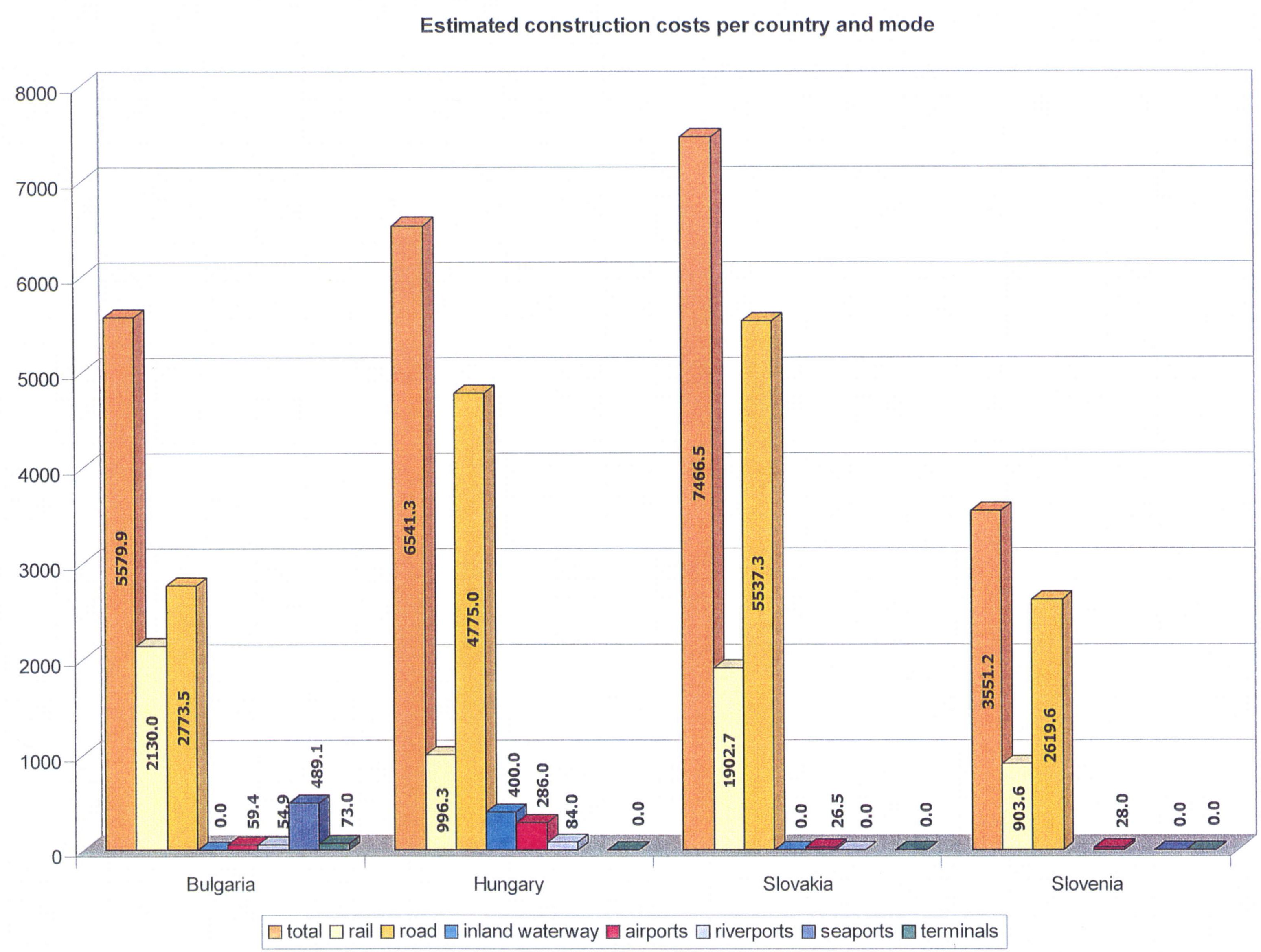

Diagram 3-5: Estimated construction costs per country and mode for Bulgaria, Hungary, Slovakia and Slovenia

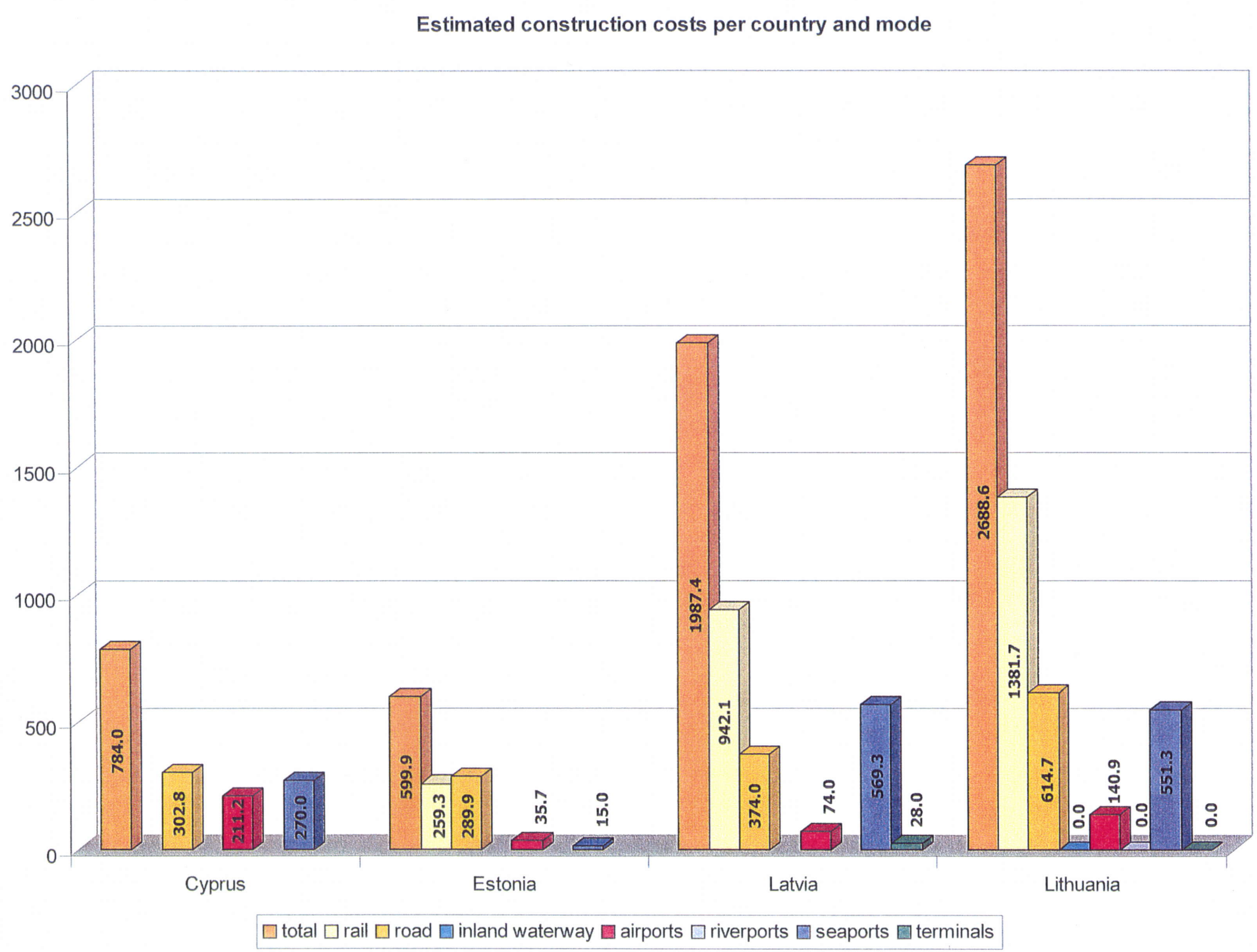

Diagram 3-6: Estimated construction costs per country and mode for Cyprus, Estonia, Latvia and Lithuania

3.3.2 Individual calculation of the costs

In addition to the countries' estimations, the Secretariat attempted to calculate the construction cost of the TINA road and rail network on a section by section basis, using the results of the relevant PHARE Study **"Updating of Transport Unit Costs in Acceding Countries"**, by COWI. More information on the COWI Study on upgrading of Infrastructure Costs in acceding countries is given in the Box.

Updating of Transport Unit Costs in Acceding Countries.

Background, objectives and scope of work

A study undertaken by COWI in 1995 estimated the overall costs of upgrading the road and rail infrastructure in 7 countries in east and central Europe. In 1997 COWI was (under the PHARE Framework Contract) asked to carry out an update and to extend the scope of work to include the following countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

The aim of the study was to identify new unit cost estimates for the road and rail segments that are included in the Helsinki corridors together with a few additional links (i.e. the TINA Backbone network with 18,000 km of road and 20,000 km of railway lines). The unit costs are used to calculate the investments in upgrading the TINA backbone network in the period until year 2015.

The Terms of Reference comprised the following tasks:

- Review of previous studies
- Updating of unit costs
- Collection of infrastructure data
- Review of cost estimates from feasibility studies
- Review of actual construction costs from tenders
- Analysis and assessment of cost estimates and preparation of final cost estimates
- Development of data base
- Updating of cost calculations
- Verifications from Phare Partner countries
- Reporting

Methodology

It was soon realized that the previous study did not have the degree of details wanted for the present study and the same conclusion was made for the available feasibility studies. As an example they did not have any breakdown of the unit costs but only a total cost per kilometer of road or rail.

Consequently, the project was organized by activating local consultants in each of the 10 countries in order to collect updated and much more detailed data. Up-to-date information on construction costs for road and railway works has been collected by the study team (including local consultants) during visits in the 10 countries. The availability of data from recent tenders was in some countries very scarce due to the fact that the activity in new construction and rehabilitation of roads and railways has been low during the past 6-8 years. In such cases theoretical calculations and data from previous periods updated to present conditions supplemented the collected data. The collected data was compared internally and compared with other sources of information in order to validate the data.

The unit costs for each country are defined according to certain parameters: The unit costs for motorways are related to specific type of terrain (flat, hilly or mountainous), the degree of urbanization (rural or urban), the need for new major bridges and rest areas, etc. The unit costs for railway infrastructure are defined to reflect elements such as the number of tracks, the type and number of stations, whether the tracks are high speed or normal speed, whether or not they are electrified, etc. The recommended unit costs have been compiled in a new user-friendly Access database comprising information on more than 1,000 sections of road and rail works.

Main findings:

The following general remarks can be made:

Roads:

- In general the new figures seem to be approximately in the same level as in 1995, even if there are wide limits for variations.
- For some countries, the prices seem to be extremely low.
- The prices for the items that may be produced by use of local materials and by local staff are generally low while the items to be imported are much higher.
- In some countries there is no approved standard for some of the motorway elements such as Maintenance Centres and Rest Areas. This means that it is difficult to compare the prices.

Railways:

- In general it has in some countries been difficult to get actual tender results for railway works in countries with no railway construction during the past 2-3 years.
- The prices are in some cases from actual works but often supplemented by theoretical calculations.
- The countries have different standards for various items. Consequently, the unit costs are not directly comparable from one country to the others.

It is important to underline that the unit costs are based on a limited number of actual tender results. They reflect the present price levels in the 10 countries and they should not be used uncritically during the coming years. It is expected that the unit costs will get closer to the "international" level during the coming 10-20 years when the countries approach the EU.

Future work

The unit costs may easily be updated whenever new information becomes available e.g. from new tender results.

A general finding is that it is of utmost importance to have access to a detailed description of the work to be carried out on each section in order to apply the correct unit cost. The TINA Secretariat can in the future undertake collection of such descriptions.

During the calculation of the investments' costs -using the COWI unit costs-, it was found that the correlation between the real investment measures and the categories of costs identified by COWI could not be always successful. Real investments many times have specific costs elements, which are impossible to identify unless an individual cost analysis for the specific project is undertaken. However, a considerable number of reported investments could be sufficiently correlated to the COWI unit costs (corresponding to 50 % of the total investment costs). This exercise gave interesting results, which can provide a "second opinion" for the real cost of the road and rail TINA network.

The work followed the following stages:

In order to use the COWI results for the costing of the network, the TINA Secretariat, together with COWI, made an analysis of the reported investments from the countries, in order to correlate them with the work categories used in the COWI study (for which the unit cost was calculated)

- the countries were then informed of the analysis, and made remarks and suggestions;
- the Secretariat collected information (from the countries) regarding the terrain for each project. This was a necessary step, since the COWI analysis for unit costs identified five cost categories for each work activity, depending on the terrain category (flat/rural, hilly/rural, mountainous/rural, flat/urban and hilly/urban);
- using the analysis of the investments into COWI work categories, the information about the terrain, and the unit costs from COWI, the Secretariat elaborated its own estimation of the cost of the total network.

The relevant findings for the costing of the network indicate some discrepancies between estimated versus calculated costs. It seems that some countries have seriously overestimated the cost of their planned investments, while some other countries rather underestimated the relevant costs. Bulgaria, Estonia, Lithuania for rail, Romania for roads and Slovenia for rail made estimations which do match well with the COWI results.

From the analysis, it is concluded that the total cost of the road and rail TINA network can be reduced to 60 - 80 % of the reported cost by the countries (EURO 50 - 60 billion instead of EURO 77 billion).

Table 3-14 shows the results by country and mode.

Country	Road Projects				Rail Projects			
	% of comparison	**Estimated Cost**	**Calculated Cost**	**Calculated/ Estimated**	**% of comparison**	**Estimated Cost**	**Calculated Cost**	**Calculated/ Estimated**
Bulgaria	58	1609.5	1534.5	0.95	61	1300	1481.7	1.14
Cyprus	-	-	-	-	-	-	-	-
Czech Rep.	37	2184.8	1014.1	0.46	71	2777.3	1395.7	0.50
Estonia	50	143.6	129.9	0.90	55	143.9	131.1	0.91
Hungary	63	2995	1147.3	0.38	-	-	-	-
Latvia	60	225.1	458	2.04	84	788.1	507.1	0.64
Lithuania	33	202.6	268.3	1.32	58	803.9	722.1	0.90
Poland	52	9051.1	4586.2	0.51	55	8009.4	4269.1	0.53
Romania	96	4913.3	4681.7	0.95	-	-	-	-
Slovakia	37	2065.8	623.4	0.30	94	1797	784.7	0.44
Slovenia	-	-	-	-	99	899.1	783.6	0.87
Total	51	23390.8	14442.9	0.62	53	16518.7	10075.1	0.61

Table 3-14: Costing of the road and rail TINA network using the unit costs provided by COWI

3.4 REMARKS ON THE FINANCIAL PERSPECTIVES TO CONSTRUCT THE NETWORK

Table 3-15 in the next page gives some useful indices for the TINA network versus the TENs.

This table sets out some interesting features of the TINA network in comparison to the Union's Trans-European Transport Network.

The ratio of network length to surface area is an indicator of the density of the network; this is generally significantly lower in the acceding countries than inside the EU, although the density of the network in some TINA countries (e.g. Slovenia) is very close to that of the TENs, and in Cyprus (roads) is even higher.

The ratio of network length to population gives an indication of the relative availability of infrastructure for the population. The Baltic States are surprisingly well-served, compared with both the other candidates and the Union, where the average is of a similar order to that of the candidates.

The ratios of construction cost to GDP, as well as of construction cost to population, are partial indicators of the prospects for financing the network. Clearly, there will in general be fewer problems in financing the network where these ratios are relatively low. This comment should however be qualified by an examination of the ratio of construction cost to per capita GDP. This will show for example that, although Slovenia has a very high ratio of construction cost to population, this is in part compensated by its relatively high level of per capita GDP, resulting in a correspondingly greater ability of the country to finance the proposed projects. The construction cost per GDP per capita expressed in % of the population (last column of the table) has the meaning, that for example, in Latvia and Lithuania 3.2 % of the population should contribute till 2015 their 1995 GDP for the construction of the network; the respective percentage in Hungary is only 1.1 % of the population.

Any assessment of the overall prospects for financing the network must therefore take into account the balance of all three indicators.

	Surface Area	Population	Length		Km per thousand km²		Km per million Inhabitants		GDP (Ref: page 21)	GDP/c (Ref: page 21)	Construction Cost	Construction Cost per GDP	Construction Cost per mil. inh.	Construction Cost per GDP/c	
			Roads	**Rails**	**Roads**	**Rails**	**Roads**	**Rails**							
	In km²	**in mil. inh.**	**in km**	**in km**					**in BEURO**	**in EURO**	**in BEURO**		**BEURO**	**in mil. inh.**	**%**
Bulgaria	110994	8.4	2113	2095	19.04	18.87	251.55	249.40	10.1	1200	5.6	0.6	0.66	4.6	**3.1**
Cyprus	9250	0.6	342	-	36.97	-	570.00	-	6.8	10570	0.8	0.1	1.31	0.1	**0.7**
Czech Republic	78860	10.3	1842	2350	23.36	29.80	178.83	228.16	35.9	3490	10.7	0.3	1.04	3.1	**1.7**
Estonia	45227	1.5	1000	570	22.11	12.60	666.67	380.00	2.8	1850	0.6	0.2	0.40	0.3	**1.2**
Hungary	93030	10.2	1438	2719	15.46	29.23	140.98	266.57	34.1	3340	6.5	0.2	0.64	2.0	**1.1**
Latvia	64589	2.5	1520	1338	23.53	20.72	608.00	535.20	3.4	1370	2.0	0.6	0.79	1.5	**3.2**
Lithuania	65300	3.7	1617	1021	24.76	15.64	437.03	275.95	4.6	1225	2.7	0.6	0.73	2.2	**3.2**
Poland	312685	38.6	4666	5493	14.92	17.57	120.88	142.31	91.1	2360	36.3	0.4	0.94	15.4	**2.2**
Romania	238391	22.7	2534	3155	10.63	13.23	111.63	138.99	27.2	1200	10.3	0.4	0.45	8.6	**2.1**
Slovakia	49036	5.4	949	1400	19.35	28.55	175.74	259.26	13.3	2470	7.5	0.6	1.38	3.0	**3.1**
Slovenia	20255	2	566	569	27.94	28.09	283.0	284.50	14.5	7240	3.6	0.2	1.78	0.5	**1.4**
TOTAL TINA	1087617	105.9	18587	20710	17.09	19.04	175.51	195.56	243.8	2302	86.5	0.4	0.82	37.6	**2.0**
EUROPEAN UNION	2238700	372.1	75300	73900	33.64	33.01	202.36	198.60	6414.0	17237					
Ratio CEC/EC	48.6%	28.5%	24.7%	28.0%	50.8%	57.7%	86.7%	98.5%	3.8%	13.4%					

- Reference Network in the 11 Acceding Countries: the TINA Network
- Reference Network in the Member-States: the tr-TENs
- The Construction Cost refers to all modes, and not only to road and rail
- GDP and Population are figures taken from Agenda 2000 for the year 1995

Table 3-15: Main indices for the TINA Network versus TENs-tr

An essential element in the whole TINA planning process (design and agreement on the network) was that this network would have a realistic prospect of its construction being financed. As endorsed by all the Senior Officials' meetings, the realisation of the network must be in line with the financial guideline, foreseeing an average construction cost of about 1.5% of GDP in each country (document **TINA - 10/97**).

Table 3-16 below has been constructed using the figures for forecast GDP per country (period: 1998 - 2015, see Chapter 2.1), combined with the information on the construction costs for the TINA network (see section 3.2, as well as Table 3-13).

From this table it appears that, in some cases, strict compliance with the indicative annual ceiling of 1.5% of GDP restricts the prospect, for some countries, of constructing all the parts of the network they propose in their territories.

This is in particular the case for Latvia, Lithuania, Romania, Slovakia and especially Bulgaria.

A possible conclusion could be that, for some countries, the complete realisation of the network would have to be extended beyond 2015.

Countries	**1.5 % of the moderate accumulated GDP till 2015**	**Cost of the network**
Bulgaria	3.2	5.6
Cyprus	3.8	0.8
Czech Republic	13.9	10.7
Estonia	1.3	0.6
Hungary	14.8	6.5
Latvia	1.5	2.0
Lithuania	2.1	2.7
Poland	47.4	36.3
Romania	9.5	10.3
Slovakia	6.3	7.5
Slovenia	6.4	3.6

Table 3-16: 1.5% of accumulated GDP till 2015 in comparison with TINA network construction costs

Diagram 3-7 illustrates the results of the Table 3-16, showing the construction costs of the TINA Network per country, versus the financial ceilings.

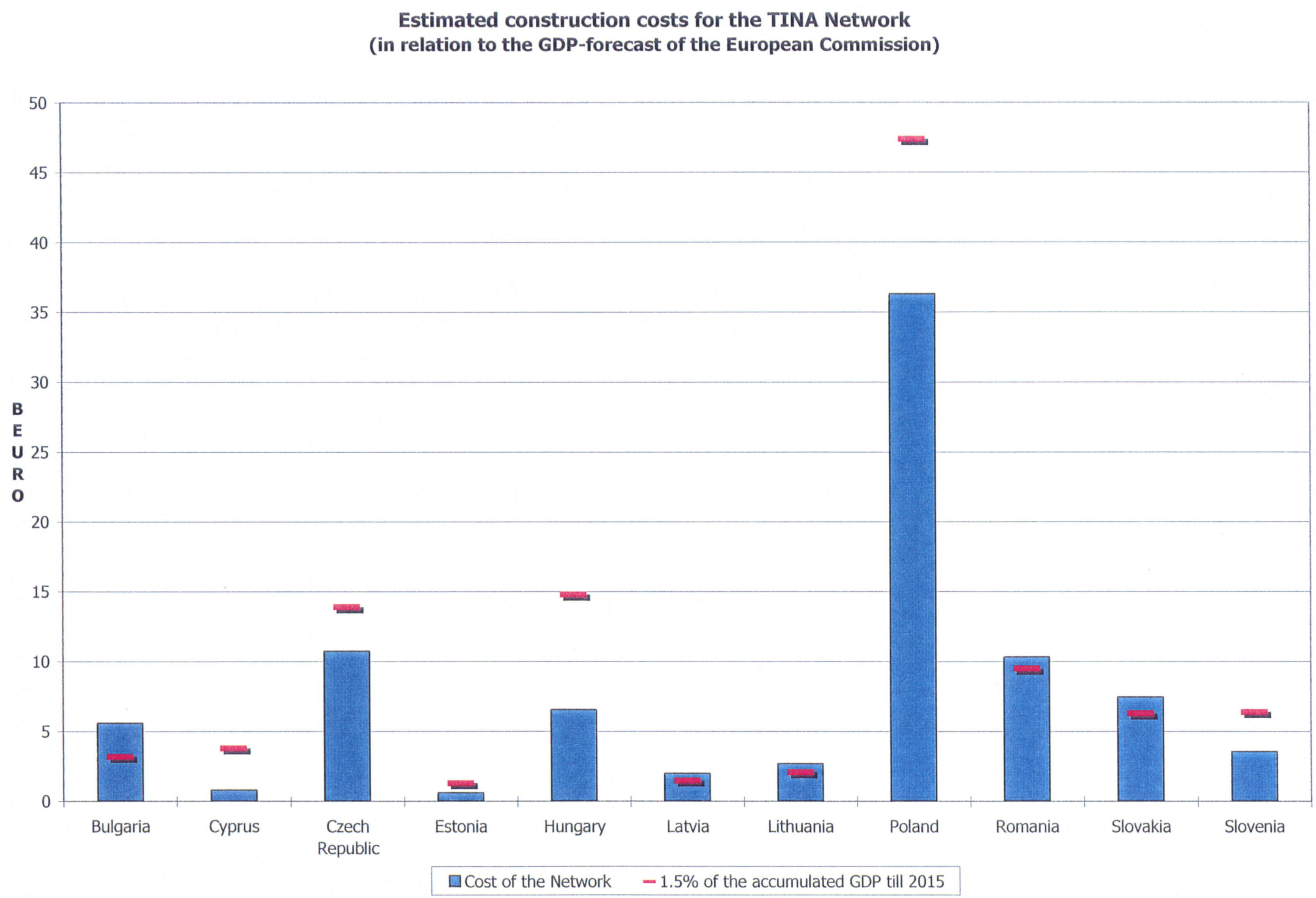

Diagram 3-7: Estimated construction costs for the TINA Network (in relation to the GDP-forecast)

4 CONSTRUCTING THE NETWORK

4.1 TRAFFIC FORECASTS

4.1.1 THE APPROACH TO THE TRAFFIC FORECAST QUESTION

During the first stages of the TINA process, there was no coherent forecast of traffic in the region of the candidate countries for accession. Only national or regional forecasts existed, which were neither co-ordinated nor compatible. The need for detailed future traffic forecasts (based on common sources and assumptions) led the European Commission to launch a specific Study for traffic forecasts on the TINA network. The Study is expected to be concluded in July 1999, and will cover the future planning needs sufficiently, while also providing basic information for project linked cost-benefit analysis purposes (reference: ToR of the PHARE Study "**Traffic Forecast on the ten Pan-European Transport Corridors of Helsinki**").

However, in the present stage of defining the TINA Network, the Consortium, which elaborates the Study, made available the first preliminary results of the Study, covering a "reference scenario". The investigation on possible "problematic" sections on the future (2005, 2010, and 2015) network (see Chapter 4.5) is based on these results. A further investigation -based on the whole range of the future traffic scenarios- will be included in the Final TINA Report, after the completion of the PHARE Study.

A reference to the "Traffic Forecast on the ten Pan-European Transport Corridors of Helsinki" Study follows:

Description of the Study

The main objective of this project is to achieve a common basis in terms of databases and forecast methods for the 13 PHARE countries and to apply this method to the total multi-modal network in the PHARE countries, using the TINA network as a basis. The consultants have added to this the objective to link this common basis with databases and methods used on behalf of studies currently executed on behalf of DGVII of the Commission, including a common basis of splitting up countries into regions comparable with the NUTS-2 level. Another additional objective relates to the dissemination of the results: the databases, the methods and the forecasts.

In order to achieve these results, a consortium of institutes has been formed, consisting of NEA (NL) as the leader, IWW (D) and INRETS (F) as western partners and furthermore consisting of one institute per PHARE country: CDV (Czech Republic), CELU (Latvia), DISCOUNT (Bulgaria), FIDA (Lithuania), IN-PUMA (FyroM), IPSA (Bosnia and Hercegovina), ITS (Albania), INCERTRANS (Romania), KTI (Hungary), OBET (Poland), Prometni (Slovenia), TTU (Estonia) and VUD (Slovak Republic).

The first step in the project was to create a base year database for passenger and freight flows, containing the dimensions mode, region of origin, region of destination, type of goods (freight), and purpose of trip (passenger). Moreover a network including secondary links has been developed. As much of this detailed information is not directly available and several sources for different types of information were identified much attention has been given to the methodological approach. Basis of this approach is the top-down structure: estimations of unknown details are done by subdividing data from the higher level. By this the method can be seen as a framework: in case additional data is available the database can be updated without affecting the higher levels. Two seminars in 1998 were organised to develop this approach with the participation of all (16) institutes involved.

Based on the base year databases forecasts were made. Several scenarios were developed, containing descriptions on the socio-economic development, on the integration process in central Europe and on the completion of infrastructure. The forecasting techniques used contain growth models, partly based on developments of transport times and costs and partly based on the effect of harmonisation of the transports markets within Europe. Before applying the assignment phase the tons of freight transport and the number of passengers are translated into number of vehicles (road) and trains (rail).

During a seminar in spring 1999 the database, the scenarios as well as the first results have been evaluated, again under participation of all institutes involved.

Databases, for base year and forecasting years, networks, tools for applying variants to the scenario's and calculating sensibilities here and presentation tools have been put into a toolbox by country, made available to the participating institutes and to the PHARE and TINA Secretariat.

The reference scenario

The reference scenario consist of the following elements:

- Moderate economic growth;
- Existing infrastructure;
- No harmonisation effects on mode choice in freight transport (Existing modal split per type of goods per geographic relation).

The economic scenario for the years 2000-2015 is similar to the development in the TINA moderate scenario in its First Progress Report (August 1998). However, the recent developments and forecasts up to the year 2000 have been updated due to the latest available sources, resulting in a slower development in the period between the base year and 2000.

Other scenarios

The moderate scenario will be elaborated together with three infrastructure scenarios:

- The existing network (as in the reference scenario);
- The complete TINA- network updated to western standards by 2015;
- A partly completed network due to financing possibilities (the consultants guess).

In these scenarios the effect of harmonisation of the transport markets on modal split will be modelled.

In addition to this a low economical scenario has been developed, which will be applied on the existing network. A high economic scenario will be tested in combination with the completed TINA network in 2015. In both these variants modal-split changes due to market harmonisation will be applied.

Specific variants are applied in relation to the political development on the Balkan (the variant includes relations to former Yugoslavia in a structure as before 1990) and to the transport policy in eastern Europe (the variant includes restrictions in traffic on corridor 2 and 9).

Follow-up

The consultants see the results of this project as a first step in introducing standards in databases and forecast methods in central Europe. These standards are linked to the standards developed in Western Europe, since the project execution has been linked to a similar DGVII project in Western Europe.

The results only keep their value once the system will be maintained. Once it has been declared, as a standard institutional arrangements have to be made to ensure its use in relevant projects and regular updating. One source of updating is the inclusion of the results of new statistical systems in counties were the statistical systems are not yet fitted for a system of market oriented transport. Especially in the road freight statistical systems improvements are needed. Furthermore a learning process of working with this type of models has started and will result in improved capabilities within the participating institutes.

Institutional arrangements to be made include:

- co-ordinating the participating institutes;
- organising the process of improving and further work;
- organising access to the data and tools;
- keeping the standards on application.

It is the opinion of the consultant that there is, once the follow-up has been organised the value of the project for the coming TINA work will exceed the value of the present results.

4.1.2 Preliminary Results of the Study

A set of preliminary results concerning traffic forecasts for rail and road were sent to the TINA Secretariat by NEA. The traffic forecasts were sent only for the backbone network, for the years 2005, 2010 and 2015. The results were given in the form of main thresholds

> < 80 trains/day and ≥ 80 trains/day for railways,
> < 15.000 PCUs per day, between 15.000 - 20.000 PCUs per day and > 20.000 PCUs per day for roads,

which, according to the UN/ECE/WP.5 recommendations can define the essential infrastructure needs.

Four Maps in **Annex IV** show the existing rail traffic for 1995 and the preliminary traffic forecast for 2005, 2010 and 2015 respectively.

Four Maps in **Annex V** show the existing road traffic for 1995 and the preliminary traffic forecast for 2005, 2010 and 2015 respectively.

The sections where no data exist are shown with a different colour.

For reasons of comparison, two more maps are attached (in **Annex VI**), showing the rail and road traffic forecasts as they were prepared for the TINA 1998 Progress Report, based on the countries' estimations.

4.2 METHODOLOGICAL BASIS FOR THE DEFINITION OF COMMON CRITERIA REGARDING BOTTLENECKS, MISSING LINKS AND QUALITY OF SERVICE OF INFRASTRUCTURE NETWORKS

One of the main rules accepted in the TINA process was that the technical standards of the future infrastructure should ensure consistency between the capacity of network components and their expected traffic. To achieve this, it was accepted that these standards should be in line with the recommendations of the UN/ECE Working Party on Transport Trends and Economic (WP.5) on the definition of transport infrastructure capacities (Trans/WP5/R.60).

The efficiency of a traffic network depends on the one hand on the structure of the network and the density of the network and on the other hand on the quality of single network elements -sections and points of interconnection. The level of service concept and the relations between capacity and quality of transport service is an indicator drawn upon in order to identify insufficient parts of a network.

4.2.1 ROADS

The main cause for infrastructure bottlenecks is the insufficient infrastructure capacity. In order to eliminate bottlenecks of this kind, measures to extend capacity are necessary. A quantifiable and practical bottleneck criterion that is to be found in all European countries is that of road capacity. It permits to compare internationally the bottlenecks in various countries.

The capacity of a road is generally defined by the maximum number of vehicles capable of passing a section of a road. Capacity always relates to a set of operating conditions concerning infrastructure on the one hand and traffic on the other.

When defining the elements of bottlenecks and missing links implicitly the quality of service of a transport infrastructure is determined. On the other hand, the notion of capacity is related to the explicit description of corresponding quality levels of transport service which may be defined by the values of a number of quality indices such as vehicle speed, travel time, regularity of transport, comfort and convenience, cost of vehicle movement etc. If a high quality of transport service is to be obtained, a somewhat diminished capacity must be accepted. Conversely, if the acceptable quality level is lowered, a higher capacity will be achieved. From this interrelationship ensues the practical corollary, that for each mode of transport a compromise has to be agreed upon between capacity and level of service, which is specific for each particular case. Thus, the precondition for the identification of bottlenecks is the determination of the desired or seen as necessary, quality of transport service. The capacity can be determined depending on this quality.

In the case of roads, the term "quality of transport service" is used to refer to a number of parameters, such as travel speed and travel time, traffic interruptions, and freedom of manoeuvre, safety and comfort.

Between these different parameters of influence, there are multiple interrelations. On the other hand, the quality of transport service depends on the infrastructural situation, as there are the concepts of horizontal and vertical alignments, number of lanes, width of lanes, quality of road surface, etc. In addition, the volume and composition of traffic plays a decisive role on the quality of transport service.

In order to correlate practically the necessary road infrastructure to be offered with the transport demand, the following correlation between road categories and average daily traffic is recommended:

Type of Road Infrastructure	Traffic
4-lane motorway	40.000 - 60.000 PCU/ 24 hrs
Roads of 3 lanes	15.000 - 20.000 PCU/ 24 hrs
Roads of 2 lanes	8.000 - 12.000 PCU/ 24 hrs

4.2.2 Railways

The quality of transport service on railways can be described by the parameters of average travel speed and travel comfort. The average travel speed on railroad sections depends mostly on the constructional parameter, such as the horizontal and vertical alignment and the structural condition of the rails. Furthermore, numerous technical factors such as e.g. existing signal installations, distance of blocks etc. are important. Especially the structural condition of the rails also influences the travel comfort.

The capacity of a line can be regarded as a bottleneck criterion. A great number of elements have to be taken into consideration in the determination of the capacity of a given railway line, such as the freeway fixed installations, the stations installations and the safety and signalling installations. In view of the great many factors involved and the complex functions that link these factors, the detailed calculation of the capacity of a railway line implies a considerable amount of work.

As a practical recommendation, UN/ECE/WP.5 suggested the following thresholds, linking the offered capacity to traffic:

Type of Rail Infrastructure	Traffic
Single track main lines	60 - 80 trains per day
Double track main lines	100 - 200 trains per day

These values only represent commercial trains, i.e. movements of locomotives, service transport etc., are not included.

However, as these capacity limits are only very rough figures, a detailed analysis of the operation conditions is, in any case, absolutely necessary.

4.3 FROM POTENTIAL INVESTMENT MEASURES TO CONCRETE PROJECTS

The Transport Infrastructure Needs Assessment (TINA) in the candidate countries for accession, identified investment needs of the order of EURO 86 billion up to 2015 for the realisation of the TINA network, comprising railway, road, airport, sea port, river port and terminals infrastructures. In the description of these investment needs, no clear distinction has been made between actual projects and possible investments.

TINA annotates sections, components or links of the transport network as "possible investment measures", which require upgrading or refurbishing or which are newly required since they have been identified as "missing". Their identification process broadly follows the recommendations of WP5 of the UN-ECE (identification of missing links and bottlenecks). Their costs have been estimated by the relevant authorities (an indication about the accuracy of these estimations has also been derived through the TINA process, see Chapter 3.3.2) but for the most of the cases the required studies to confirm their maturity –pre-feasibility or feasibility or design studies - have not been made.

Thus, the total cost volume of all "possible investment measures", as quoted above with EURO 86 billion, most likely indicates an upper ceiling for investments in order to bring the network considered to a desired technical and/or capacity standard.

In the screening process, which follows in order to, find fundable or bankable projects most likely some of these possible investment measures might be dropped at least for the period until 2015, or might be formulated in different options of lower costs.

The Decision No (96)1692EC of the European Parliament and the Council (guidelines for the development of a Trans-European Transport Network) requires to identify "projects of common interest", annotating those possible investment measures which are of particular interest for the Union as a whole. Relevant criteria are mentioned in these guidelines. Those identified as necessary for the realisation of the network will be further defined and ultimately developed to mature projects ready for financing.

Project **assessment in the TINA process** concerns mainly to identify such **projects of common interest**. This requires the following main stages:

- the network outline using qualitative and strategic assessment methods;
- identification of possible investment measures for the realisation of the network;
    - assessment and identification of priorities for the realisation of the network based on strategic socio-economic and environmental considerations;
- identification of projects of common interest and their priorities in the implementation of the network which in particular requires to assess;
    - their importance for the Community;
    - their economic viability;
    - possible options for financing.

The term "projects of common interest" is not very well defined and discussions in the TENs Committee are addressing this issue. At present any project, which contributes to the completion of the TEN-Tr, is considered as "of common interest". However, it might be useful to define this term more precisely taking into account that certain links in the network are more of regional or national rather than Community nature. TINA will follow closely this discussion and adapt its methods as appropriate.

Use of the term **Project** should be restricted to possible investment measures which have undergone some assessment, are fairly mature and advanced in their structure, and which can meet the criteria of the financial institutions. Every project must be properly defined at a level of detail that permits sensible appraisal. Clear description of the project, starting and ending date, budget, etc. should be essential parameters to be known, before the assessment of the project. This description of the project should provide clear indications for its socio-economic and financial viability, plus information concerning its environmental effects, following the instructions set out in the relevant EC regulations.

In the network, outlined by the TINA process, it is the work of the relevant authorities, the IFIs and, depending on the financial engineering, the banks and possible other private investors, to identify **fundable** and where appropriate **bankable** projects. Such projects are usually sections or parts of projects of common interest.

For the authorities and IFIs the work comprises to obtain information about the

- socio-economic and financial performance of the projects;
- environmental assessment of each project;
- economic ranking of the projects.

and to bring them to maturity which annotates that the information and the features of the project allow to enter the process of financial engineering which i.e. addresses the issue if the projects are suitable for public or private financing or a mixture of both. Only with this information it can be determined if projects are fundable or bankable. Fundable projects are those with a high socio-economic benefit but low financial rate of return; bankable projects are those with reasonable revenue streams, manageable financial risks and a financial rate of return above 10%.

When considering transport infrastructure projects, the countries should recall that in principle, these projects could be financed by the public and/or the private sector. The balance between the two will depend on many factors, including: political preference; cost of finance; country risk and investors' perceptions; project risks etc. Projects could be financed on a traditional, sovereign basis (100 % public), on a purely private basis (100 % private) or by a combination (public-private partnership with public and private percentage between 0 % and 100 %). The Commission and its funding administrations and the IFIs recommend to consider all forms of financing searching for a financing structure which as efficient as possible uses the public funds under the given circumstances. This requires as soon as appropriate to bring all possible financing entities interested in the project into play.

The <u>socio-economic performance of the projects</u> will identify:

- economically viable projects that could generate a revenue stream directly from users and are likely to be financially viable (e.g. a container terminal) - such projects could and should be implemented by the private sector and the role of the public sector would be to provide an "enabling environment" (not investment);
- economically viable projects that could generate a revenue stream, but are unlikely to be financially viable on a stand-alone basis (e.g. some combined transport; toll motorways) - with appropriate structuring, these projects could potentially attract private finance in conjunction with public funds (i.e. some form of public-private partnership, PPP);
- economically viable projects where there is no revenue stream directly from users, but where a mechanism could be envisaged to mobilise some private investment and risk transfer to the private sector by means of a revenue stream via the public sector(e.g. by shadow tolls); and
- economically viable projects where no direct or indirect revenue stream can be envisaged, and therefore should be implemented by the public sector on a traditional, sovereign basis.

The financial performance should define the best possible way to allocate the available public finance such as to leverage private finance, and combine public and private finance, to generate the optimum economic return. This task could be performed outside TINA in project committees or, when the project is sufficiently advanced, in project entities.

Every project proposed for financing shall be accompanied by a specific Study for its environmental effects following the relevant directives. These effects should cover the total range of possible impacts that can be generated -directly or indirectly- by the project. One should consider the option to incorporate this assessment into the socio-economic assessment considering ecological impacts as part of social impacts. Certain environmental effects are frequently quantified and included in socio-economic analyses such as Noise; Air Pollution; and Severance.

Accurate assessments, especially of noise and severance implications, are dependant on detailed design and should be assessed at project level; however, roads, inland waterways and rail links may be characterised in an abstract way in terms of noise and severance, giving generalised attributes to these modes of transport and their different categories such as two lane or four lane roads or one and two track railways taking expected traffic volumes into account. The level of detailed design and the necessary data will, in general, not be available for the more strategic project assessment initially to be prepared in the TINA process; however, this is at that level of assessment not required.

In the TINA process projects will be ranked, having regard to first economic and social criteria, second their safety features, and third taking into consideration cohesion and ecological effects. TINA restricts itself to the criteria of sustainable mobility and the Union's cohesion. It is assumed that public sector funding constraints and policy preferences are applied by those entities that eventually commit for financing. At the end it is up to the financing institutions to build up their own priorities.

A possible ranking of the projects could be based on the economic Benefit / Cost Ratio (B/C). In addition to the B/C Ratio, other economic indices, derived by the socio-economic and financial analysis could be also taken into account in the economic ranking process, when necessary. In the case of projects with similar balance of economic indices, the ones that make the better use of existing infrastructure should be given preference. It must be ensured that all the costs and benefits that result from the project (including those related to abandoned infrastructure or that whose use is changed by the project) are included in the calculation of the economic indices.

The TINA process would scrutinise each project for its potential for PPP financing eventually identifying those projects, which look promising for private financing shares. This would be undertaken under the general goal to use public funds as efficient as possible.

4.4 GUIDANCE FOR PROJECTS' APPRAISAL

Before any decision on financing/ funding individual projects is taken, the proposed for implementation projects should be subject to a socio-economic assessment.

The TINA Group in its meeting in Vienna, June 1998, has recommended establishing a common method for socio-economic project assessment, which the funding and financing institutions would endorse. Environmental assessment needs to be incorporated into this socio-economic appraisal at both network and project level.

The proposed guidance for projects appraisal will be an Annex to the Final Report. The overall aim of this document will be to establish a common framework so that schemes and options submitted to the various financing/ funding institutes by different states have been selected and appraised on a broadly comparable basis, and are presented in a way that facilitates review and analysis.

The principal focus of this guidance is the social appraisal of projects, that is an assessment of the overall economic and social value. Also of interest is the pattern of gains and losses associated with the project. In particular the financial sustainability of the project is relevant, so that the pattern of financial, economic and social flows associated with the project needs to be demonstrated. This is best achieved by the use of a framework approach containing at its core a cost-benefit analysis but with additional reporting of environmental impacts and impacts of broader policy. The method is oriented towards projects, which are sufficiently well defined to be capable of serious evaluation. The framework is capable of handling projects on all modes of transport.

The guidance will state clearly that the project must be properly defined at a level of detail that permits sensible appraisal. All projects must be assessed against a do-minimum baseline; guidance will be provided on the appropriate definition of the baseline. All accession countries have many potential projects, so advice is needed on screening and shifting procedures to help identify the appropriate projects for detailed appraisal. Formulation of options within projects, and the need to consider low cost options is also underlined.

In order to have a common framework for cost-benefit analyses, the guidance defines which impacts (including environmental impacts) can be given money values and on what basis. Values of time, accident and vehicle operating costs and their derivation is covered, including relationships with wage rates and economic data. The guidance also provides recommendation for evaluation using both local and European values.

The central role of this guidance is to support a social appraisal. But in addition, the analysis also sheds light on the outline financial performance of the scheme. This is important from the perspective of the financial institutions. Therefore financial flows - revenues and costs to the relevant parties- need to be shown explicitly within the appraisal. The appraisal provides an opportunity to think creatively about Public-Private Partnership projects and only to put forward projects, which have a realistic chance of being funded. If the project appears to be socially worthwhile and potentially fundable, the banking institutions will have their own more detailed financial appraisal procedures.

4.5 Status of the Network today, in 2005, in 2010 and in 2015

The status of the road and rail TINA network[5] is presented in the following form:

ROAD	RAIL
4-lanes motorways	High speed lines (speed > 160 km/h)
3-4 lanes expressways	Double electrified lines, conventional
2-lanes roads	Double, non-electrified lines
	Single electrified lines
	Single, non-electrified lines

The current (1999) status of the network for road and rail is shown in the two Maps of **Annex VII**. The future (2005, 2010 and 2015) status of the road and rail network is shown in the relevant Maps of **Annex VIII**.

A comparison of the existing (1999) and future (2005, 2010 and 2015) status of the network with the current (1995) and future (2005, 2010 and 2015 respectively) traffic in the various rail and road sections, gives some interesting indications for the existing bottlenecks (the analysis is based on the recommendations of UN/ECE/WP.5 for the needed infrastructure capacity - see Chapter 4.1.2 - The analysis does not include the sections where traffic data do not exist). The status of the network for the years 2005, 2010 and 2015 is based on the information received by the countries (see the footnote), concerning the proposed investment measures per section and the time horizons of their implementation. All the relevant information for the proposed investment measures, description of measures, starting and finishing dates, etc., can be found in the TINA database.

All the relevant Maps, showing the infrastructure capacity inneficiencies on the Network are shown in **Annex IX**. All the infrastructural bottlenecks are indicated in red.

In this respect:

For the Rail Network

Year	Infrastructure Bottlenecks	Comments
1999	Poland • Bialystok – Sokolka Slovakia/Hungary • Bratislava – Hegyeshalom Hungary • Pusztaszabolcs – Pecs Bulgaria • Sofija – Radomir	
2005	Poland • Bialystok – Sokolka Slovakia/Hungary • Bratislava – Hegyeshalom Hungary • Pusztaszabolcs – Pecs	All the bottlenecks of 1999 continue to exist. In addition, two more bottlenecks (between Szekesfehervar – Boba and Celldomolk - Szombathely, both in Hungary) appear, presumptively due to the increase of the

[5] The analysis does not include Cyprus, since there are not traffic forecast yet available for this country. The future status of the network includes updated (April 1999) information for all countries, except Romanian and Hungarian railway infrastructure; the future status of the rail network in these two countries was based on 1998 data, which will be probably revised.

	• Szekesfehervar – Boba • Celldomolk - Szombathely Bulgaria • Sofija – Radomir	traffic, which was not followed by a relevant increase of the "offer".
2010	Slovakia/Hungary • Bratislava – Hegyeshalom Hungary • Pusztaszabolcs – Pecs • Szekesfehervar – Boba • Celldomolk - Szombathely Bulgaria • Sofija – Radomir	The bottlenecks are the same with those of 2005, except of the section Bialystok – Sokolka in Poland, which now has the capacity to serve normally the traffic.
2015	Slovakia/Hungary • Bratislava – Hegyeshalom Hungary • Pusztaszabolcs – Pecs • Szekesfehervar – Boba • Celldomolk - Szombathely Slovakia • Surany - Nove Zamky Bulgaria • Sofija – Radomir Romania/Bulgaria • Giurgiu N. – Ruse Latvia • Krustpils – Daugavpils	All the bottlenecks of 2010 continue to exist. In addition, three more bottlenecks (between Surany - Nove Zamky in Slovakia, Krustpils – Daugavpils in Latvia and Giurgiu N. – Ruse in Romania and Bulgaria) appear, presumptively due to the increase of the demand, which is not followed by the analogous increase in the "offer" of infrastructure. In total, three sections appear with infrastructural capacity problems the whole period 1999-2015: Bratislava (Slovakia) - Hegyeshalom (Hungary) Pusztaszabolcs - Pecs in Hungary Sofia - Radomir in Bulgaria

For the Road Network

Year	Infrastructure Bottlenecks - Comments
1999	Infrastructure bottlenecks exist in various parts of the network, a fact proving the necessity for radical infrastructure interventions on the network.
2005	Infrastructure bottlenecks still exist on many parts of the network. However: The comparison between the two maps for "road bottlenecks" in 1999 and 2005 (see Annex IX) shows a slight improvement. Many parts of the network have been upgraded, and thus can cope with the future traffic. In some cases, certain sections appear with infrastructural inneficiencies for 2005, where the same sections could cope well with the traffic in 1999 (e.g. the section "Bucharest-Focsani" on Corridor IX in Romania).
2010	The situation appears to be slightly improved; main improvements seem to be the normal functioning of Corridor II between Warsaw and German borders, and the upgrade of many parts of Corridor VI in Poland.
2015	The situation is well improved in comparison to the previous years. However, there are still remaining great parts of the network with infrastructure capacity problems. A better view on the relevant map in Annex IX, shows clearly that the remaining infrastructural inneficiencies mainly continue to exist on a "north-south" direction (Corridor I in Estonia, Corridors Vi and V in Poland, Slovakia, Czech Republic and Hungary, Corridor IX in Bulgaria). This may have to do with the tendency to strengthen the "east-west" routes towards the CIS. The infrastructural inneficiencies of the road links "Tallinn-Johvi" in Estonia and "Orsova- Bucharest" in Romania, both in the "east-west" direction, are also noted.

For a deeper analysis, two separate maps were produced (see **Annex X**) for 2015, showing the so called "Minimum Network" for rail and road network respectively.

This "Minimum Network" (it is only an imaginary network) was defined taking into consideration the following rationale:

- the network is defined according to the expected 2015 traffic, taking into account the recommendations of UN/ECE/WP.5 for the relation between the traffic and the needed infrastructure (for example: if on one road section the expected traffic exceeds 20.000 PCU/day, this section is indicated as a motorway, or if on one rail section the traffic forecast shows less than 80 trains/day, the section is indicated as a single line);
- the "minimum network" maps mark in red all the sections where we have "less" infrastructure than necessary, according to the 2015 traffic (bottlenecks);
- using the same technique, the "minimum network" maps can also mark in a different colour the sections where we will have (following the proposed measures) "more infrastructure" than necessary (taking into consideration only the infrastructure which results from reported investment measures; existing (1999) infrastructure even if is "more" for the 2015 traffic is not marked as such).

The analysis of this exercise gives us some very interesting conclusions:

<u>Rail network</u>

The problematic parts of the network in 2015, will be those between:

(a) Bratislava (Slovakia) - Hegyeshalom (Hungary)
(b) Pusztaszabolcs - Pecs in Hungary
(c) Sofjia - Radomir in Bulgaria
(d) Szekesfehervar – Boba in Hungary
(e) Celldomolk – Szombathely in Hungary
(f) Surany - Nove Zamky in Slovakia
(g) Krustpils – Daugavpils in Latvia
(h) Giurgiu N. – Ruse between Romania and Bulgaria

It is a serious fact, that in the final planned TINA network, certain infrastructure bottlenecks continue to exist. Three of the eight problematic parts show the problem the whole period 1999-2015 (the a, b and c), two sections will appear with a capacity problem in sometime between 1999-2005 (the d and e) and three sections will show the problem sometime between 2010 - 2015 (the sections f, g and h).

On the contrary, there are many parts in the rail network, where the "offered" infrastructure in 2015 exceeds the capacity needs. Of course, it must be emphasised that many times the attractiveness of the rail mode strongly depends on the better infrastructure, and thus, a double railway line (conventional or high speed) can offer those services needed to compete with other modes (when a single line cannot). However, the combination of the two findings (more infrastructure where the capacity does not such require, and the parallel existence of lines with less capacity than necessary) can raise certain questions about the allocation of the money to be invested in railway infrastructure.

Road network

There are still a lot of problematic parts (sections having "less" infrastructure than necessary) on the network in 2015. As it was already stated, these inneficiencies continue to exist mainly on the "north-south" direction. On the other hand, there are a lot of parts on the network, with "more" infrastructure than necessary. Obviously, as in the case of rail, the improved road infrastructure can offer better services to the users (confort, safety, etc.). Yet, the parallel existence of parts which provide more than necessary infrastructure capacity, with parts which do not have the necessary infrastructure capacity may be a planning defficiency, which has to be considered.

4.6 INTEROPERABILITY, ENVIRONMENTAL PROTECTION AND SAFETY ASPECTS, REGARDING THE DESIGN OF THE TINA NETWORK

Annex XI presents the relevant European Union legislative and institutional framework (*acquis communaitaire*) and the international agreements which refer to interoperability, environment and safety aspects for each transport sector (road, rail, inter-modal, inland waterway, maritime and air transport) and concern the implementation of the TINA infrastructure network. The key objective of this Annex is to identify the implications of the adoption of the various international statutes for interoperability, safety and environment to the TINA infrastructure Network and the resulting -potentially imposed-technical overall standards.

All the three aspects -interoperability, environmental protection and safety- are referring to two types of legislation: (i) the one related to the technical standards, as it is the case of the relevant Union's provisions; the international agreements AGR, AGC, AGTC, AGN; the recommended practices by TER, TEM, UN-ECE WP5 Group; the national standards and (ii) the other related to the adoption of legislation harmonising the institutional set-up and thus facilitating the travel, as it is the case for vehicle standards, border crossing procedures, operating systems (e.g. ERTMS in Railways).

As it concerns (i), it is recognised that in the TINA countries, the only commonly accepted legislation are the international agreements, which however are not strictly enforced by all states. On the other hand, there is no detailed common EU legislation for technical standards, each member-state employing each own standards, although some of them are quite similar for certain cases. Consequently, it is very difficult to conclude something quite strict for the TINA infrastructure network, as it concerns the details of design. However general implications can be drawn, after careful analysis of the relevant international agreements, technical standards in selective EU member states and best practices.

The analysis highlights the difficulty in establishing common technical standards for the TINA network. Although there is a basic international framework (mainly from the various international agreements in the context of the UN/ECE), the reference macro-design parameters should be always fine-tuned at a micro-scale. For the most of the problems the needed legislation does exist, but only at national level related to very detailed technical standards. The implementation of the proper framework of standards that can ensure a minimum interoperability, common procedures for environmental protection and safety rules for the TINA network, with its peculiarities and the budgetary constraints, should be seen as one of the future priorities. Custom made strategic technical standards for the TINA network are needed; they can ensure interoperability, safety and environmental protection, incorporating best practices at national or international level. A good example for such approach is the Standards and Recommended Practices developed by the UN for the Trans-European North South Motorway (TEM) in the early 80's.

5 OPERATING THE NETWORK

The TINA process has been designated to initiate the development of a multi-modal transport network within the territory of the candidate countries for accession. All the necessary steps to define the various stages of development of this infrastructure in the time horizon of 2015 were assessed; however, it must be underlined that any infrastructure development should be accompanied with those necessary measures to ensure the efficient operation of the infrastructure network.

Using the terminology of the Decision No 1692/96/EC on Community guidelines for the development of the trans-European transport network, the TINA Network -like the TENs- should comply with the following provisions:

" *Article 2 - Objectives*

2. The network must:

(a) ensure the sustainable mobility of persons and goods ... under the best possible social and safety conditions, while helping to achieve the Community's objectives, particularly in regard to the environment and competition, and contribute to strengthening economic and social cohesion;

(d) allow the optimal use of existing capacities

Article 3 - Scope of the network

3. The traffic management systems and the positioning and navigation systems shall include the necessary technical installations and information and telecommunications systems to ensure harmonious operation of the network and efficient traffic management

Article 5 - Priorities

(i) the development and establishment of systems for the management and control of network traffic and user information with a view to optimising use of the infrastructure"

In this respect, Chapter 5.1 includes some recommendations for an efficient operations policy in the candidate countries, to improve the services provided on the infrastructure network (also improving its efficiency and attractiveness), while Chapter 5.2 includes a summary of some main technical fields on which the Union focus, in order to achieve the goals of the required efficient operations policy (ERTMS, GNSS, VTMIS, etc.)

5.1 Towards an Efficient Operations Policy in TINA Countries

This is an interesting chapter; however, it is not the result of your work but a description of the work of DGVII; I would assume that you should shorten it substantially to the implications with the TINA work and put the information if you feel so into an annex.

The TINA Network should be seen as incorporating both an infrastructure and a services network, both being adapted to the Union's regulations and rules.

To achieve the construction of a proper infrastructure network in the TINA countries, the TINA process has defined the required investment measures and standards, as described in Chapters 3 and 4, and Annex XI.

For better services on the network, the main prerequisite is the national adoption of the Union's legislative and institutional framework, known as *acquis*. The adoption of this regulatory framework can ensure that the "physical" extension of the TEN to the TINA countries will be accompanied with the necessary measures to ensure compatibility with the Union's transport structures and facilitate the access to the market. The final goal is the elimination of the existing legal, financial, operational and commercial barriers in the transport sector in these countries.

As the countries of Central and Eastern Europe made their transition from centrally planned to market economies, this transition had serious effects on the transport sector. A successful transition to a market economy requires the involvement of both public and private sectors. Governments may choose to retain ownership of strategic transport assets; on the other hand, it is widely recognised that public ownership of transport operating assets is rarely necessary. Corporatisation and privatisation can force public authorities to make explicit their non-commercial requirements of an enterprise (public service obligations). Such arrangements require public authorities to compensate enterprises for the cost of those obligations, preferably by special contracts containing efficiency incentives. Privatisation also provides a more robust framework to tackle long-standing issues of overmanning and inefficient working practices. This is always a challenging process that generally progresses in stages, but nevertheless is necessary for transport companies to compete effectively and serve customers' needs.

In addition, action is needed in one more area. This is the introduction of fair and efficient pricing in transport, i.e. ensuring that charges for transport use reflect its total cost. Pricing is a key policy instrument that promotes sustainability at certain levels: by influencing overall transport demands, tackling the cause of the congestion problems, encouraging the use of environmentally friendly modes of travel, etc.

In further detail:

5.1.1 Road Transport

Road transport volumes (for passengers and traffic) are likely to increase enormously in the future, in line with motorization and restructuring/development of the economies. It is therefore important to manage road systems efficiently, in line with economic and social criteria.

For better exploitation of the road system, it is important to:

- mobilise private capital and management expertise (for example for toll motorways, whether through concessions or public-private partnerships), and
- to foster sector reforms through sovereign operations

A list of barriers has been reported by certain European Studies ("Conditions for the progressive integration of European inland transport markets", a PHARE Study by BCEOM, March 1998), which should be overcome, in order to create an integrated transport market. These barriers may be legal, commercial, financial or operational.

5.1.2 Railway Transport

Railway traffic has dropped by more than half in many countries, with reductions of up to 70-80 per cent in some. This tendency should be inverted, since railway transport can offer many energy efficient and environmentally friendly solutions. Europe's railways lack interoperability -the capacity to provide services, which can run with equal efficiency on several national infrastructures. This is the case also for the Union's railways, and of course a major problem for the rest of Europe.

Railway undertakings across the region have to restructure, as a consequence of the well-known political and economic upheavals of the last ten years. Furthermore, the railway enterprises must restructure in order to develop business in markets where railways have a comparative advantage. International experience suggests that railway restructuring is a long term process and thus, as railways have a high proportion of costs that are fixed in the short run, it will take time to bring costs and revenues into balance, while continuing to renew essential infrastructure.

The main legislative framework of the Union for railways should be applied to the TINA countries; in this respect, in particular the provisions of the Directives 91/440, 95/18 and 95/19 should be introduced the sooner possible (this application is already effective in the majority of the TINA countries).

- Council Directive No 91/440, on the development of the Community's railways
- Council Directive No 95/18 on the licensing of railway undertakings
- Council Directive No 95/19, on the allocation of railway infrastructure capacity and the charging of infrastructure fees

These directives include a set of measures which are listed hereunder and which serve as a basis for identifying those barriers to be removed or reduced through strict application of such directives:

- management autonomy for railway companies
- separation between management of infrastructure and transport operations
- working out of an access policy to the railway infrastructure
- improvement of the financial structure of the networks

Besides the Union's framework, there are also a lot of rules set in several International Agreements, which provide a framework for international interoperability, and as such, should be also respected by the countries.

5.1.3 Rail Freeways

Trans-European Rail Freight Freeways is a Commission's initiative, set out in the White Paper on "A Strategy for Revitalising the Community's Railway".

This concept is designed to remove current obstacles to long-distance hauling of freight across Europe by rail. This could be a key initiative in the push to shift freight back onto rail. This initiative presents an opportunity to accelerate the development of cross border rail freight in the short term through practical steps related to infrastructure access and use.

Key implementation measures for Rail Freightways include the short term identification of available infrastructure capacity, and the establishment of One Stop Shops capable of delivering a seamless infrastructure tariff process and co-ordinating the practical aspects of infrastructure access.

According to European Commission, there are likely to be significant opportunities for extending the Freeway concept beyond the borders of the Community. The extent to which the expected benefits from the freeways implementation can be achieved depends on how much of the overall concept can be implemented on routes extending beyond the Community.

In terms of rail freight operations, the main goal can be the establishment of some common rules, which can create a network of rail services covering the whole of Europe, on which railway undertakings can operate efficiently, making the best use of the infrastructure. In this respect, the Rail Freightway concept can be seen as the first step towards this direction.

5.1.4 Inter-modal Transport

Inter-modal transport, which combines the line-haul advantages of rail with the distributional flexibility of road, has been one of the items of considerable interest of the EU, in the context of its sustainable mobility policy. Emerging EU policy is to support improvement of inter-modal freight terminals, develop the inter-modal freight systems through Trans-European priority freight routes and launch pilot projects for inter-modal services.

For the better management of the freight traffic, it is very important to consider the benefits from a combined transport network based on specific rail, road, inland waterway and maritime shipping corridors, together with trans-shipment facilities for switching freight from one transport mode to another. This network can be seen both as an infrastructure and services network, since the realisation of the potential for inter-modal and other rail freight will depend on increasing the rail network access to enable private international train operators to use the European rail system to offer efficient, integrated door-to-door services.

The Combined transport Network can benefit from technical harmonisation in railways, although other interfaces will also need to be made compatible. The network will be very dependent on inter-modal nodes that will allow easy transfer from one transport mode to another, or to local commuter routes for passengers and goods.

Realisation of the potential for inter-modal and other rail freight will depend on increasing network access to enable private international train operators to use the European rail system to offer efficient, integrated door-to-door services. The private sector has important skills and expertise to deploy in the management of inter-modal terminals and ancillary logistics activities.

Besides the Union's institutional framework, the European Conference of Ministers of Transport (ECMT) provides a forum for the development of inter-modal transport, with working documents and resolutions, although they are mere proposals to Members for a common approach. Most recommendations included in ECMT resolutions are in accordance with European Union provisions already in force.

On the other hand, UN/ECE provides strict rules, which do form a legal basis. The European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), was drawn up in order to facilitate the international transport of goods, taking into account the expected increase in the international transport of goods as a consequence of growing international trade and the adverse environmental consequences such developments might have.

5.1.5 INLAND WATERWAYS

For this "mode" of transport, infrastructure constitutes a major problem, but one which is not insoluble in the mid term, at least where the Danube is concerned. Its development is generally accepted as a priority not only in the EU, but also by all European countries, which have expressed this opinion in the Pan-European Transport Conferences of Crete and Helsinki.

A complete development, based on a flight of locks and dams, was envisaged by the Danube Commission.

As far as it concerns operations, the main types of necessary measures refer to the promotion of better access of the TINA countries' fleets to the EU markets, and vice versa. In this context, the adoption of commonly accepted standards (complying with those of Rhine) and training of crews (to obtain Rhine diplomas and licenses) are main prerequisites.

Inland waterway transport is, in essence, a multi-modal form where the operation to be carried out is in fact a chain in which each of the links contributes to the end result. If one of the links is missing the chain cannot be made. More than other modes, inland waterway transport is therefore dependent on a development strategy which supposes simultaneous removal of the various barriers and coherent development of the entire system.

Concerning river ports, they merit special attention and must be dealt with individually. In general, collapse of traffic levels has left infrastructures and equipment which are over-sized and which require re-organisation and re-equipping.

The adoption of all the relevant work of the UN/ECE, and in particular the implementation of the provisions of AGN[6] and ADN[7] is of vital importance.

5.1.6 AIR TRANSPORT

With regard to infrastructure (airports, air traffic control, etc.), the challenge to long-term sustainability is much less acute than in the airline industry. Long-term sustainability will be fostered by: (a) the implementation of development plans dimensioned to meet the short and medium-term needs of the industry, phased in line with market demands, and (b) the pricing of services at levels that enable full cost recovery and encourage the most efficient use of resources.

Following the modernisation of basic civil aviation infrastructure, it is anticipated the increasing private sector involvement in fields like ground handling, in-flight catering, warehousing, freight forwarding etc. In reality, air transport provides a lot of investment opportunities (Runway, taxiway and apron improvements, lighting and navigation systems, passenger and cargo terminals buildings, ground handling equipment, office buildings for the airport enterprises or catering centres, ancillary equipment (such as power supply and heating), environmental infrastructure (such as waste management and noise protection), etc.).

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[6] AGN: European Agreement on main inland waterways of international importance

[7] ADN: Agreement on Dangerous Navigation

5.1.7 Maritime Transport

Seaborne trade may grow faster than world trade as a whole, as a consequence of the new circumstances and the trade diversion.

Maritime transport is characterised by many peculiarities, and in this sense, a further examination of the sector in the TINA countries requires further analysis.

However, the institutional environment that its establishment in the TINA countries can help interoperability and better efficiency of the sector, does exist in the Union.

5.1.8 Sea Ports

Port projects can have important transition impacts within the sector by developing modern facilities and improving management, and externally by facilitating trade and achieving environmental gains.

Many ports are capable of substantially larger throughput, without major investment. Both productivity and throughput can be increased by better co-ordination with inland transport (especially the availability of rail wagons for direct loading/ unloading), modest investment in storage facilities and improved management.

Privatisation may start with the use of private services (for example, forwarding, stevedoring, bunkering and lighterage) leading on to private terminals and, in some cases, privatisation of the port authority itself. High quality management, capable of change, is also essential.

5.2 Intelligent Transport Systems (ITS)

The aim of the existing and future TEN-Network is to establish an integrated network that can strengthen economic and social cohesion, and provide safe and sustainable mobility. It brings together land, water and air transport infrastructure networks, including traffic management and user information systems, across the whole of the Union, together with connections to Central and Eastern Europe. Research and development carried out within national and various EU programmes have led to the demonstration of advanced ITS applications.

Many problems of the existing European transport networks can be solved or at least partly solved by the use of intelligent systems. Up to now, the activities on telematic applications concentrated on road and rail. But ports and combined transport play also an important role in the transport system. More than 80% of the trade between the EU and the rest of the world is transported via ports and the share of combined transport is growing steadily.

The main ITS applications include navigation systems and related services, making the best possible use of technology to improve the movement of people and goods. They offer significant opportunities in terms of increased transport efficiency, better safety, improved comfort for travellers and less pollution for the environment.

They also provide the means for:

- better management of existing transport networks;
- integrating different transport modes and services;
- improving traffic flows and data exchange;
- enabling the provision of high quality added value transport services.

The Union is preparing within the framework of the Fifth Framework Programme various Key Actions, in particular "Sustainable Mobility and Intermodality" and "Systems and Services for the Citizens", that cover research, technological development and demonstration on ITS.

Within the TINA process rather late the Group started to look at the different options. However, the Group felt the need to finalise first the design of the network and to identify the possible investment measures for the physical construction of the network. It considers this activity as an important future item of work for the Group.

6 CONCLUSIONS, RECOMMENDATIONS

6.1 THE TINA NETWORK

The TINA Network resulted by a number of essential considerations, such as the future GDP of the countries, the percentage of this GDP dedicated to the construction of the Network, traffic forecasts, linkage of traffic forecasts to infrastructure needs, etc.

However, the most important prerequisite for the Network's design was the guiding principle that this network should be seen as the possible future extension of the TEN, in an enlarged Union. In this respect, the network must be in line with the main provisions of the Common European Transport Policy and with its main objective, to ensure sustainable mobility for people and goods.

The essential guidelines for the design of the TINA network were:

- To define a (future) Trans-European transport network which interconnects national networks, makes them interoperable and links the peripheral regions of the (enlarged) Union with the centre
- Respect for the environment embodied in transport systems which help resolve major environmental problems
- Promotion of the highest possible safety standards
- Links to third countries

The final TINA network comprises 18,587 km of roads, 20,710 km of railway lines, 4,131 km of inland waterways, 40 airports, 15 seaports, 52 river ports and 84 terminals.

The outline of the network has been finally defined; however, minor changes in its shape might occur, if future studies prove this necessity. Furthermore, in these cases where there is still an uncertainty, the routing of the Pan-European Transport Corridors is subject to final decisions of their Steering Committees.

The network seems to serve well the region of the candidate countries.

The ratio of network length to surface area is generally significantly lower in the acceding countries than inside the EU, but the ratio of network length to population is generally of a similar order to that of the Union.

The cost to construct the Network has been estimated by the countries to EURO 86,547 million (EURO 31,241 million for the railway network, EURO 45,805 million for the road network, EURO 1,795 million for the inland waterways network, EURO 4,138 million for airports, EURO 298 million for river ports, EURO 2,985 million for seaports and EURO 286 million for terminals).

An indicative individual costing for rail and road modes, based on unit costs, showed that the reported EURO 77 billion for rail and road constructions on the network might be reduced to EURO 50 - 60 billion.

6.2 DEVELOPMENT OF THE NETWORK

An essential element in the whole TINA planning process was that this network would have a realistic prospect of its construction being financed, based on a perspective of an average construction cost of about 1.5% of GDP in each country.

From the Report it appears that, in some cases, strict compliance with the indicative annual ceiling of 1.5% of GDP restricts the prospect, for some countries, of constructing all the parts of the network they propose in their territories.

A possible conclusion could be that, for some countries, the complete realisation of the network would have to be extended beyond 2015. Things can radically change if the involvement of the private sector or the IFIs can be ensured. Furthermore, the realisation of the total network can be considered as having much better perspectives, taking into account that some of the currently reported investment measures may change to project options with less cost, if the needs do not ask for more. In this sense, the future status of the network as reported today, might change and alternatives of lower cost may appear for certain sections of the network.

In the present stage, the development of the network is "scheduled" according to the national plans. The term "scheduled" does not precisely reflect the reality, as there is no any central planning for the network development. However, the financial interventions by the European Commission and the IFIs aim at this necessary rational development, synchronised with the European needs and the international economic framework. The priority projects to be identified and financed by ISPA will serve this task, since their choice is based on a number of main criteria to achieve the needed rational development. In this sense, the projects linking to the existing TEN and projects, which are on the Backbone Network will have priority for investment, while promotion of railway traffic will be favoured. Furthermore, preference will be given to projects which lever additional forms of finance, e.g. combinations of grant and loan financing in public-private partnerships.

For the realisation of the network, the countries have reported a number of potential investment measures (of a total cost of EURO 86.5 billion). However, it is worth mentioning that any plan for the construction of the network requires the definition of concrete projects. This process will need detailed feasibility and environmental studies on a case by case basis, in order to define viable projects which can form an -as much as possible- viable network (*ref.: Article 2, point (f) of the Decision No 1692/96/EC*). The assessment of the projects will be based on the methodology for projects assessment, which will be finalised the coming months and will be a part of the TINA Final Report.

6.3 Operation of the Network

The operation of the network is the second fundamental option of its existence. Even if the network exists, it must be ensured that the infrastructure must be used in the most efficient way. For the proper operation of the network, two separate options appear:

- The technical tools to be introduced on the network to improve the level of its services and to make it more attractive. The introduction of the Intelligent Transport Systems (ITS) on the TINA network can serve this objective.
- The sufficient legislative - institutional framework to ensure access under the best conditions, eliminating any administrative obstacles and barriers, and thus improving its exploitation. In this sense, the adoption of the EU acquis is a sine-qua-non prerequisite for the better functioning of the network.

Based on the EU provisions for the European networks, it can be said that the absolute objectives are:

- An internal market which works efficiently and facilitates the free movements of goods and people
- A coherent, intergrated transport system using the most appropriate technologies
- Social policies to protect and promote the interests of those working in and using transport

6.4 THE WAY AHEAD

The TINA process has so far achieved its intended goal, and preparations in the acceding countries for an extension of the Trans-European Network are well under way. The first stage of the process, the development of outline maps for road and rail networks in the eleven candidate countries has been completed. Further work concerning the development of an investment strategy covering both the pre-accession phase and the period after accession is under way. The TINA process provides a framework of reference for the transport network in the EU and the candidate countries, reflecting the main transport priorities at trans-national level. The present mandate for the TINA process ends, when the Group delivers its final report. In the next stage, the focus will be on use of different financing instruments, and on investment pipelines. However, the implementation of the recommended network needs close monitoring and, in the course of the accession process, adaptations of the network outline might also be necessary. This would in particular require close co-ordination with the Accession Partnerships and National Programmes for the Adoption of the *acquis* and reporting on progress within the framework of the Europe Agreements.

The TINA process has been successful, but the work is on-going. Further technical assistance is needed for monitoring progress, and utilising common methodologies for project analysis and priority setting.

It is clearly necessary for work with the candidates on TINA to be coherent with work inside the Union on the Trans-European Network. This will require using the same methodologies and requires a common reporting framework.

In the next stage of this process, certain action in some main fields is necessary:

- On the basis of the network outline endorsed in the TINA process, establish, for the transport sector, priorities amongst possible investment measures using the criterion of sustainable mobility and an investment project pipeline for external financing
- Promotion of institutional building, and of organisational and regulatory measures favouring the competitiveness of rail
- Promotion of PPP schemes
- Development and adaptation of assessment methods for the future Trans-European transport network, including strategic environmental assessment, for its components, and for possible investment measures and projects
- Monitoring of the development of the future Trans-European transport network in the acceding countries and its usage, with the publication of regular information on progress
- Maintenance of a Geographical Information System (GIS) and an Expert Network in the field of monitoring the GIS for Central Europe

ANNEXES

ANNEX I – TINA NETWORK


TINA Rail Network
TINA network
Existing lines
Planned lines
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
Some of the rail connections are dedicated specially to freight transport
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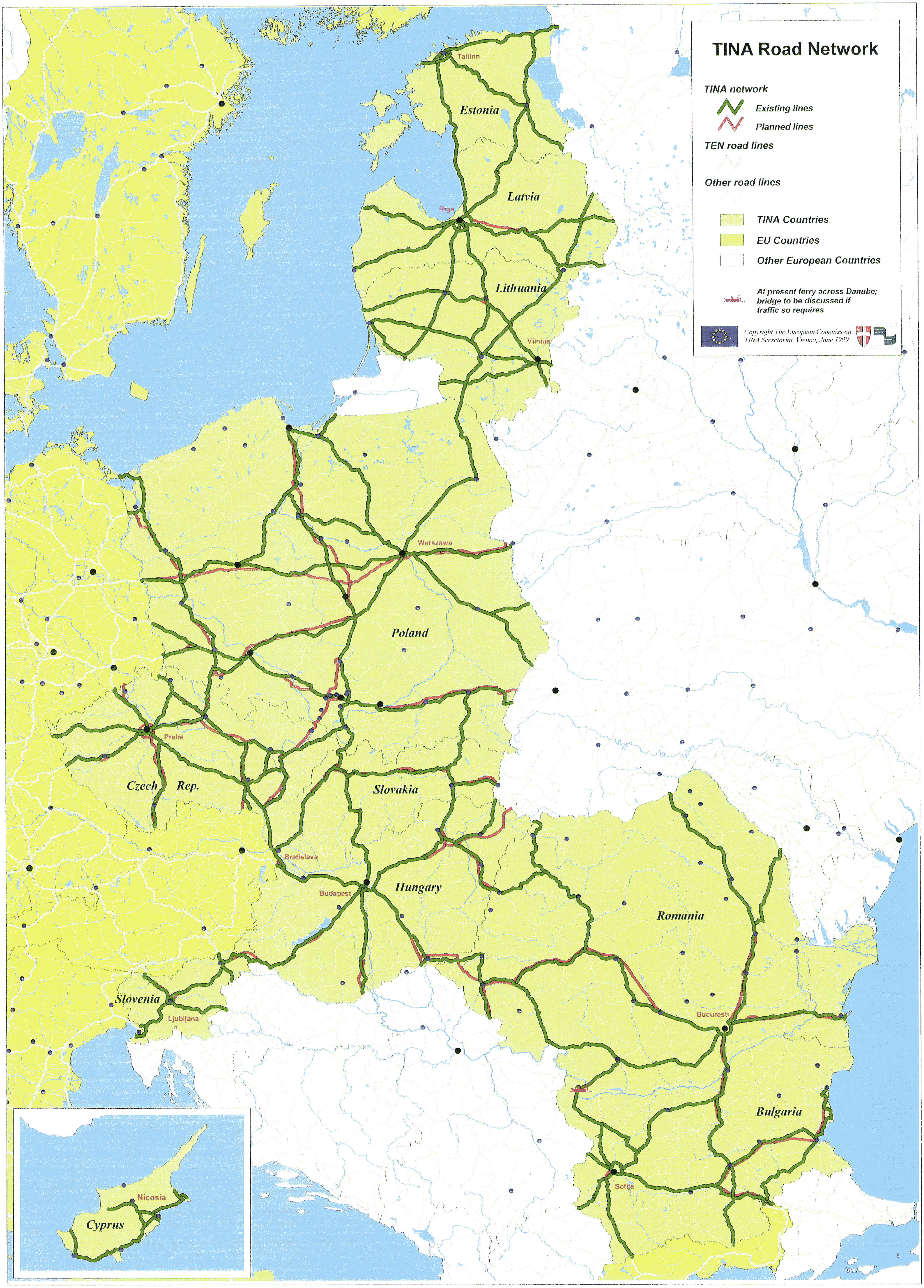
Tallinn
Estonia
Latvia
Riga
Lithuania
Vilnius
Warszawa
Poland
Praha
Czech Rep.
Slovakia
Bratislava
Hungary
Budapest
Romania
Slovenia
Ljubljana
Bucuresti
Bulgaria
Sofija
Nicosia
Cyprus



TINA Road Network
TINA network
Existing lines
Planned lines
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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Slovakia
Bratislava
Budapest
Hungary
Slovenia
Ljubljana
Romania
Bucuresti
Bulgaria
Sofija
Nicosia
Cyprus

TINA Network
Nodes & Waterways
TINA Waterways
TINA Airports
TINA Seaports/Riverports
TINA Terminals
TINA Countries
EU Countries
Other Countries
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Slovenia
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Bulgaria
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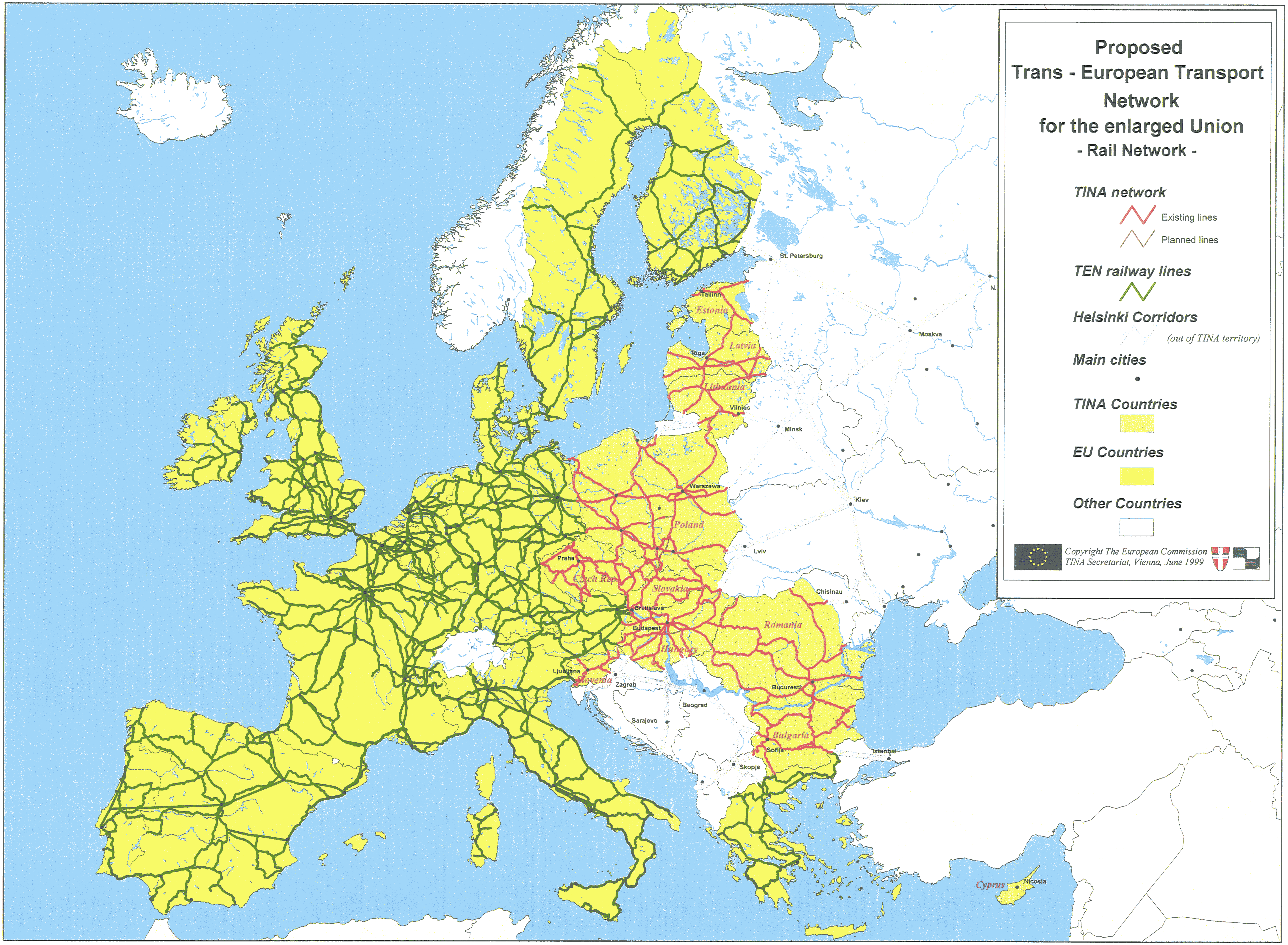
Nicosia
Cyprus

ANNEX II – TINA AND TEN NETWORK



Proposed
Trans - European Transport Network
for the enlarged Union
- Rail Network -
TINA network
Existing lines
Planned lines
TEN railway lines
Helsinki Corridors
(out of TINA territory)
Main cities
TINA Countries
EU Countries
Other Countries
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St. Petersburg
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Riga
Latvia
Lithuania
Vilnius
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Praha
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Bratislava
Budapest
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Chisinau
Romania
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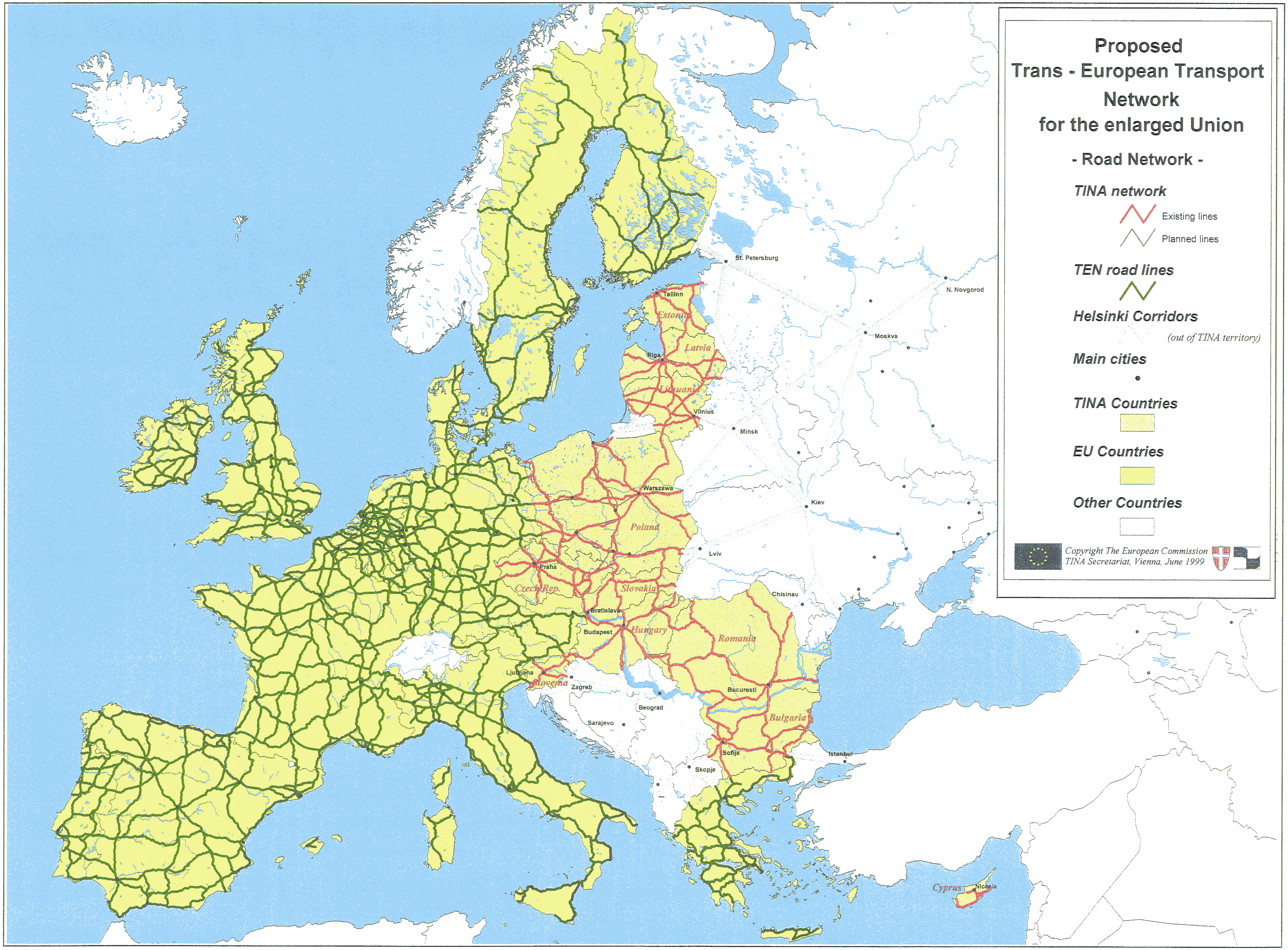
Zagreb
Beograd
Sarajevo
Bucuresti
Bulgaria
Sofija
Skopje
Istanbul
Cyprus
Nicosia



Proposed
Trans - European Transport
Network
for the enlarged Union
- Road Network -
TINA network
Existing lines
Planned lines
TEN road lines
Helsinki Corridors
(out of TINA territory)
Main cities
TINA Countries
EU Countries
Other Countries
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Czech Rep.
Slovakia
Chisinau
Bratislava
Budapest
Hungary
Romania
Ljubljana
Slovenia
Zagreb
Bucuresti
Beograd
Sarajevo
Bulgaria
Sofija
Istanbul
Skopje
Cyprus
Nicosia

ANNEX III – TINA NETWORK – NATIONAL MAPS


TINA Network - Bulgaria
TINA railway network
TINA road network
Existing lines
Planned lines
Existing lines
Planned lines
TINA waterways
TINA Airports
TINA Ports
TINA Terminals
TEN railway network
TEN road network
Other railway lines
TINA - Countries
Other roads
EU Countries
Cities
Other Countries
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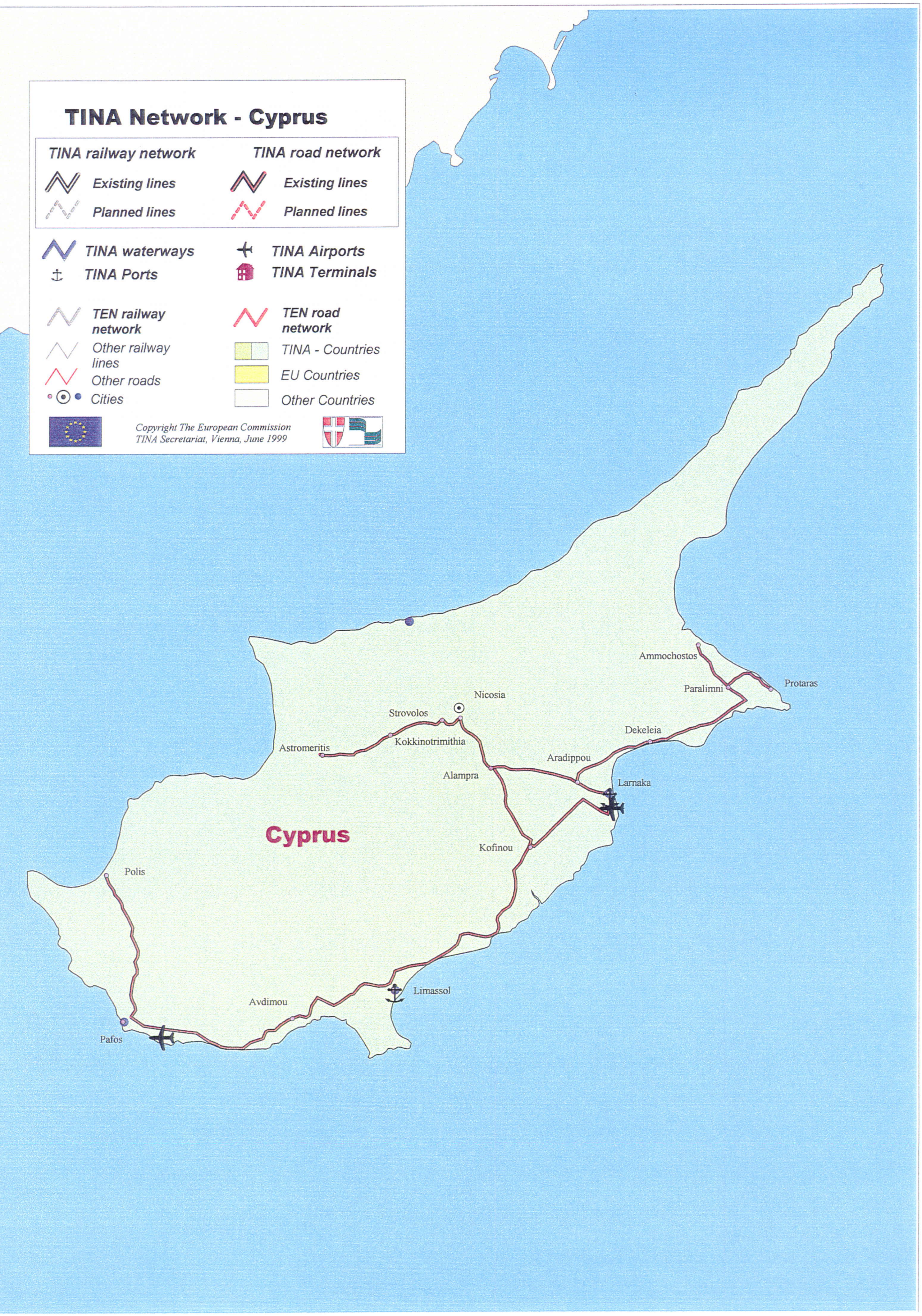
TINA Secretariat, Vienna, June 1999
Alba Iulia
Brasov
Braila
Buzau
Faurei
Romania
Ploiesti
Cernavoda
Constanta
Lehliu
Fetesti
Medgidia
Bucuresti
Videle
Rosiori
Giurgiu
Ruse
Vidin
Calafat
Kaspican
Sindel
Varna
Priselci
Bjala
Pleven
Gorna Oriahovista
Veliko Turnovo
Montana
Mezdra
Vraca
Karnobat
Burgas
Gabrovo
Dabovo
Zimnica
Jambol
Botevgrad
Bulgaria
Kalotina
Tulovo
Bezmer
Stara Zagora
Volujak
Pernik
Sofija
Batanovci
Orizovo
Skutare
Gita
Dimitrovgrad
Krumovo
Plovdiv
Haskovo
Svilengrad
Kap. Andreevo
Turkey
Ormenion
Dupnica
Gjuesevo
Makaza
Gen. Todorov
Kulata
Greece


TINA Network - Cyprus
TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
TINA - Countries
EU Countries
Other Countries
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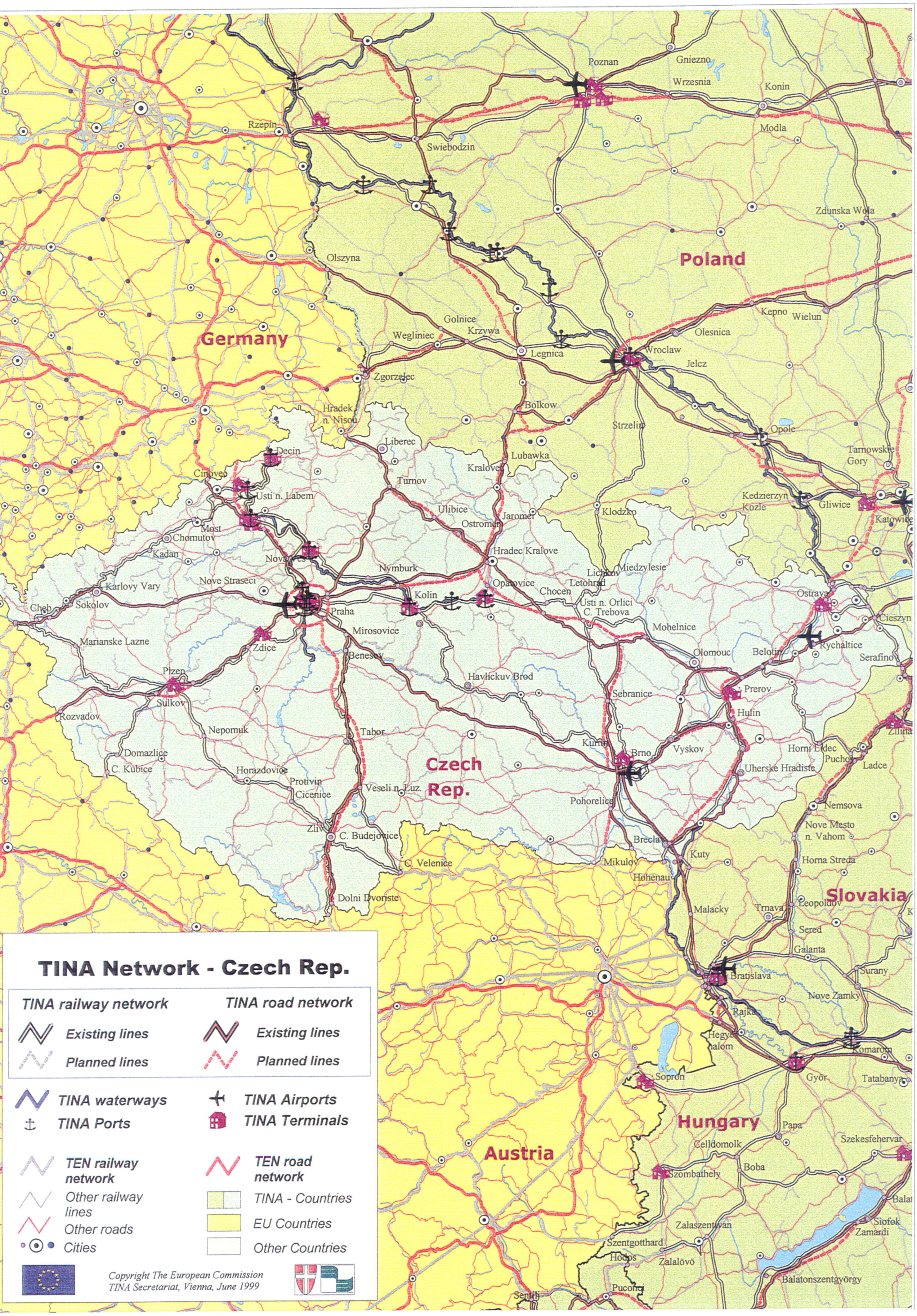
Cyprus
Nicosia
Strovolos
Kokkinotrimithia
Astromeritis
Alampra
Aradippou
Larnaka
Dekeleia
Ammochostos
Paralimni
Protaras
Kofinou
Limassol
Avdimou
Pafos
Polis


TINA Network - Czech Rep.
TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
TINA - Countries
EU Countries
Other Countries
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Germany
Poland
Czech Rep.
Slovakia
Hungary
Austria
Poznan
Gniezno
Wrzesnia
Konin
Modla
Rzepin
Swiebodzin
Zdunska Wola
Olszyna
Golnice
Krzywa
Weglinec
Legnica
Kepno
Wielun
Olesnica
Wroclaw
Jelcz
Zgorzelec
Hradek n. Nisou
Bolkow
Strzelin
Opole
Liberec
Lubawka
Kralovec
Decin
Cinovec
Usti n. Labem
Turnov
Tarnowskie Gory
Kedzierzyn Kozle
Gliwice
Katowice
Ulibice
Ostromer
Jaromer
Klodzko
Most
Chomutov
Kadan
Nova
Hradec Kralove
Nymburk
Karlovy Vary
Nove Straseci
Opatovice
Chocen
Letohrad
Miedzylesie
Usti n. Orlici
C. Trebova
Ostrava
Cieszyn
Cheb
Sokolov
Kolin
Praha
Mirosovice
Mohelnice
Rychaltice
Serafino
Marianske Lazne
Zdice
Benesov
Olomouc
Belotin
Havlickuv Brod
Prerov
Plzen
Sulkov
Sebranice
Hulin
Rozvadov
Nepomuk
Tabor
Zilina
Kuřim
Brno
Vyskov
Horni Lidec
Puchov
Domazlice
C. Kubice
Horazdovice
Protivin
Cicenice
Veseli n. Luz.
Uherske Hradiste
Ladce
Pohorelice
Nemsova
Nove Mesto n. Vahom
Zliv
C. Budejovice
Breclav
Kuty
C. Velenice
Mikulov
Hohenau
Horna Streda
Malacky
Trnava
Leopoldov
Dolni Dvoriste
Sered
Galanta
Bratislava
Surany
Nove Zamky
Rajka
Hegyeshalom
Komarom
Gyor
Tatabanya
Sopron
Papa
Szekesfehervar
Celldomolk
Szombathely
Boba
Balaton
Siofok
Zamardi
Zalaszentivan
Szentgotthard
Hodos
Zalalövö
Balatonszentgyörgy
Pucon
Sentilj


TINA Network - Estonia
TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
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EU Countries
Other Countries
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Johvi
Sillamae
Muuga
Tallinn
Aegviidu
Tapa
Juri
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Manniku
Keila
Mustvee
Tartu
Estonia
Parnu
Kanepi
Koidula
Voru
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Valga
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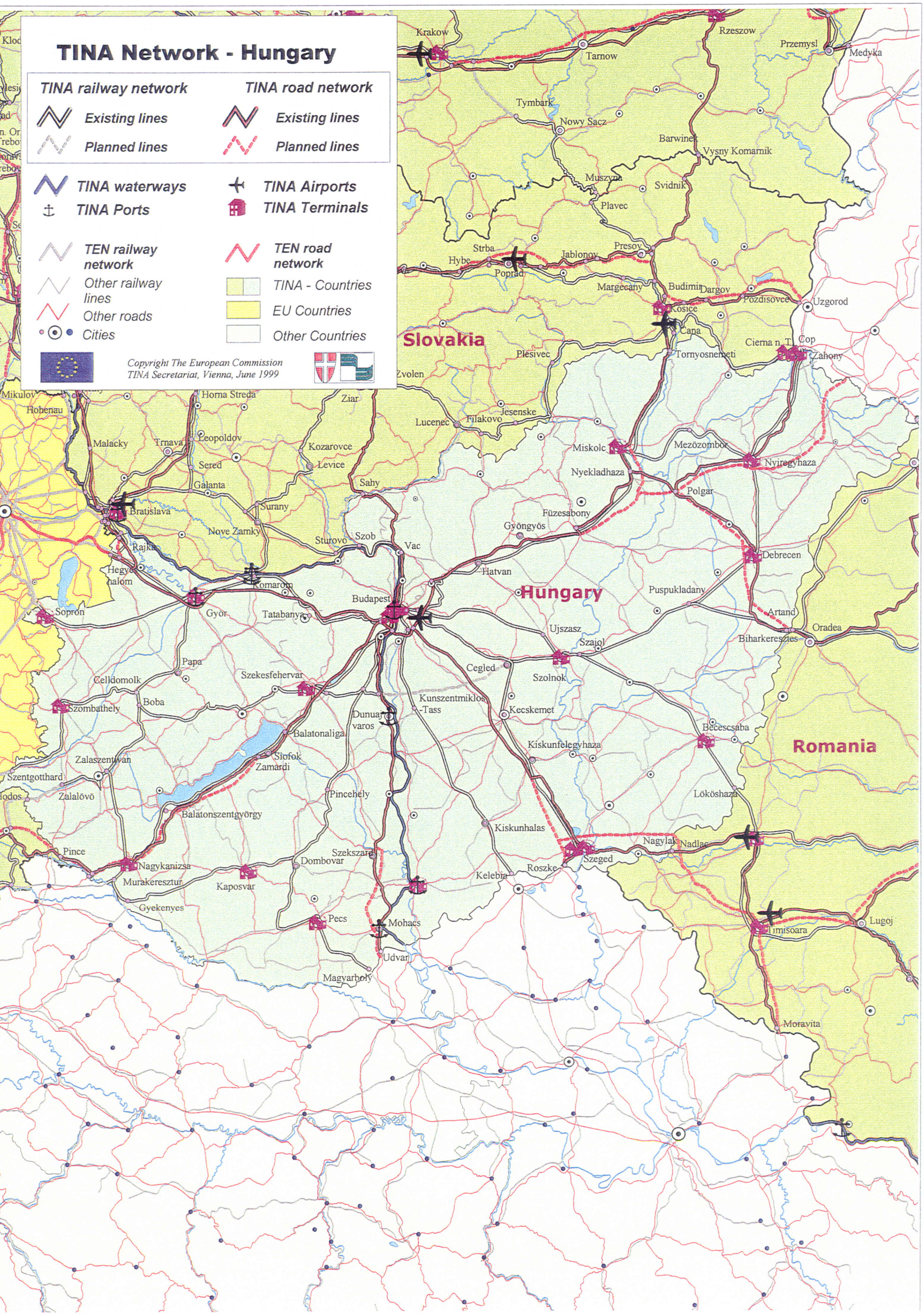
Ikla
Ainazi
Svetciems
Vitrupe
Valmiera
Latvia
Incukalns
Ieriki


TINA Network - Hungary
TINA railway network
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TINA Ports
TINA Airports
TINA Terminals
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Other roads
Cities
TEN road network
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Muszyna
Svidnik
Plavec
Presov
Jablonov
Strba
Hybe
Poprad
Margecany
Budimir
Dargov
Pozdisovce
Uzgorod
Kosice
Cana
Tornyosnemeti
Cierna n. T.
Cop
Zahony
Plesivec
Zvolen
Ziar
Lucenec
Filakovo
Jesenske
Horna Streda
Mikulov
Hohenau
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Kozarovce
Levice
Sered
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Sahy
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Sturovo
Szob
Vac
Rajka
Hegyeshalom
Komarom
Sopron
Gyor
Tatabanya
Budapest
Hatvan
Gyöngyös
Füzesabony
Miskolc
Nyekladhaza
Mezözombor
Nyiregyhaza
Polgar
Debrecen
Puspukladany
Artand
Oradea
Biharkeresztes
Ujszasz
Szajol
Szolnok
Cegled
Kecskemet
Kunszentmiklos-Tass
Papa
Celldomolk
Szekesfehervar
Szombathely
Boba
Dunaujvaros
Balatonaliga
Siofok
Zamardi
Zalaszentivan
Szentgotthard
Zalalövö
Pincehely
Balatonszentgyörgy
Kiskunfelegyhaza
Becescsaba
Lököshaza
Kiskunhalas
Szeged
Nagylak
Nadlac
Roszke
Kelebia
Szekszard
Dombovar
Kaposvar
Pince
Nagykanizsa
Murakeresztur
Gyekenyes
Pecs
Mohacs
Udvar
Magyarboly
Timisoara
Lugoj
Moravita

TINA Network - Latvia
TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
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Valga
Luhamaa
Valka
Ikla
Ainazi
Svetciems
Vitrupe
Valmiera
Incukalns
Ieriki
Grebneva
Karsava
Ventspils
Riga
Baltezers
Tukums
Ogre
Koknese
Krustpils
Jekabpils
Rezekne
Zilupe
Terehova
Berzpils
Kekava
Dalbe
Jelgava
Gluda
Meitene
Kalviai
Grenctale
Salociai
Nicgale
Indra
Paternieki
Eglaine
Daugavpils
Medums
Liepaja
Riaubonys
Rokiskis
Sapeliai
Zarasai
Kupiskis
Kuziai
Siauliai
Telsiai
Radviliskis
Panevezys
Utena
Palanga
Kretinga
Linkaiciai
Klaipeda
Kryzkalnis
Ukmerge
Kedainiai
Silute
Taurage
Paneveziukas
Jonava
Sitkunai
Gaiziunai
Kaisiadorys
Pagegiai
Panemune
Kaunas
Vilnius
Kena
Mauruciai
Kazlu Ruda
Trakai
Medininkai
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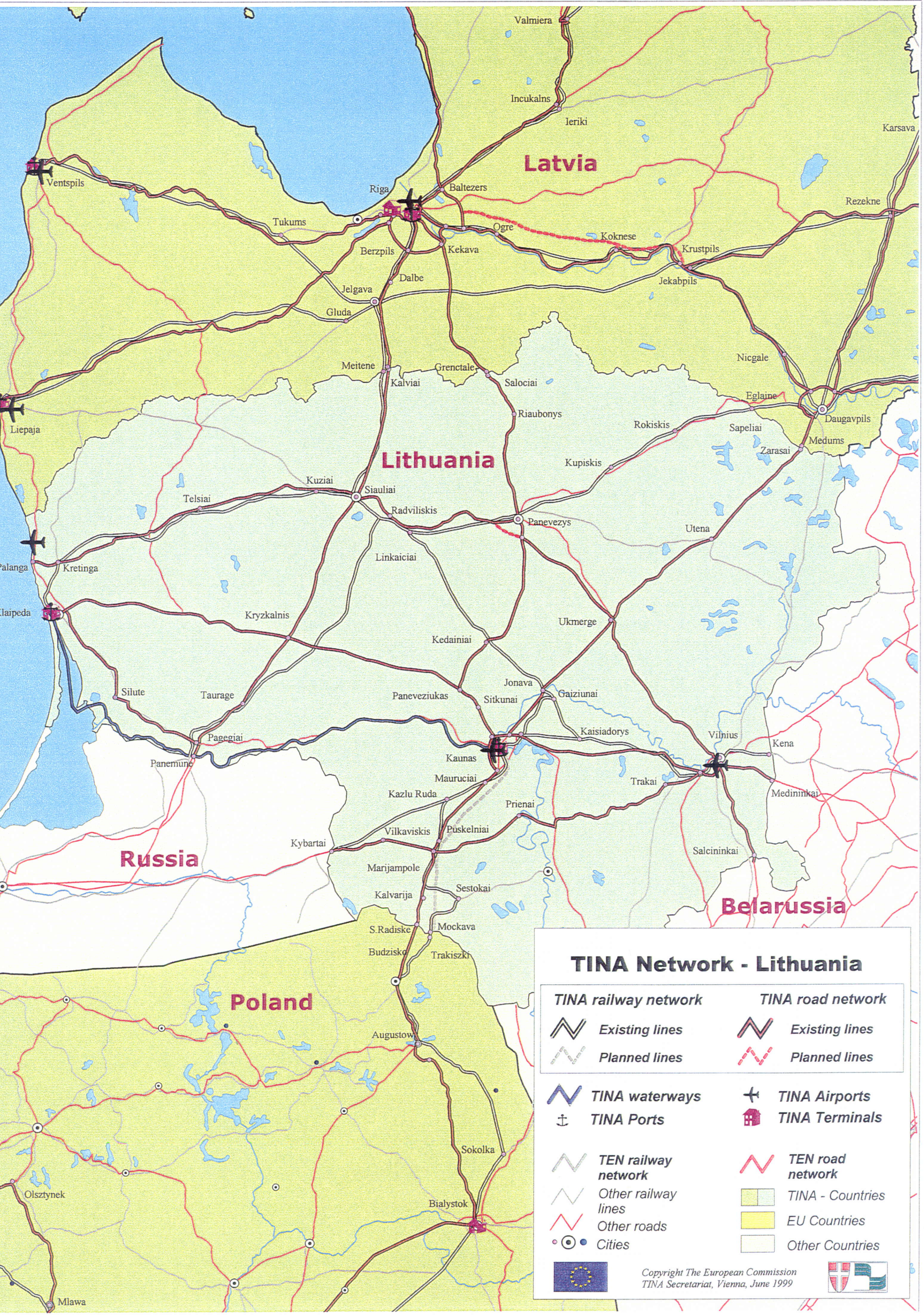
Sestokai
Kalvarija
S.Radiskis
Mockava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Riga
Baltezers
Rezekne
Tukums
Ogre
Koknese
Krustpils
Berzpils
Kekava
Jekabpils
Dalbe
Jelgava
Gluda
Nicgale
Meitene
Grenctale
Kalviai
Salociai
Eglaine
Liepaja
Riaubonys
Daugavpils
Rokiskis
Sapeliai
Medums
Zarasai
Kupiskis
Kuziai
Siauliai
Telsiai
Radviliskis
Panevezys
Utena
Palanga
Kretinga
Linkaiciai
Klaipeda
Kryzkalnis
Ukmerge
Kedainiai
Jonava
Silute
Taurage
Paneveziukas
Sitkunai
Gaiziunai
Kaisiadorys
Pagegiai
Vilnius
Kena
Panemune
Kaunas
Trakai
Mauruciai
Medininkai
Kazlu Ruda
Prienai
Vilkaviskis
Puskelniai
Kybartai
Salcininkai
Marijampole
Sestokai
Kalvarija
S.Radiske
Mockava
Budzisko
Trakiszki
Augustow
Sokolka
Olsztynek
Bialystok
Mlawa
TINA Network - Lithuania
TINA railway network
TINA road network
Existing lines
Planned lines
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
TINA - Countries
EU Countries
Other Countries
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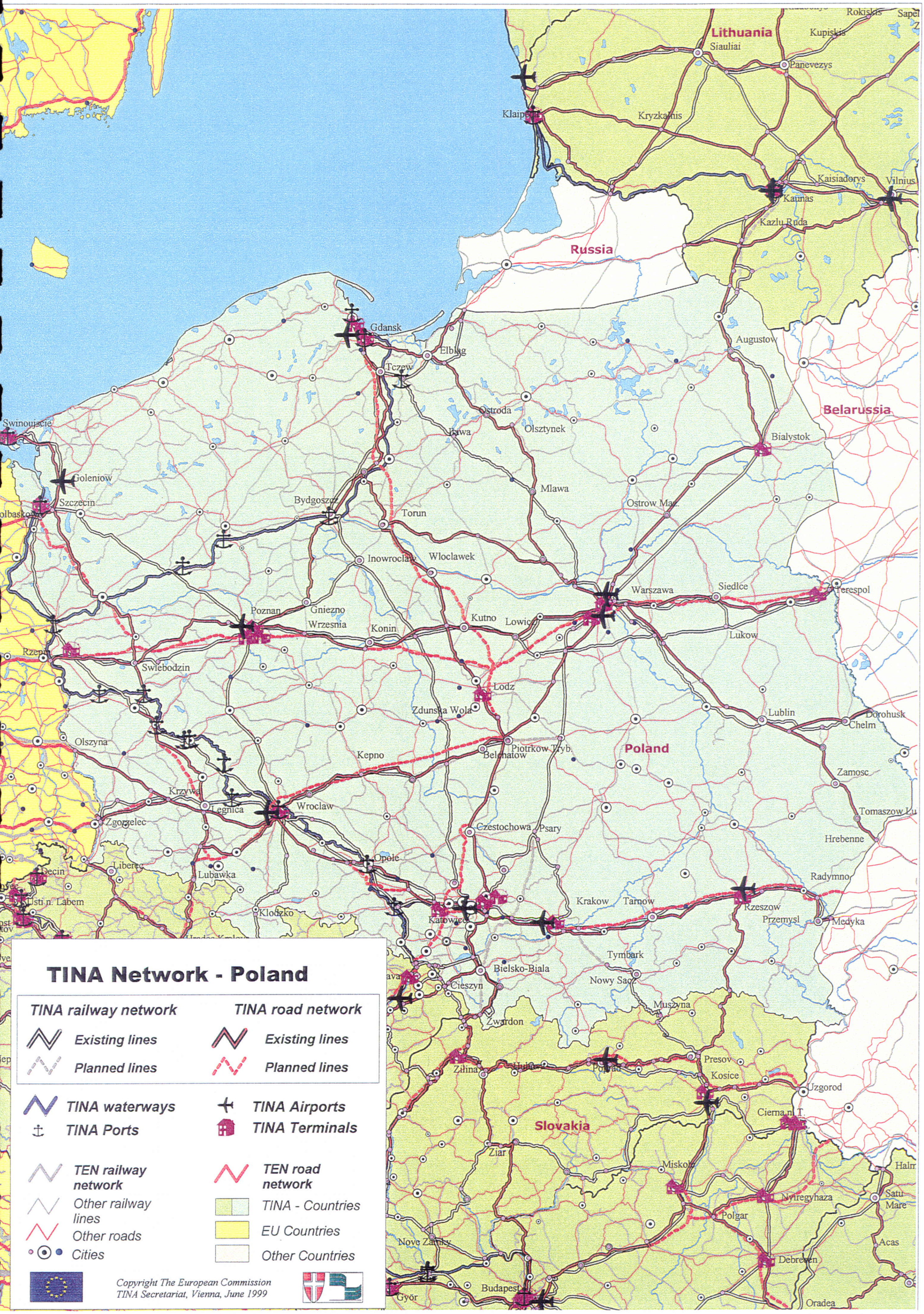
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TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
TINA - Countries
EU Countries
Other Countries
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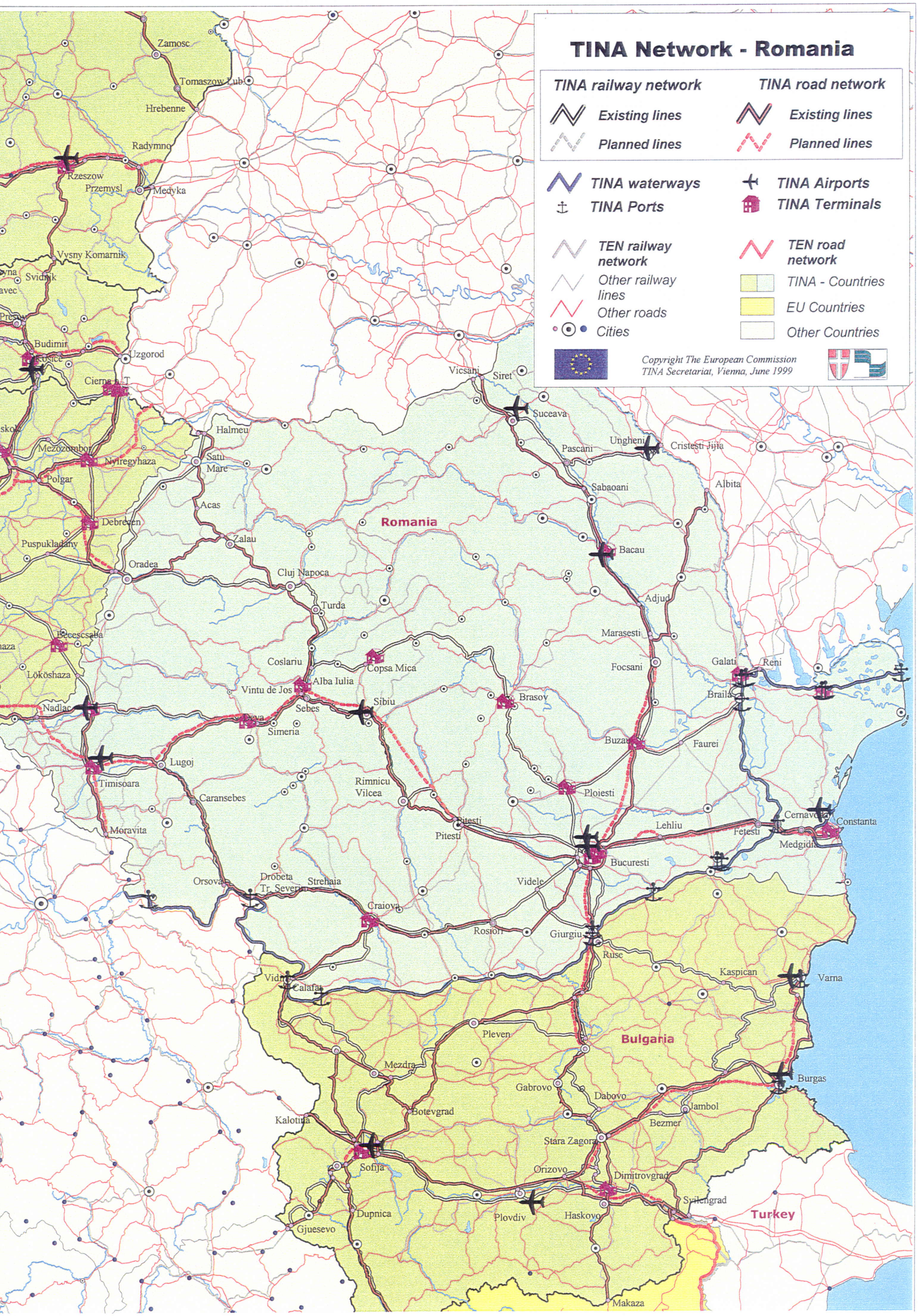
Russia
Belarussia
Poland
Slovakia
Siauliai
Panevezys
Klaipeda
Kaunas
Kaisiadorys
Vilnius
Kazlu Ruda
Gdansk
Elblag
Tczew
Augustow
Bialystok
Ostroda
Olsztynek
Swinoujscie
Goleniow
Szczecin
Bydgoszcz
Torun
Mlawa
Inowroclaw
Wloclawek
Poznan
Gniezno
Wrzesnia
Konin
Kutno
Warszawa
Siedlce
Terespol
Lukow
Swiebodzin
Lodz
Zdunska Wola
Lublin
Chelm
Dorohusk
Olszyna
Kepno
Piotrkow Tryb.
Belchatow
Zamosc
Legnica
Wroclaw
Zgorzelec
Tomaszow Lu.
Czestochowa
Psary
Hrebenne
Lubawka
Opole
Radymno
Klodzko
Katowice
Krakow
Tarnow
Rzeszow
Przemysl
Medyka
Liberec
Decin
Usti n. Labem
Bielsko-Biala
Cieszyn
Tymbark
Nowy Sacz
Muszyna
Zwardon
Zilina
Presov
Kosice
Uzgorod
Cierna n. T.
Ziar
Miskolc
Nyiregyhaza
Polgar
Satu Mare
Nove Zamky
Debrecen
Acas
Budapest
Gyor
Oradea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TINA road network
Existing lines
Planned lines
Existing lines
Planned lines
TINA waterways
TINA Airports
TINA Ports
TINA Terminals
TEN railway network
TEN road network
Other railway lines
TINA - Countries
Other roads
EU Countries
Cities
Other Countries
Copyright The European Commission
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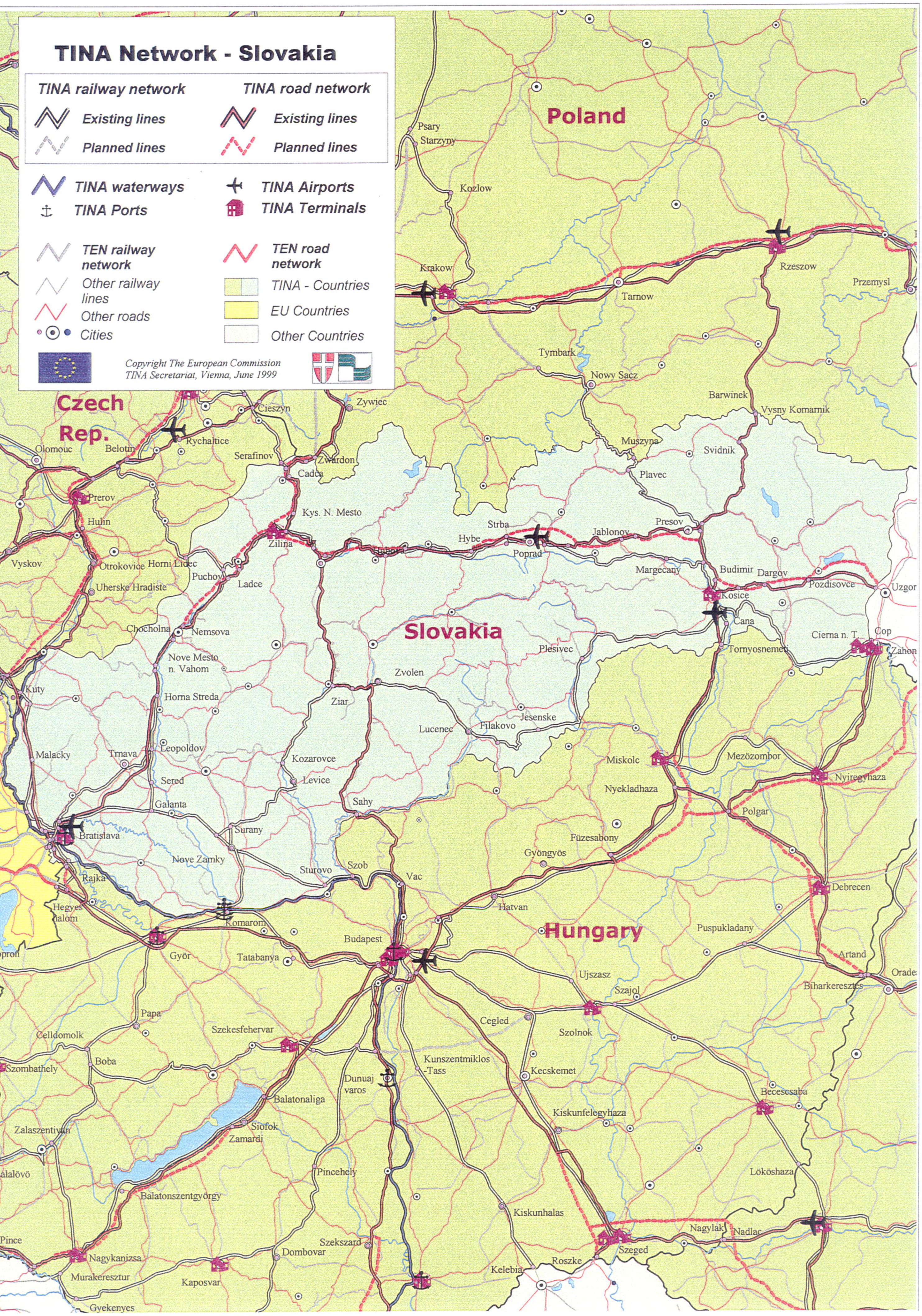
Romania
Bulgaria
Turkey
Zamosc
Tomaszow Lub.
Hrebenne
Radymno
Rzeszow
Przemysl
Medyka
Vysny Komarnik
Svidnik
Presov
Budimir
Kosice
Uzgorod
Cierna n.T.
Mezozombor
Nyiregyhaza
Polgar
Debrecen
Puspukladany
Oradea
Halmeu
Satu Mare
Acas
Zalau
Cluj Napoca
Turda
Bekescsaba
Lokoshaza
Coslariu
Copsa Mica
Alba Iulia
Vintu de Jos
Sebes
Sibiu
Simeria
Deva
Nadlac
Lugoj
Timisoara
Caransebes
Moravita
Orsova
Drobeta Tr. Severin
Strehaia
Rimnicu Vilcea
Pitesti
Craiova
Rosiori
Videle
Giurgiu
Bucuresti
Ploiesti
Brasov
Buzau
Focsani
Marasesti
Adjud
Bacau
Sabaoani
Pascani
Suceava
Siret
Vicsani
Ungheni
Cristesti Jijia
Albita
Galati
Reni
Braila
Faurei
Lehliu
Fetesti
Cernavoda
Medgidia
Constanta
Ruse
Kaspican
Varna
Vidin
Calafat
Pleven
Mezdra
Botevgrad
Kalotina
Sofija
Gabrovo
Dabovo
Jambol
Burgas
Bezmer
Stara Zagora
Orizovo
Dimitrovgrad
Svilengrad
Plovdiv
Haskovo
Dupnica
Gjuesevo
Makaza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TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
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EU Countries
Other Countries
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Przemysl
Tymbark
Nowy Sacz
Barwinek
Vysny Komarnik
Zywiec
Cieszyn
Rychaltice
Olomouc
Belotin
Serafinov
Zwardon
Cadca
Prerov
Hulin
Kys. N. Mesto
Muszyna
Svidnik
Plavec
Presov
Jablonov
Strba
Hybe
Poprad
Zilina
Vyskov
Otrokovice
Horni Lidec
Puchov
Ladce
Uherske Hradiste
Margecany
Budimir
Dargov
Kosice
Pozdisovce
Uzgor
Cana
Cierna n. T.
Cop
Zahon
Tornyosnemeti
Chocholna
Nemsova
Nove Mesto n. Vahom
Plesivec
Zvolen
Kuty
Horna Streda
Ziar
Jesenske
Lucenec
Filakovo
Leopoldov
Malacky
Trnava
Kozarovce
Levice
Sered
Miskolc
Mezözombor
Nyekladhaza
Nyiregyhaza
Galanta
Sahy
Polgar
Bratislava
Surany
Füzesabony
Nove Zamky
Gyöngyös
Sturovo
Szob
Vac
Rajka
Hegyes halom
Komarom
Hatvan
Debrecen
Budapest
Györ
Tatabanya
Puspukladany
Artand
Oradea
Biharkeresztes
Ujszasz
Szajol
Papa
Cegled
Szolnok
Celldomolk
Szekesfehervar
Boba
Szombathely
Kunszentmiklos -Tass
Kecskemet
Dunauj varos
Balatonaliga
Becescsaba
Zalaszentivan
Siofok
Zamardi
Kiskunfelegyhaza
Lököshaza
Pincehely
Balatonszentgyörgy
Kiskunhalas
Nagylak
Nadlac
Szeged
Roszke
Kelebia
Szekszard
Dombovar
Nagykanizsa
Murakeresztur
Kaposvar
Gyekenyes
Pince


TINA Network - Slovenia
TINA railway network
Existing lines
Planned lines
TINA road network
Existing lines
Planned lines
TINA waterways
TINA Ports
TINA Airports
TINA Terminals
TEN railway network
Other railway lines
Other roads
Cities
TEN road network
TINA - Countries
EU Countries
Other Countries
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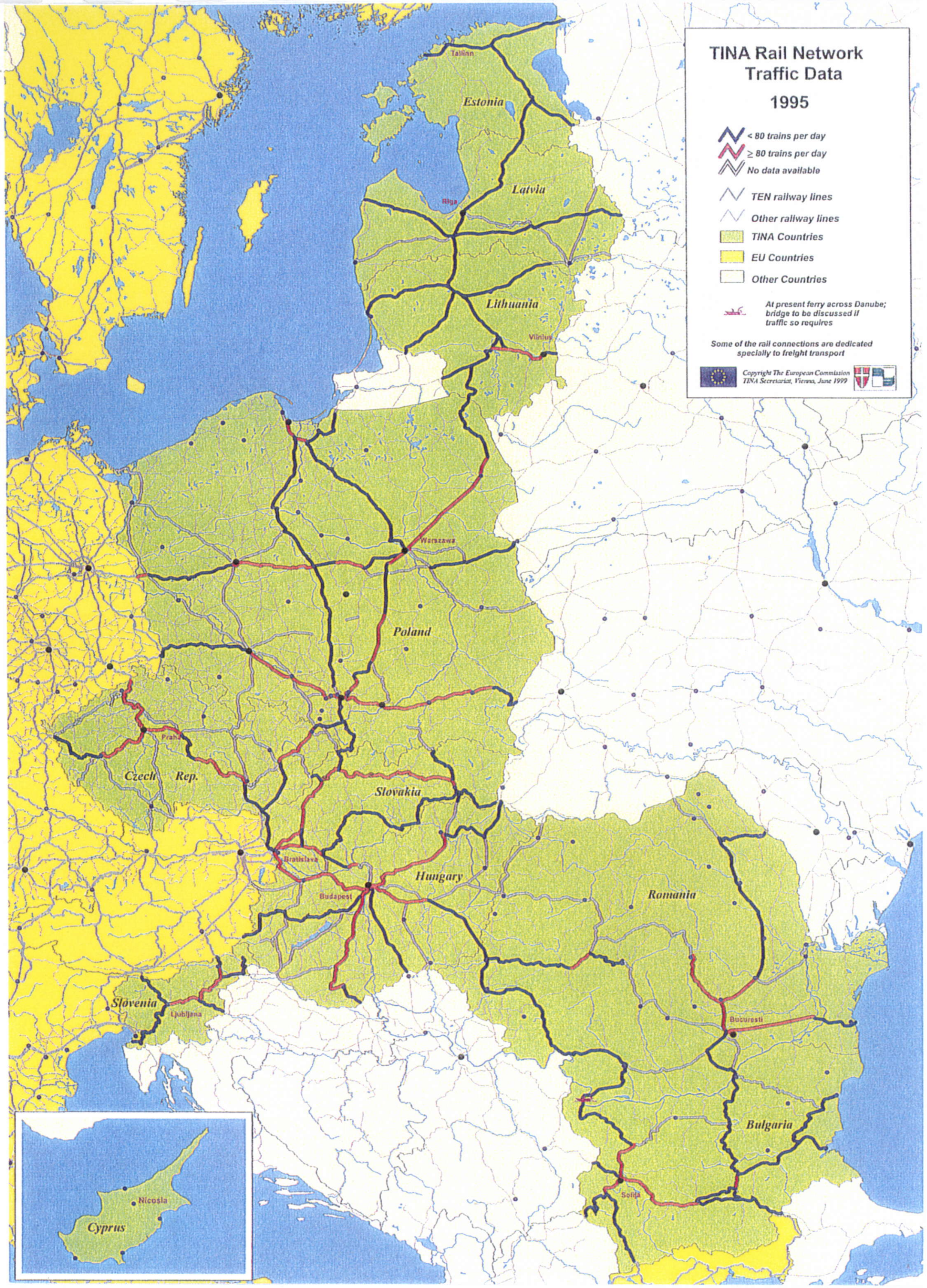
Slovenia
Croatia
Szentgotthard
Hodos
Zalalövö
Puconci
Sentilj
Pince
Maribor
Slivnica
Ormoz
Pragersko
Gruskovje
Jesenice
Karavanke
Vrba
Kranj
Vransko
Zidani Most
Sentvid
Ljubljana
Visnja Gora
Dobova
Krska Vas
Bic
Obrezje
Fernetici
Divaca
Sezana
Pivka
Ankaran
Koper
Presnica

Annex IV – Rail traffic: 1995, 2005, 2010, 2015


TINA Rail Network
Traffic Data
1995
< 80 trains per day
≥ 80 trains per day
No data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other Countries
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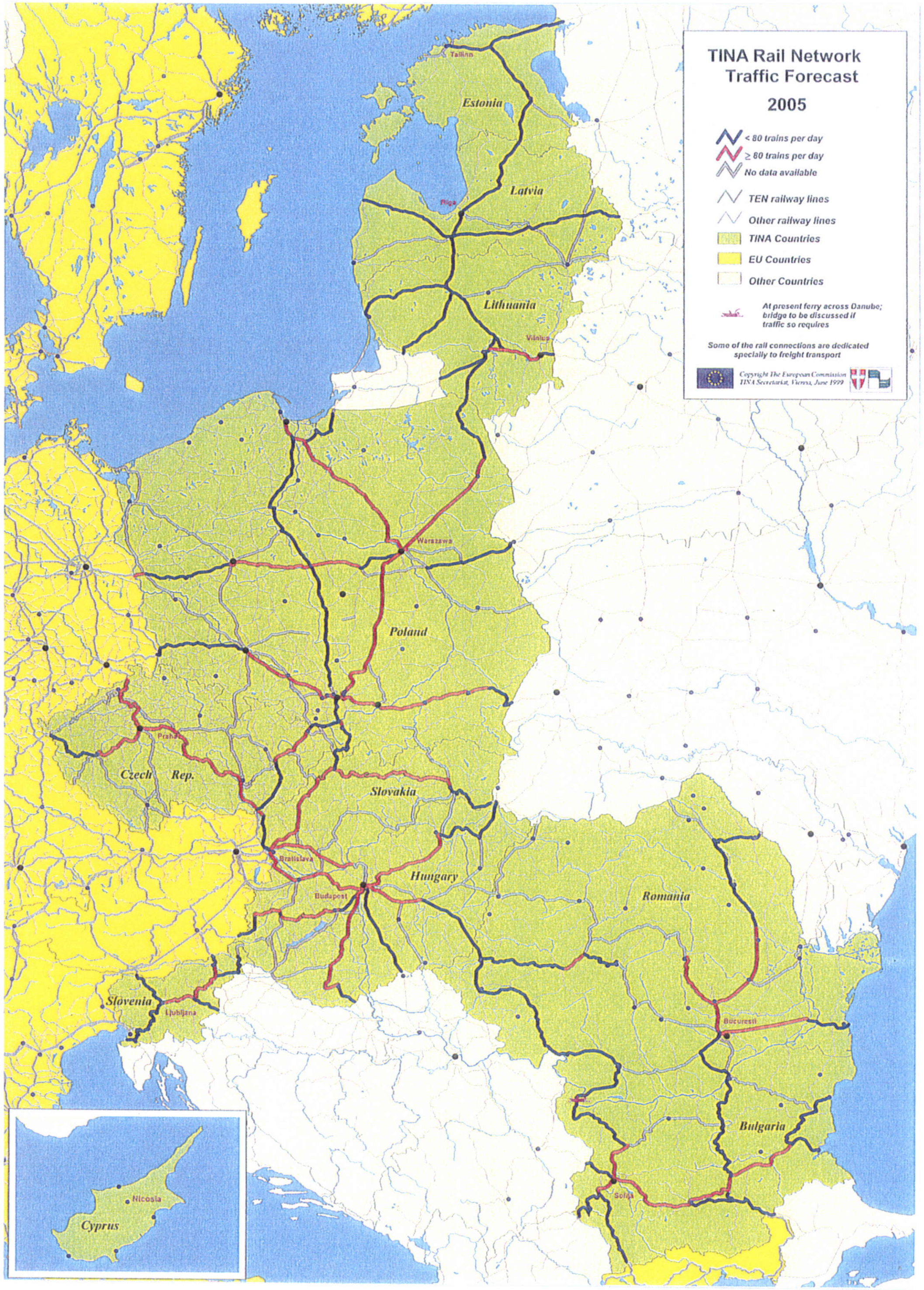
Bratislava
Budapest
Ljubljana
Bucuresti
Sofija
Nicosia


TINA Rail Network
Traffic Forecast
2005
< 80 trains per day
≥ 80 trains per day
No data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
Some of the rail connections are dedicated specially to freight transport
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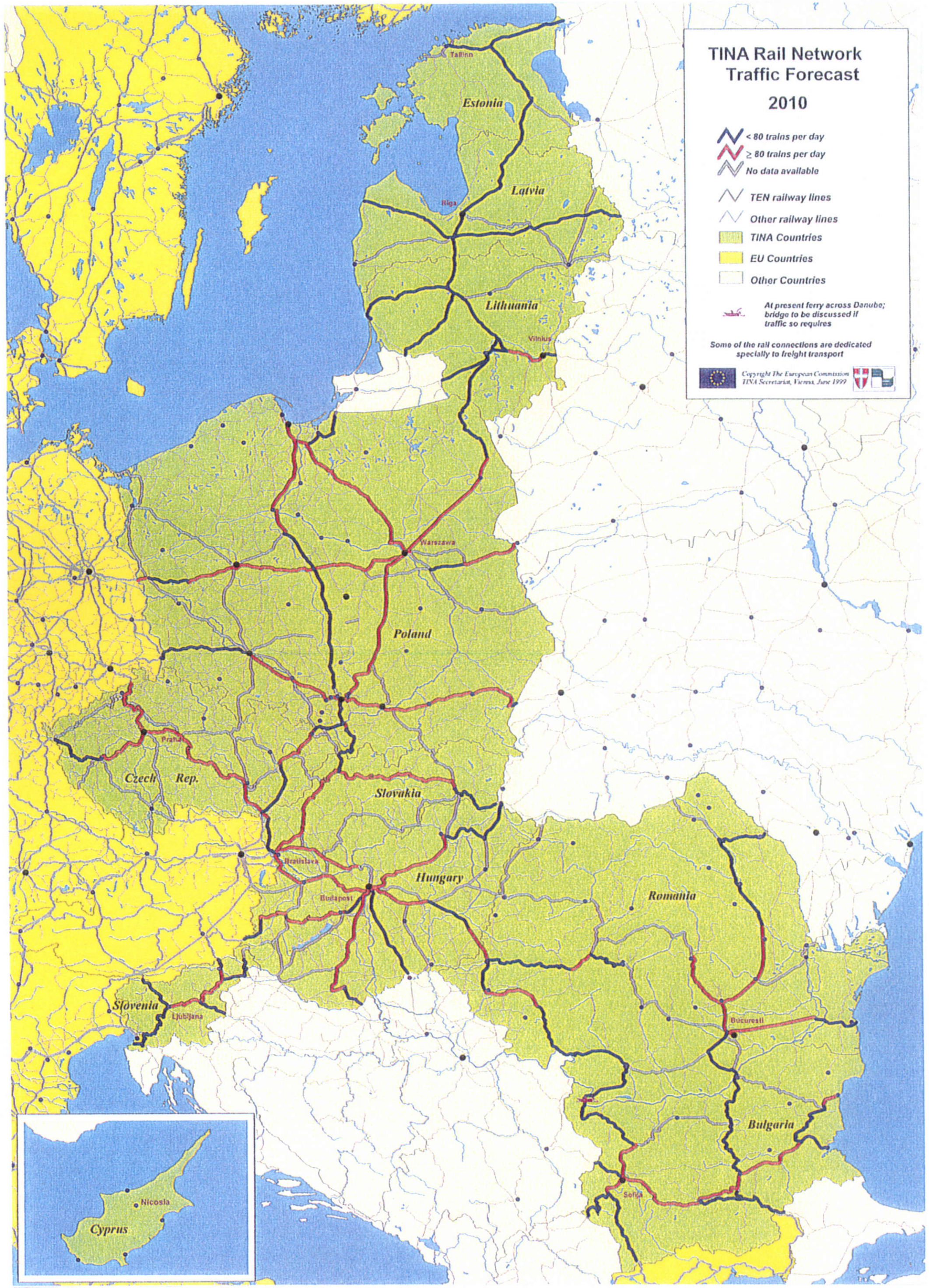
Cyprus
Tallinn
Riga
Vilnius
Warszawa
Bratislava
Budapest
Ljubljana
Bucuresti
Sofija
Nicosia


TINA Rail Network
Traffic Forecast
2010
< 80 trains per day
≥ 80 trains per day
No data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
Some of the rail connections are dedicated specially to freight transport
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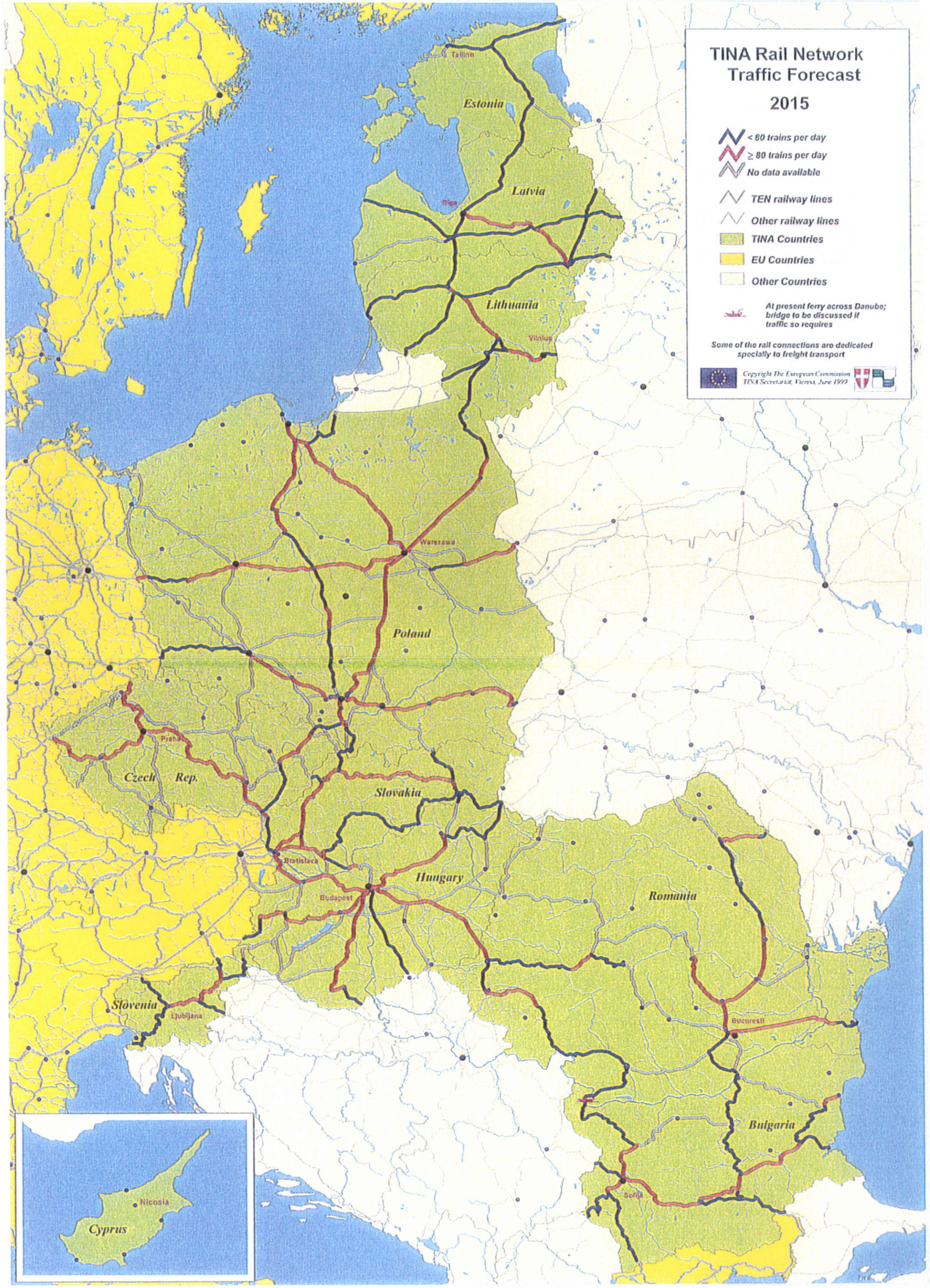
Romania
Bucuresti
Slovenia
Ljubljana
Bulgaria
Sofia
Nicosia
Cyprus


TINA Rail Network
Traffic Forecast
2015
< 80 trains per day
≥ 80 trains per day
No data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
Some of the rail connections are dedicated specially to freight transport
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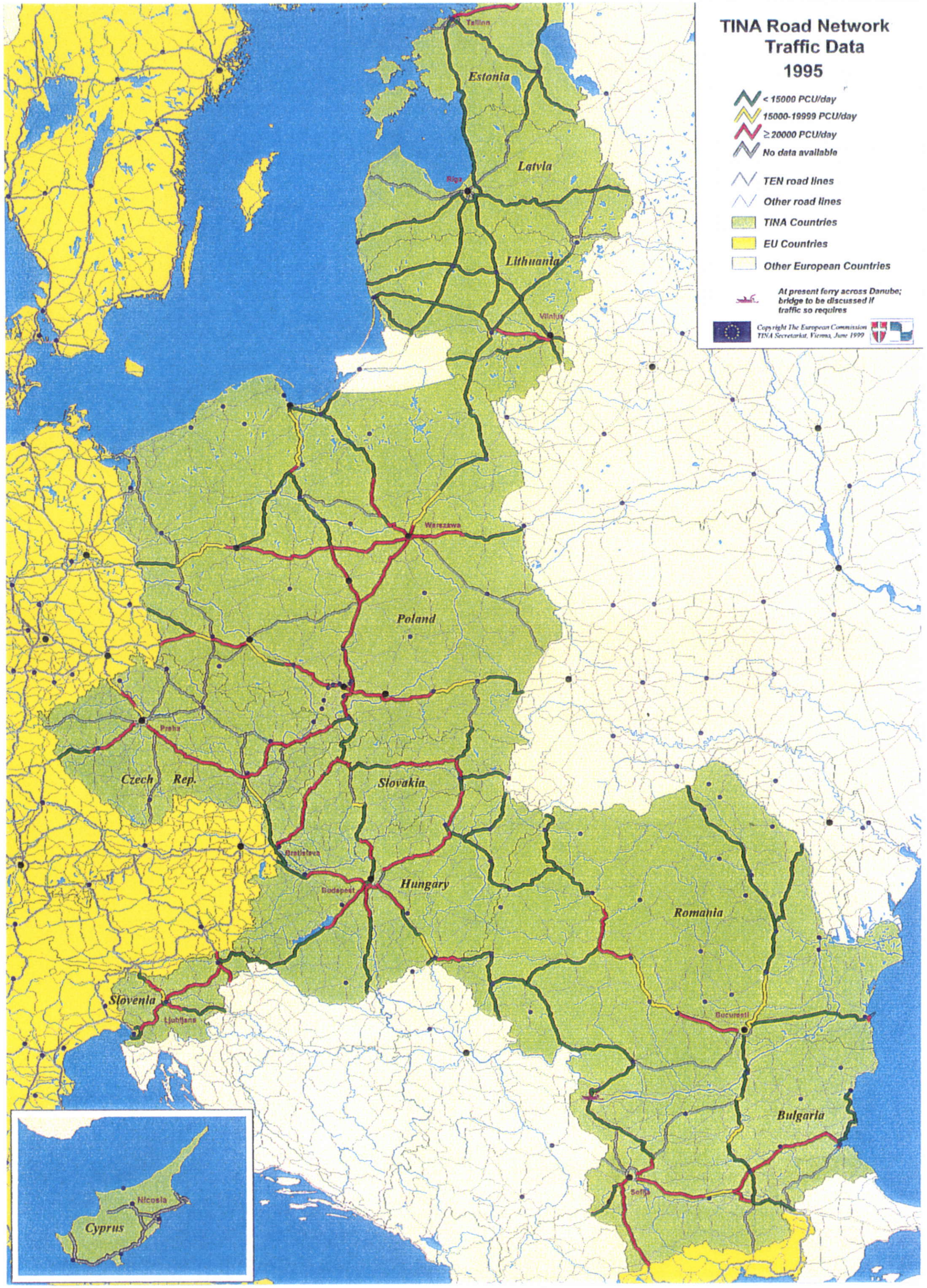
Ljubljana
Bulgaria
Sofia
Nicosia
Cyprus

ANNEX V – ROAD TRAFFIC: 1995, 2005, 2010, 2015


TINA Road Network
Traffic Data
1995
< 15000 PCU/day
15000-19999 PCU/day
≥ 20000 PCU/day
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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Bulgaria
Slovenia
Cyprus
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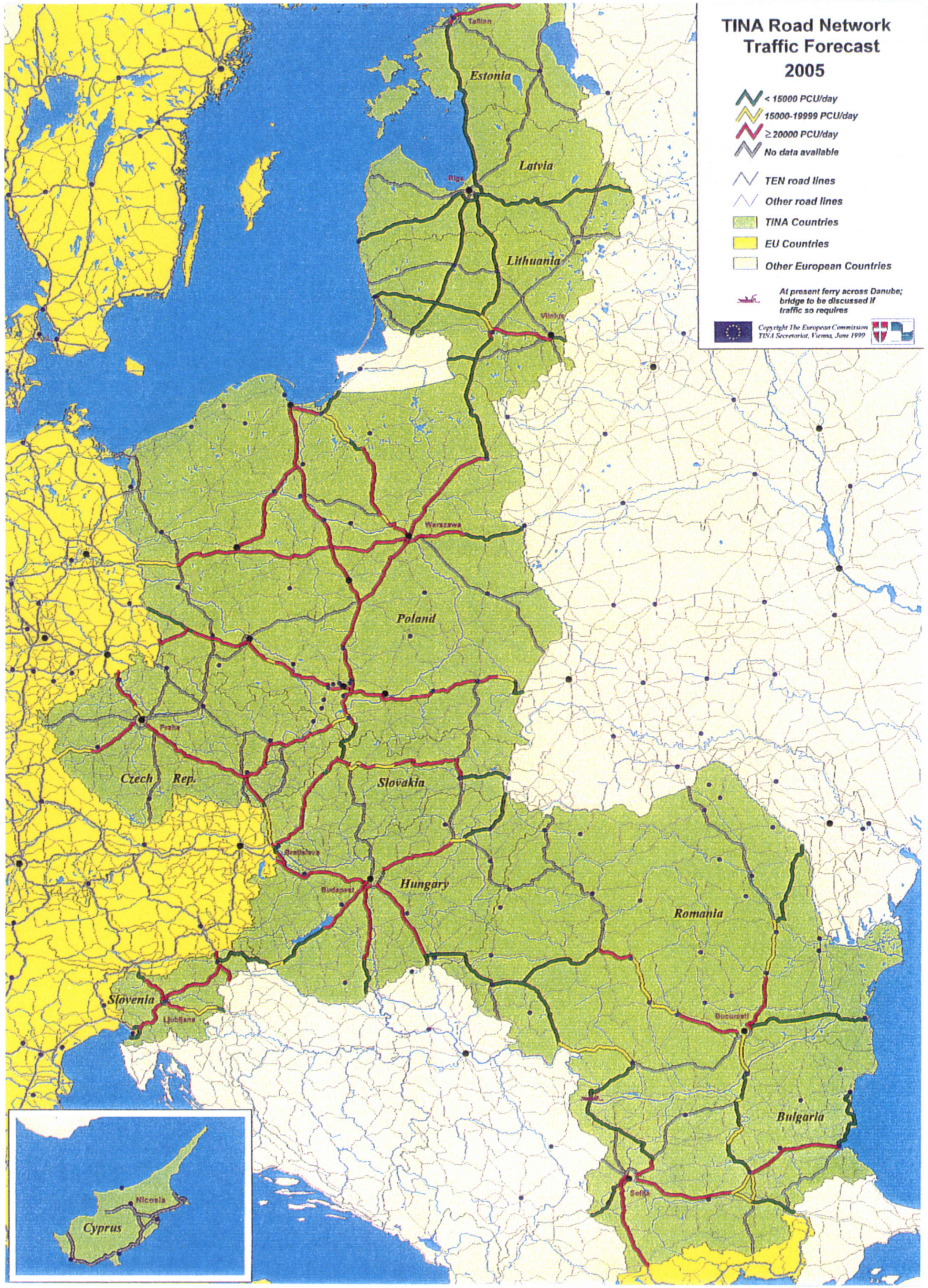
Riga
Vilnius
Warszawa
Praha
Bratislava
Budapest
Ljubljana
Bucuresti
Sofia


TINA Road Network
Traffic Forecast
2005
< 15000 PCU/day
15000-19999 PCU/day
≥ 20000 PCU/day
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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Slovakia
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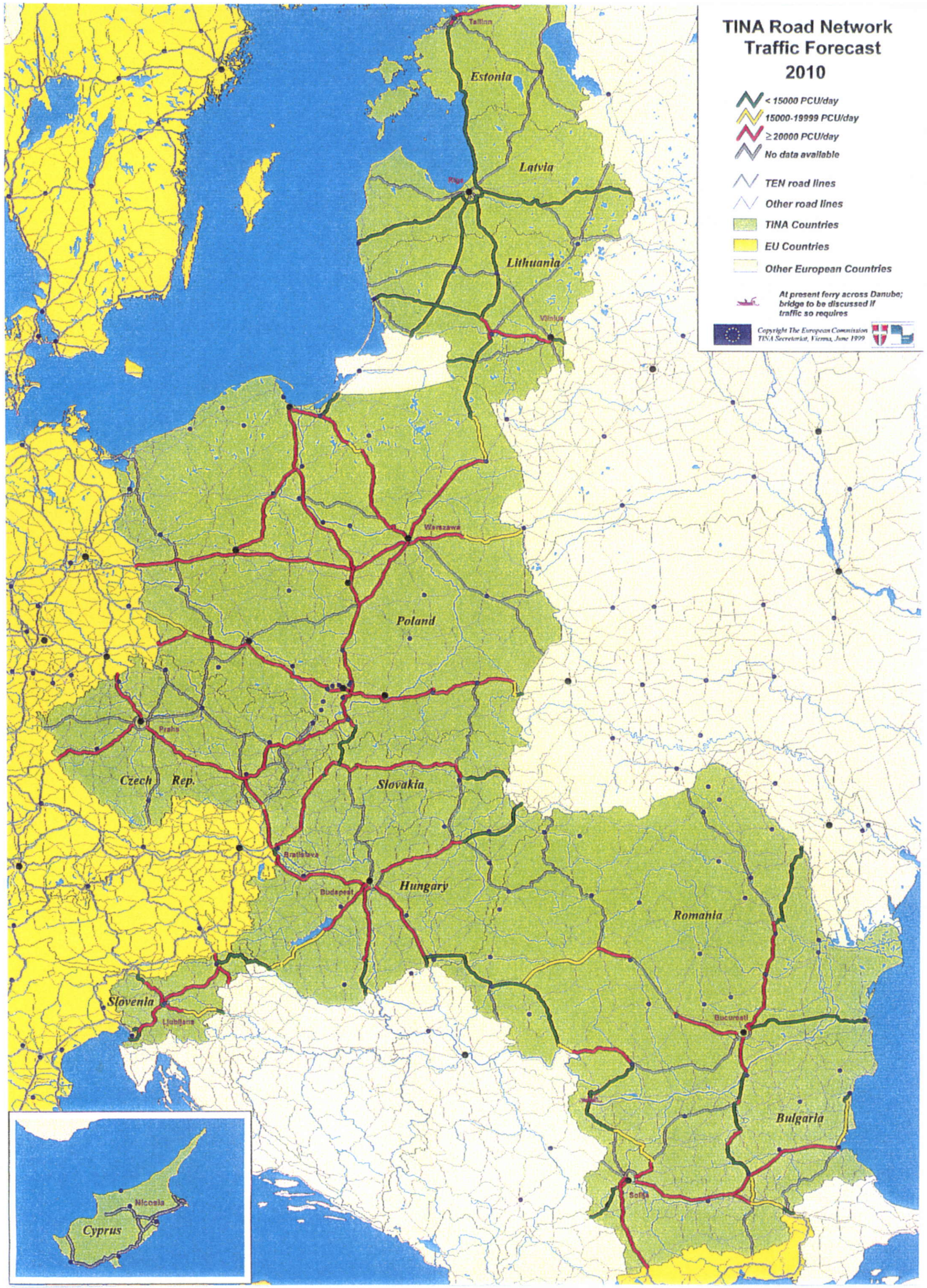
Romania
Bulgaria
Slovenia
Cyprus
Nicosia
Tallinn
Riga
Vilnius
Warszawa
Praha
Bratislava
Budapest
Ljubljana
Bucuresti
Sofia


TINA Road Network
Traffic Forecast
2010
< 15000 PCU/day
15000-19999 PCU/day
≥ 20000 PCU/day
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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Lithuania
Poland
Czech Rep.
Slovakia
Hungary
Romania
Slovenia
Bulgaria
Cyprus
Nicosia
Warszawa
Praha
Budapest
Bratislava
Ljubljana
Bucuresti
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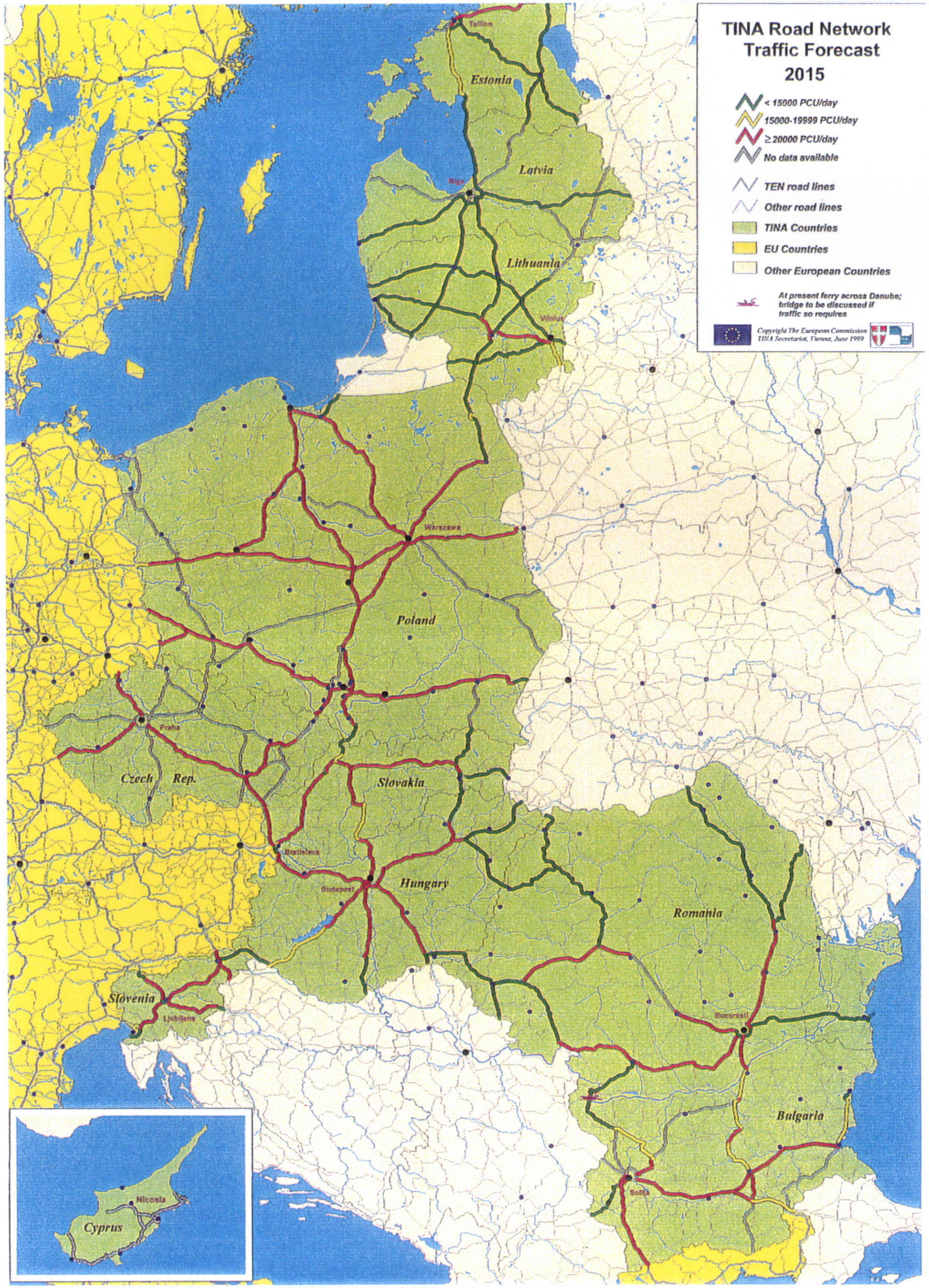
Riga
Tallinn
Vilnius


TINA Road Network
Traffic Forecast
2015
< 15000 PCU/day
15000-19999 PCU/day
≥ 20000 PCU/day
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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Latvia
Lithuania
Poland
Czech Rep.
Slovakia
Hungary
Romania
Slovenia
Bulgaria
Cyprus
Nicosia
Warszawa
Praha
Budapest
Bratislava
Ljubljana
Bucuresti
Sofia
Riga
Tallinn
Vilnius

ANNEX VI – RAIL AND ROAD TRAFFIC ESTIMATION OF THE COUNTRIES


Traffic scenario for 2015
infrastructure unchanged
RAILWAYS
Year 2015
> 80 trains per day
< 80 trains per day
Year 1995 - data for 2015 not available
> 80 trains per day
< 80 trains per day
Cities/Section points
Main cities
TINA Countries
EU Countries
Other Countries
Copyright The European Commission
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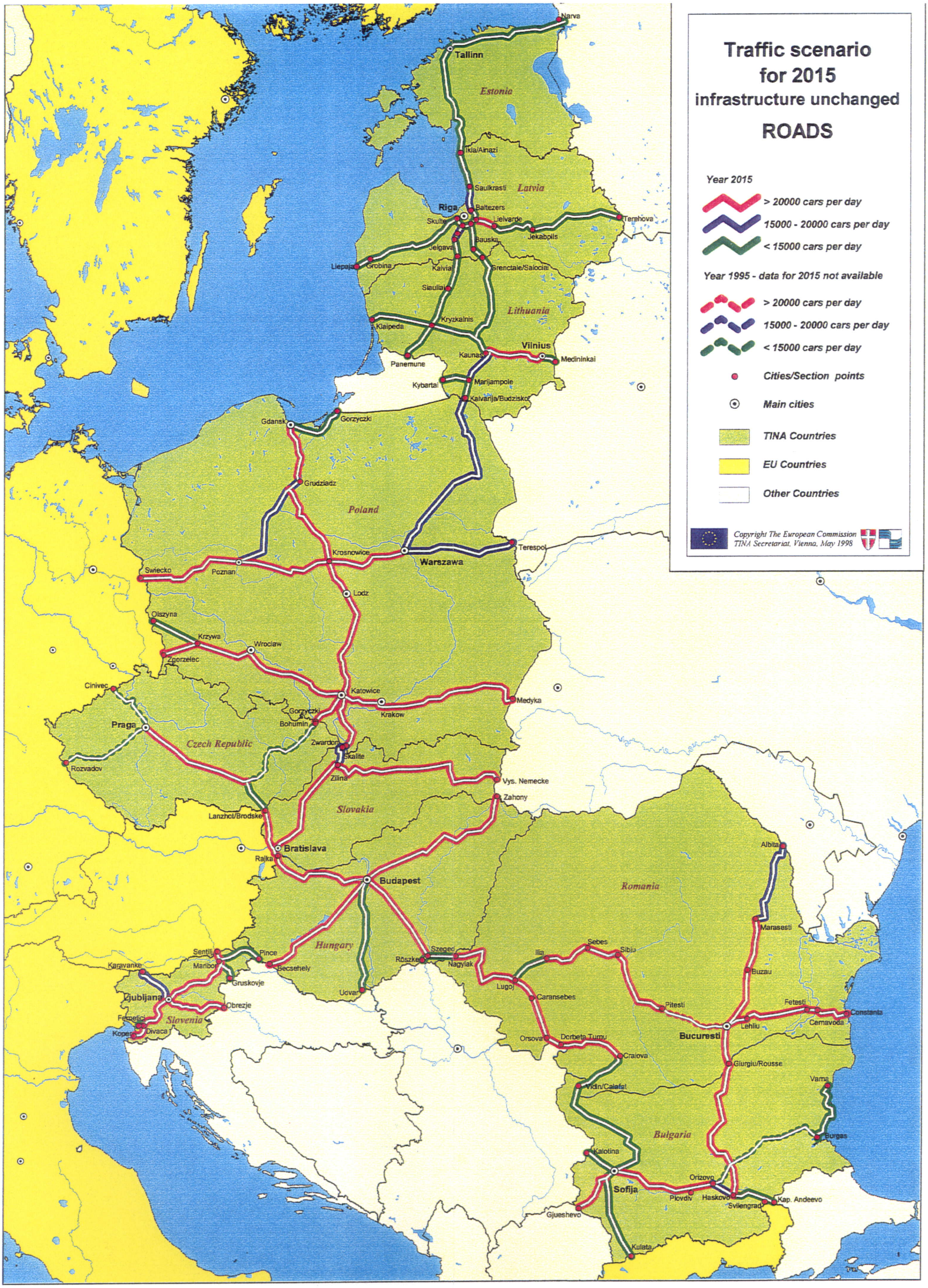
Narva
Tallinn
Tapa
Estonia
Valga
Latvia
Ventspils
Riga
Zilupe
Jelgava
Meitene
Siauliai
Radviliskis
Lithuania
Klaipeda
Gaiziunai
Kaisiadorys
Kaunas
Kena
Pagegiai
Kazlu Rūda
Vilnius
Kybartai
Mockava/Trakiszki
Gdansk
Braniewo
Tczew
Malbork
Sokolka
Poland
Terespol
Poznan
Warszawa
Kunowice
Wroclaw
Zgorzelec
Gliwice
Opole
Katowice
Medyka
Decin
Zebrzydowice
Krakow
Cheb
Praga
Petrovice
Skalite
Zwardon
Czech Republic
Cadca
Brno
Zilina
Ciema n/T.
Zahony
Breclav
Slovakia
Kuty
Bratislava
Rusovce/Cunovo
Sturovo
Budapest
Hungary
Hodos
Sentilj
Dombovar
Jesenice
Pragersko
Kelebia
Zidani Most
Ljubljana
Dobova
Slovenia
Magyarboly
Koper
Divaca
Ungheni
Iasi
Bacau
Romania
Lökösháza/Curtici
Alba Iulia
Foscani
Brasov
Arad
Lugoj
Timisoara
Caransebes
Ploiesti
Constanta
Bucuresti
Dorbeta Turnu
Strehaia
Videle
Craiova
Giurgiu/Rousse
Vidin/Calafat
Varna
Sindel
Karnobat
Bulgaria
Burgas
Kalotina
Sofija
Mihajlovo
Dimitrovgrad
Plovdiv
Svilengrad
Gjueshevo
Kulata



Traffic scenario for 2015
infrastructure unchanged
ROADS
Year 2015
> 20000 cars per day
15000 - 20000 cars per day
< 15000 cars per day
Year 1995 - data for 2015 not available
> 20000 cars per day
15000 - 20000 cars per day
< 15000 cars per day
Cities/Section points
Main cities
TINA Countries
EU Countries
Other Countries
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Tallinn
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Ikla/Ainazi
Saulkrasti
Latvia
Riga
Baltezers
Skulte
Lielvarde
Terehova
Jekabpils
Bauska
Jelgava
Liepaja
Grobina
Kalvia
Grenctale/Salociai
Siauliai
Lithuania
Kryzkalnis
Klaipeda
Vilnius
Kaunas
Medininkai
Panemune
Kybartai
Marijampole
Kalvarija/Budzisko
Gdansk
Gorzyczki
Grudziadz
Poland
Krosnowice
Warszawa
Terespol
Swiecko
Poznan
Lodz
Olszyna
Krzywa
Wroclaw
Zgorzelec
Cinivec
Katowice
Krakow
Medyka
Praga
Gorzyczki
Bohumin
Czech Republic
Zwardon
Skalite
Rozvadov
Zilina
Vys. Nemecke
Zahony
Slovakia
Lanzhot/Brodske
Bratislava
Rajka
Budapest
Romania
Albita
Marasesti
Hungary
Sentilj
Pince
Maribor
Becsehely
Szeged
Sebes
Sibiu
Roszke
Nagylak
Ilia
Karavanke
Gruskovje
Uqvar
Lugoj
Buzau
Ljubljana
Obrezje
Caransebes
Fetesti
Constanta
Fernetici
Slovenia
Pitesti
Cernavoda
Koper
Divaca
Lehliu
Orsova
Dorbeta Turnu
Bucuresti
Craiova
Giurgiu/Rousse
Vidin/Calafat
Varna
Bulgaria
Burgas
Kalotina
Sofija
Orizovo
Plovdiv
Haskovo
Kap. Andeevo
Svilengrad
Gjueshevo
Kulata

ANNEX VII – STATUS OF THE RAIL AND ROAD NETWORK IN 1999

TINA Rail Network
Status Of The Network
1999
Double track, electrified, high speed
Double track, electrified, conventional
Double track, non-electrified, conventional
Single track, electrified
Single track, non-electrified
Wide gauge: 1520 mm
All other lines: 1435 mm
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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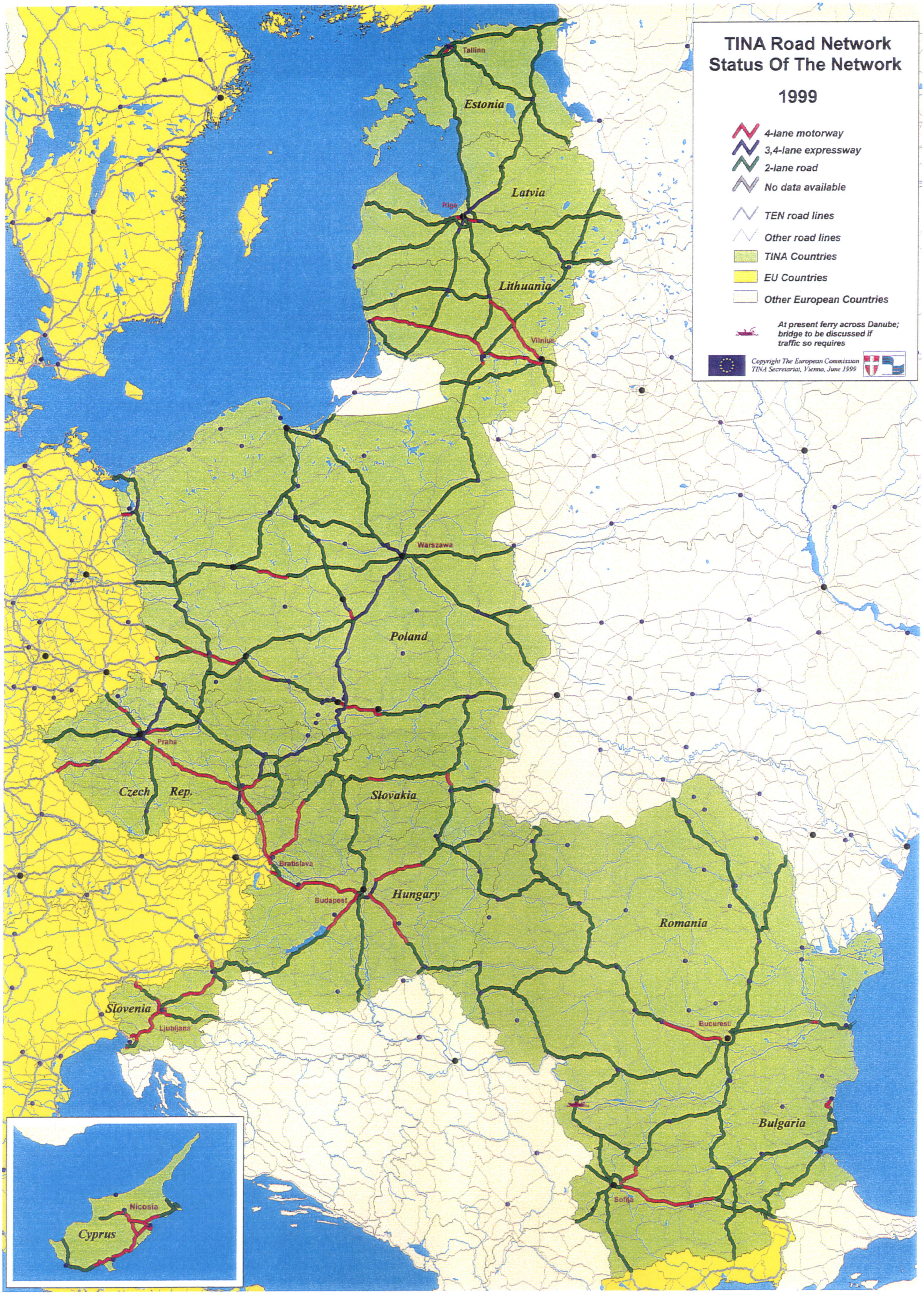
Romania
Bucuresti
Bulgaria
Sofija
Slovenia
Ljubljana
Nicosia
Cyprus



TINA Road Network
Status Of The Network
1999
4-lane motorway
3,4-lane expressway
2-lane road
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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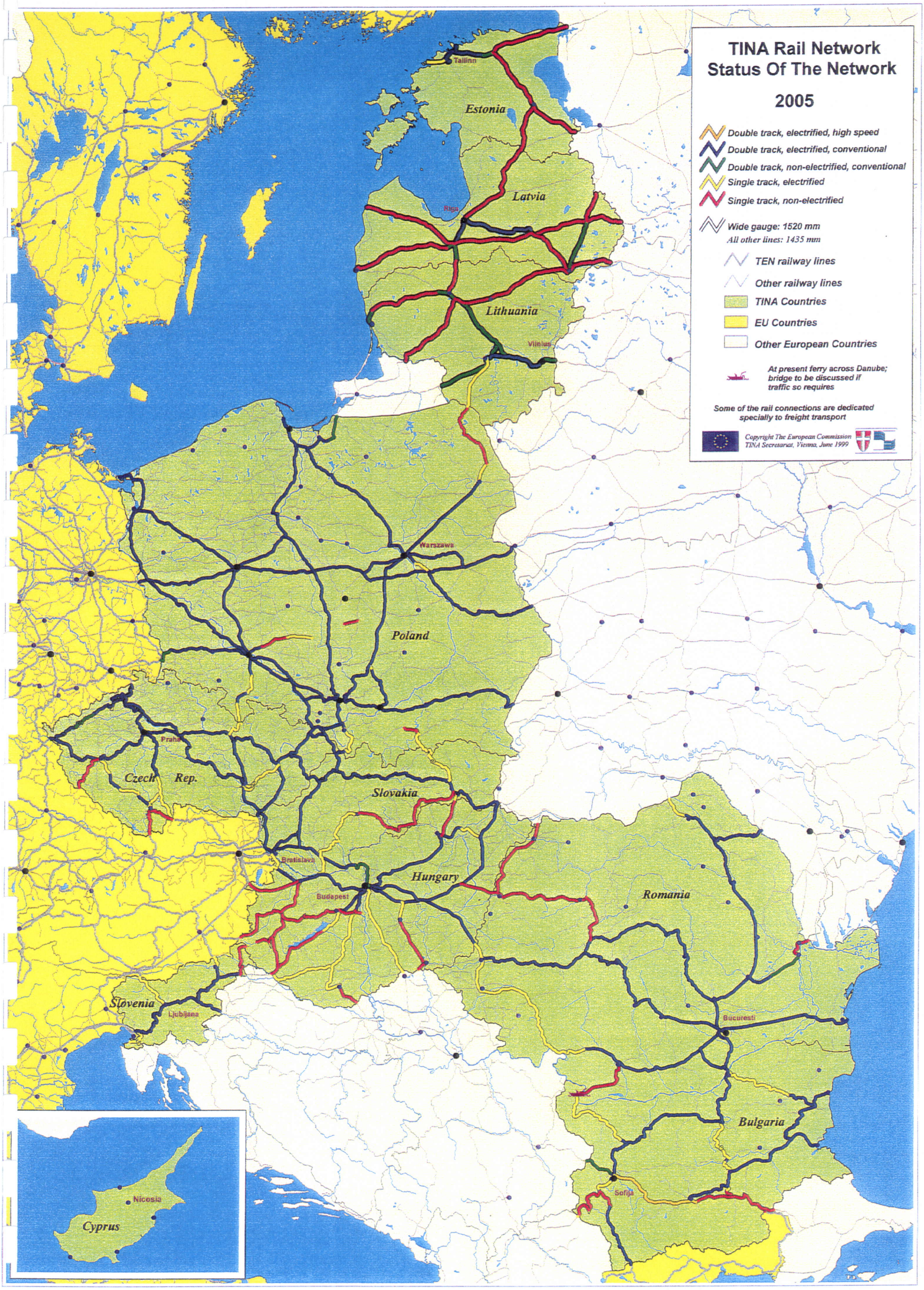
Budapest
Hungary
Romania
Slovenia
Ljubljana
Bucuresti
Bulgaria
Sofia
Nicosia
Cyprus

ANNEX VIII - STATUS OF THE RAIL AND ROAD NETWORK IN 2005, 2010, 2015


TINA Rail Network
Status Of The Network
2005
Double track, electrified, high speed
Double track, electrified, conventional
Double track, non-electrified, conventional
Single track, electrified
Single track, non-electrified
Wide gauge: 1520 mm
All other lines: 1435 mm
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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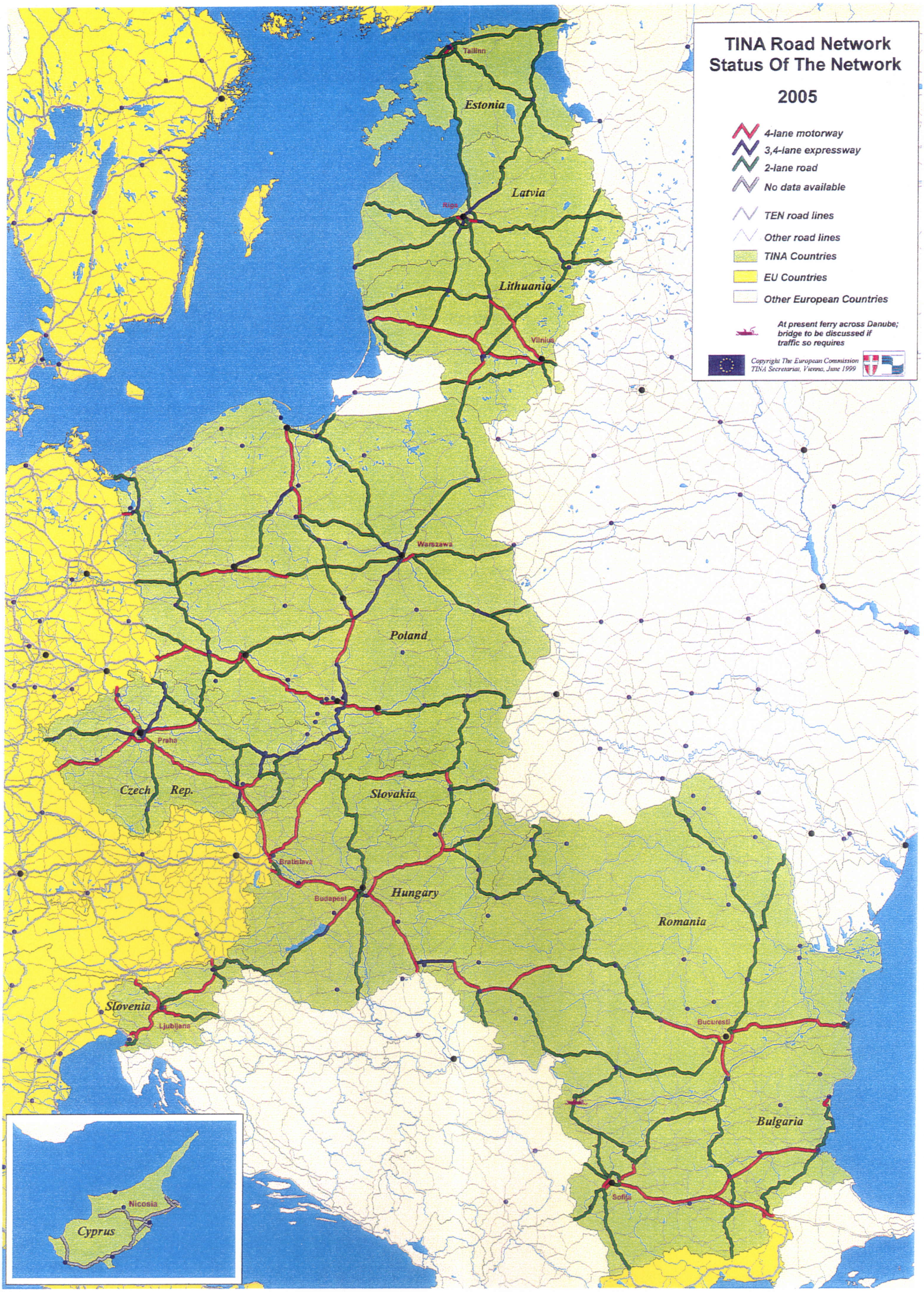

TINA Road Network
Status Of The Network
2005
4-lane motorway
3,4-lane expressway
2-lane road
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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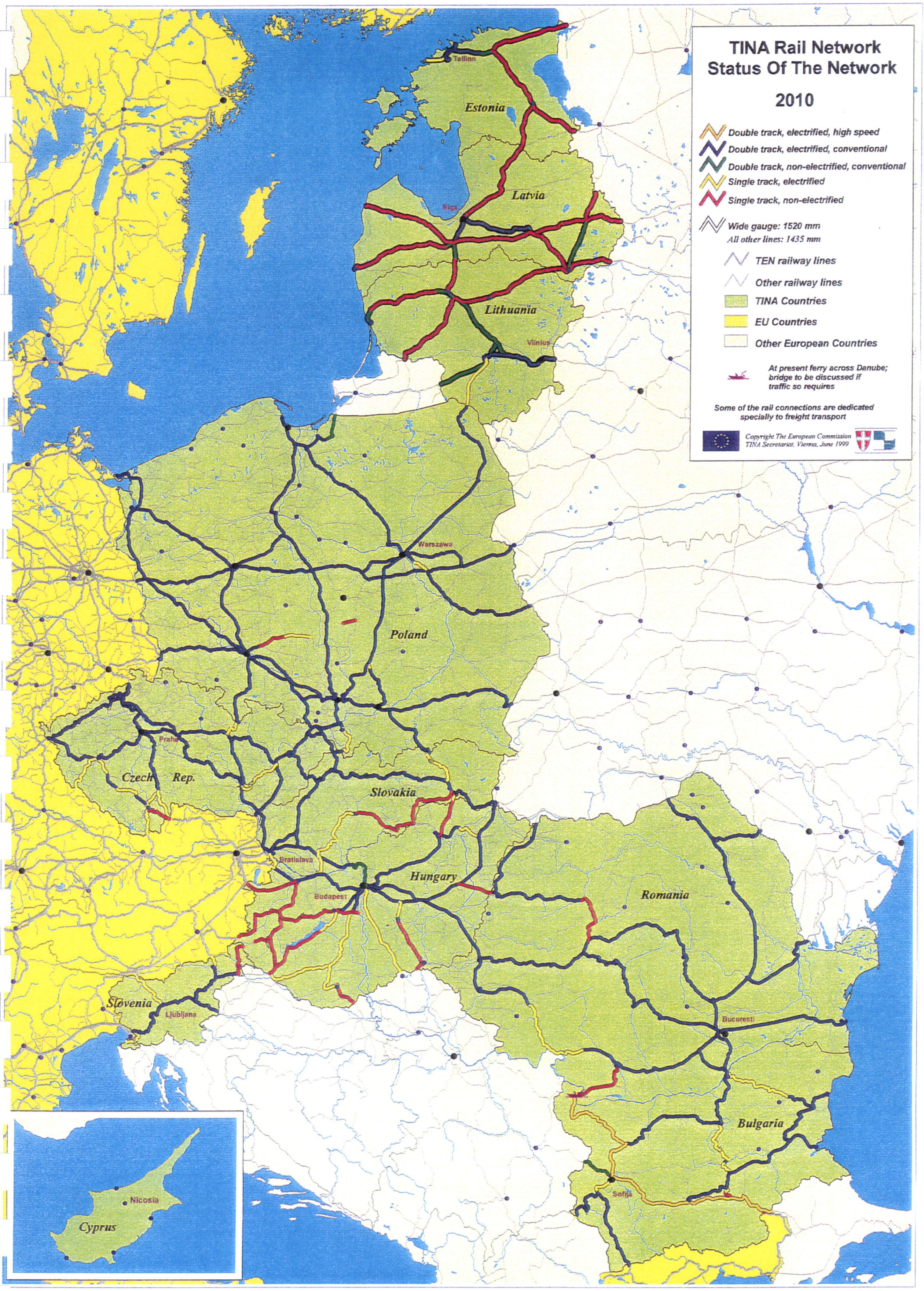
TINA Rail Network
Status Of The Network
2010
Double track, electrified, high speed
Double track, electrified, conventional
Double track, non-electrified, conventional
Single track, electrified
Single track, non-electrified
Wide gauge: 1520 mm
All other lines: 1435 mm
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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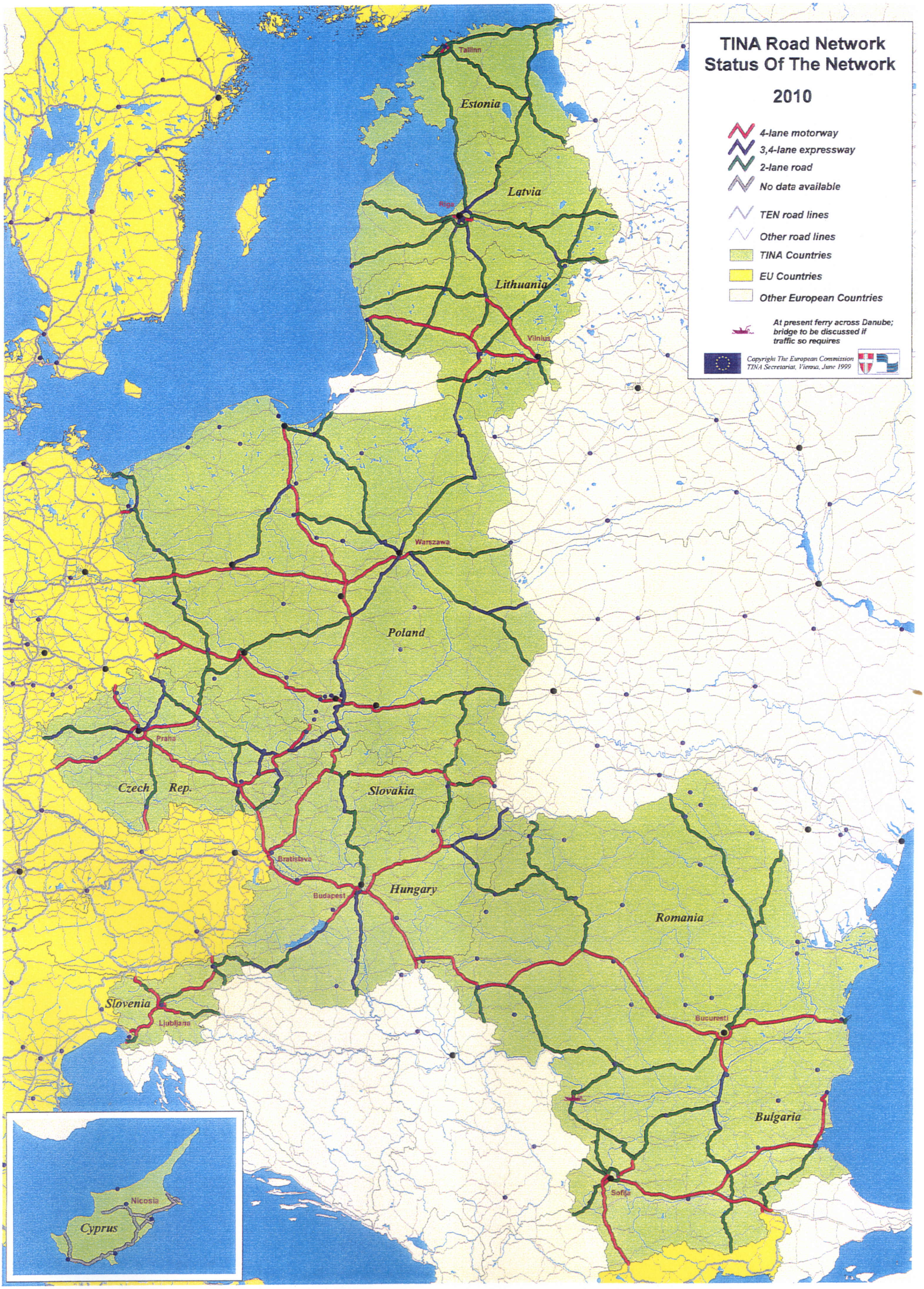

TINA Road Network
Status Of The Network
2010
4-lane motorway
3,4-lane expressway
2-lane road
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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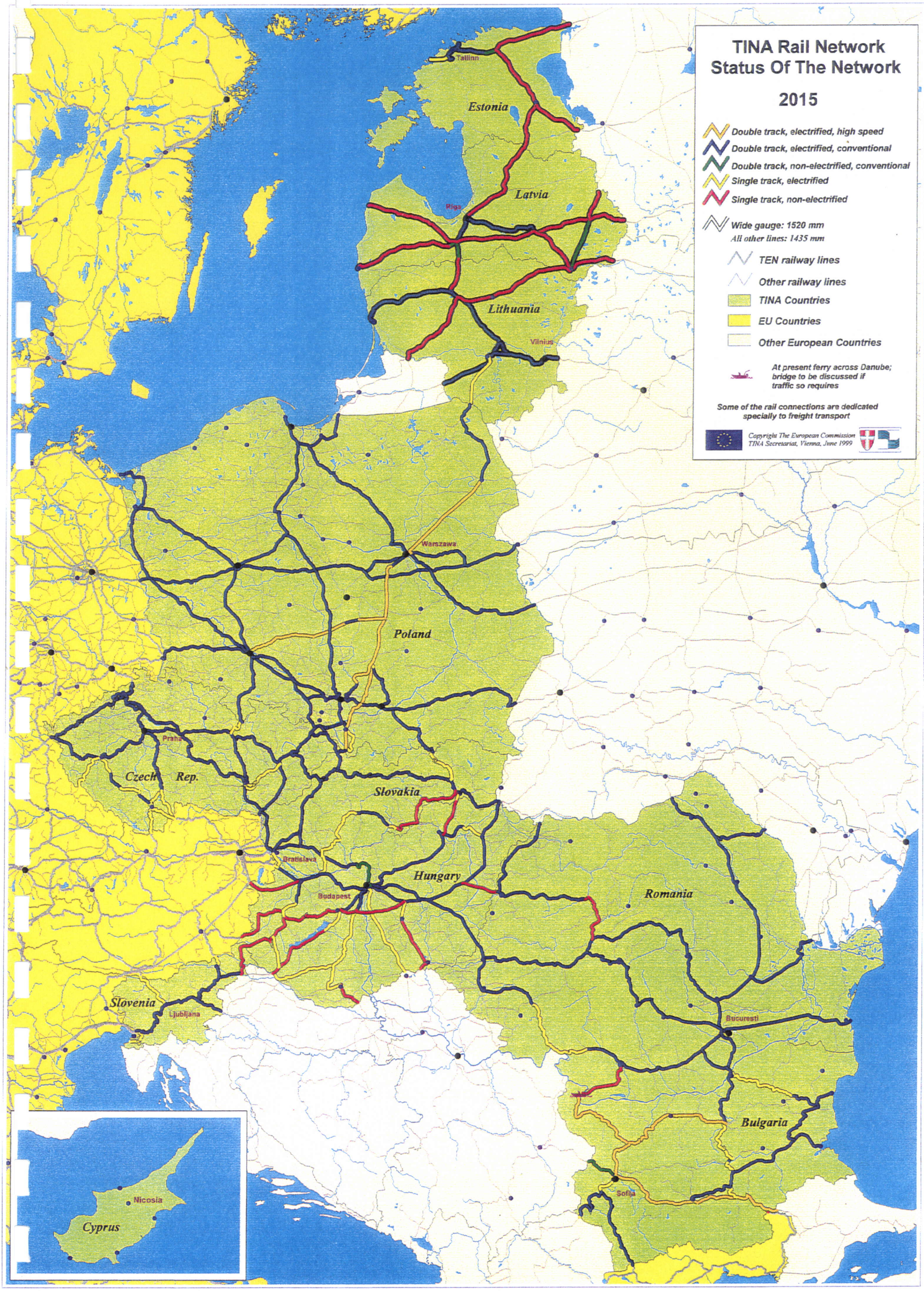
TINA Rail Network
Status Of The Network
2015
Double track, electrified, high speed
Double track, electrified, conventional
Double track, non-electrified, conventional
Single track, electrified
Single track, non-electrified
Wide gauge: 1520 mm
All other lines: 1435 mm
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
At present ferry across Danube; bridge to be discussed if traffic so requires
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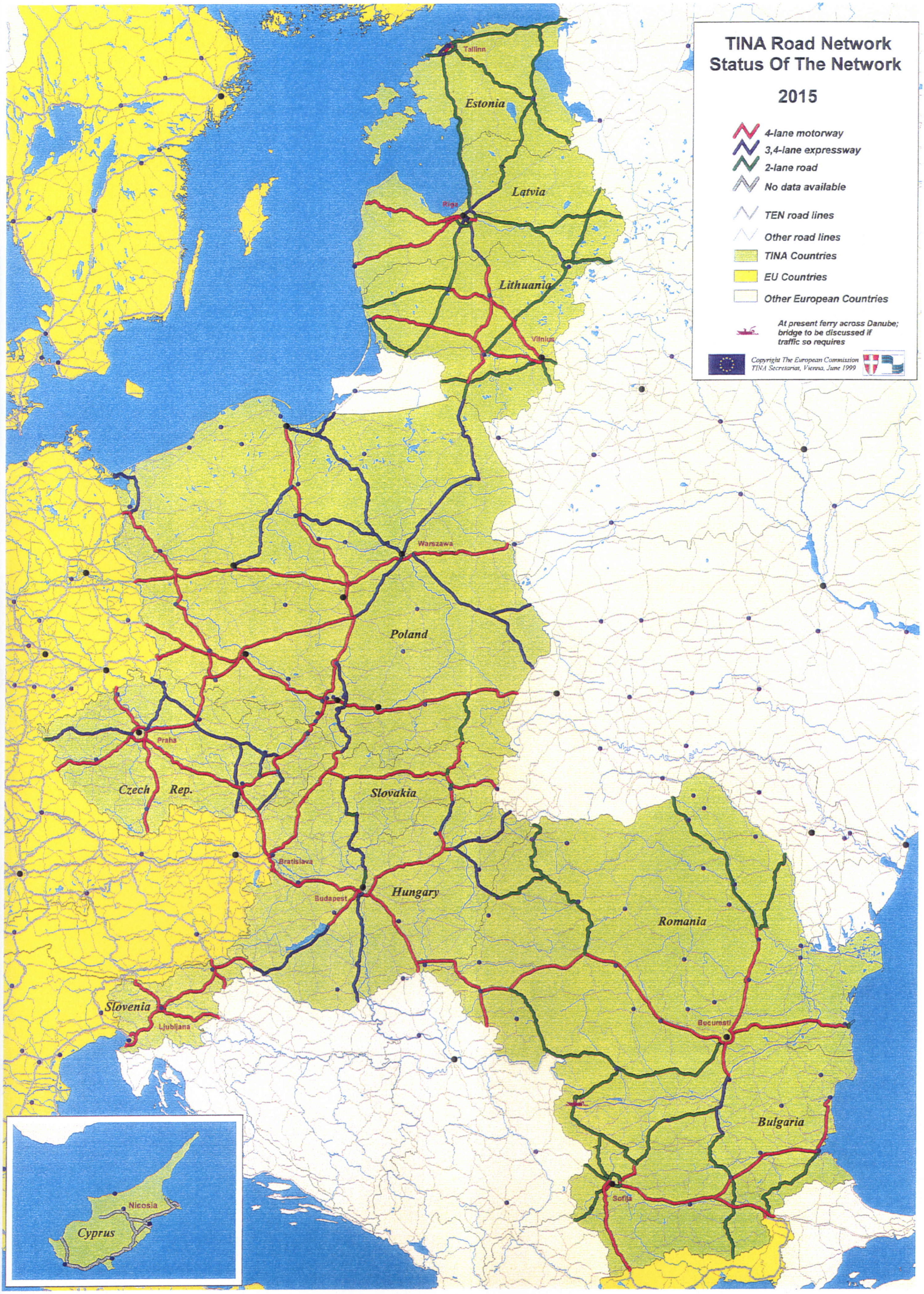

TINA Road Network
Status Of The Network
2015
4-lane motorway
3,4-lane expressway
2-lane road
No data available
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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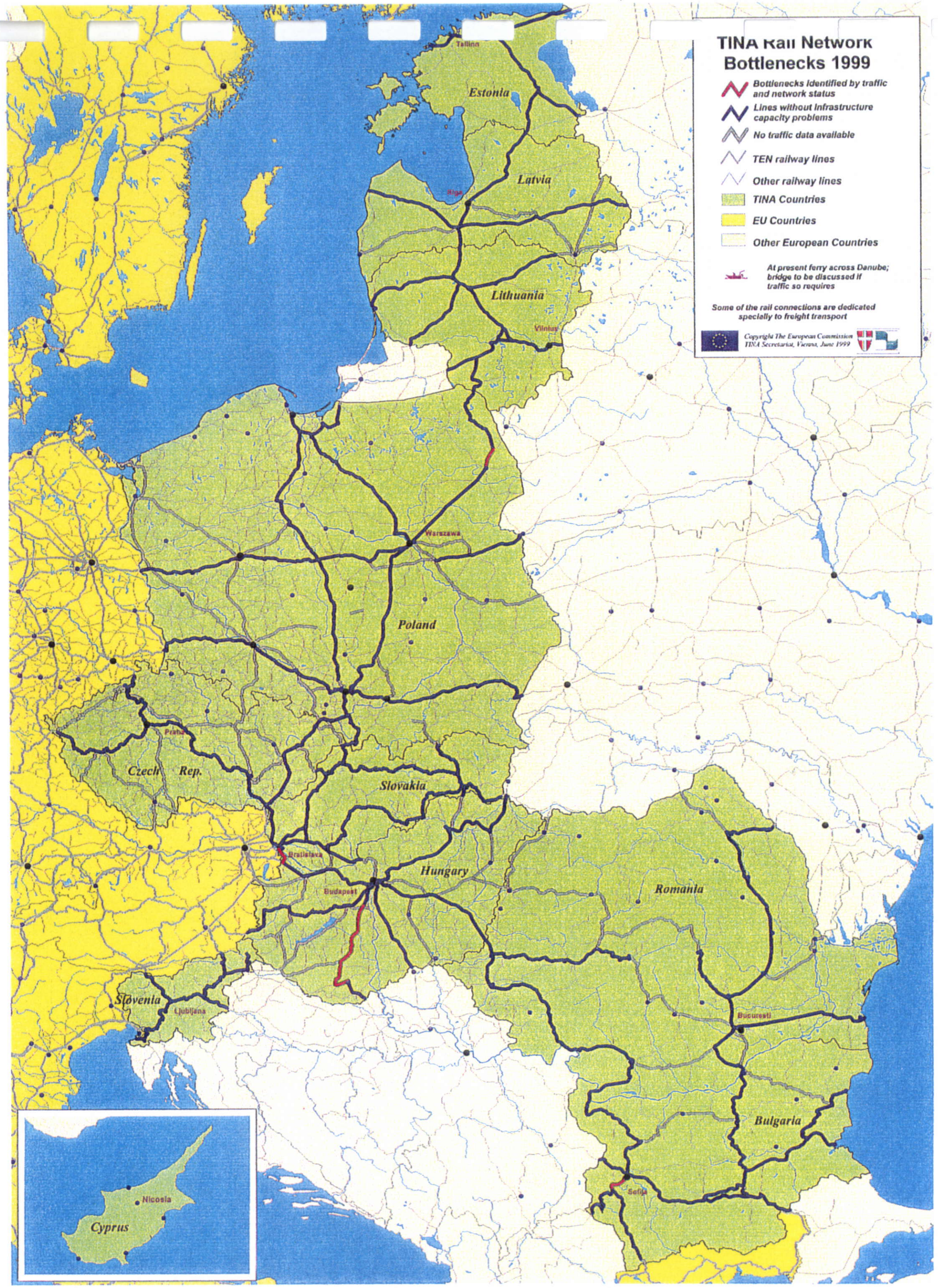
ANNEX IX – CAPACITY INEFICIENCIES FOR RAIL AND ROAD NETWORK IN 1999, 2005, 2010, 2015


TINA Rail Network
Bottlenecks 1999
Bottlenecks identified by traffic forecast and network status
Lines without infrastructure capacity problems
No traffic data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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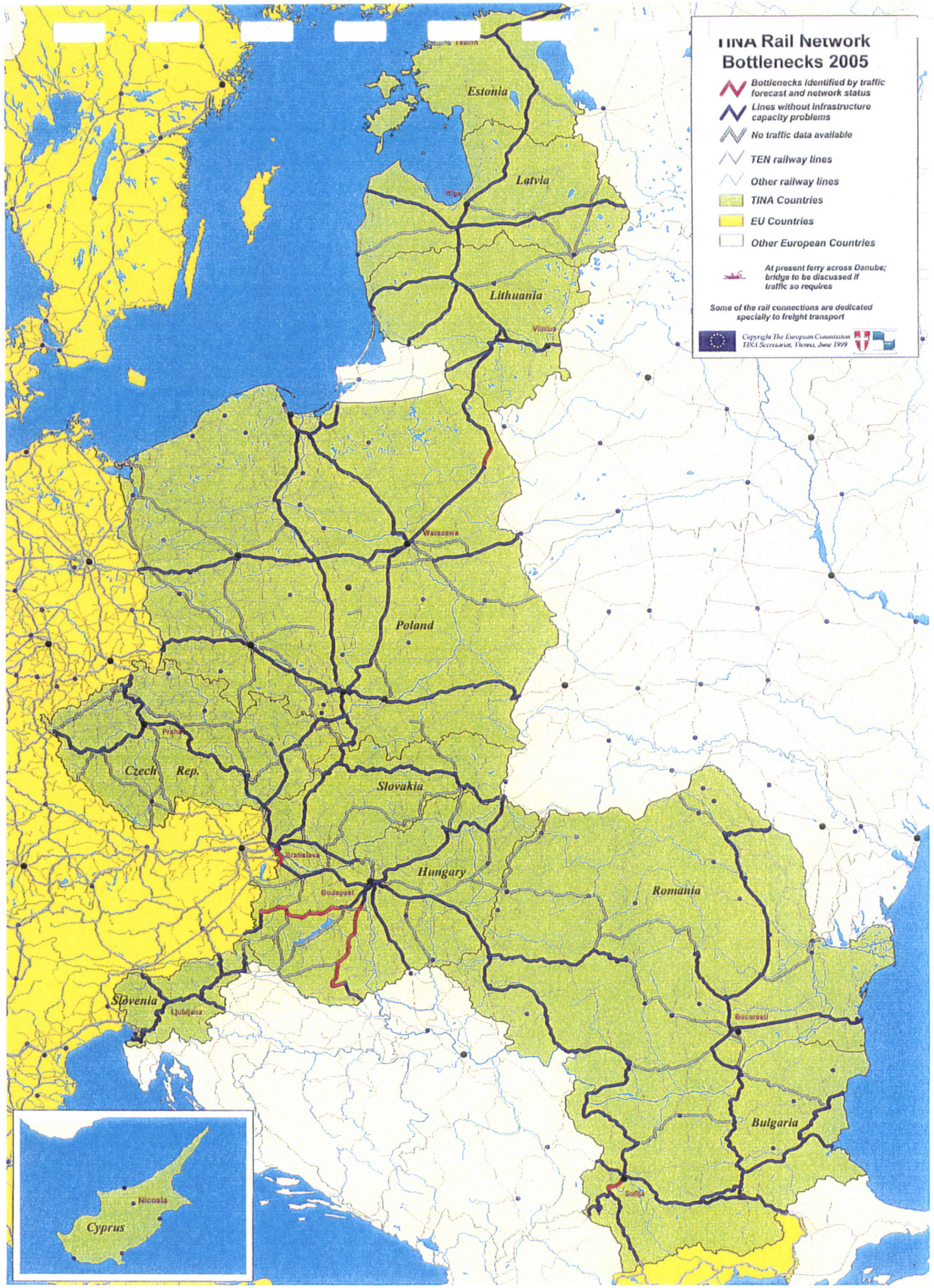
TINA Rail Network
Bottlenecks 2005
Bottlenecks identified by traffic forecast and network status
Lines without infrastructure capacity problems
No traffic data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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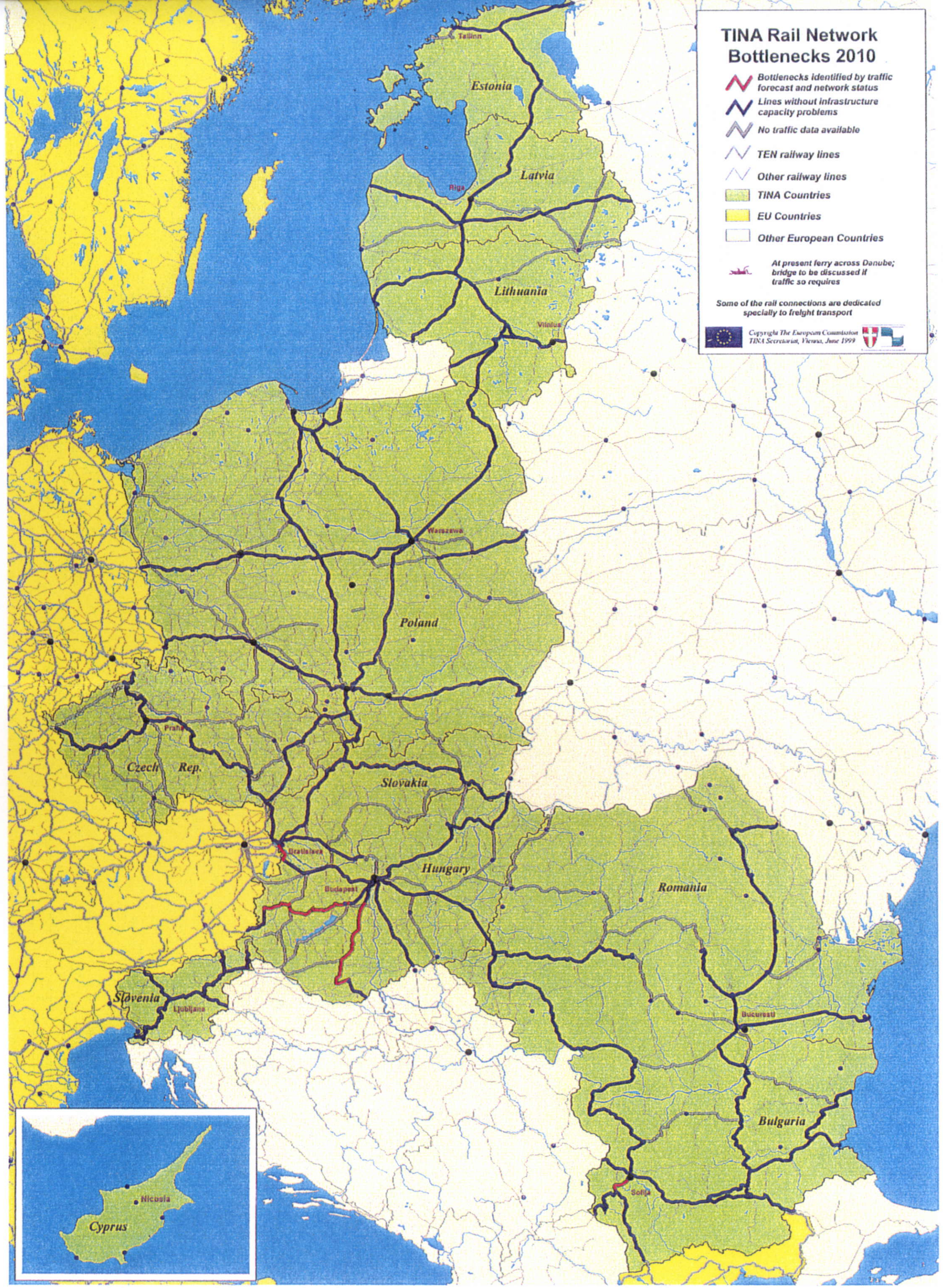
TINA Rail Network
Bottlenecks 2010
Bottlenecks identified by traffic forecast and network status
Lines without infrastructure capacity problems
No traffic data available
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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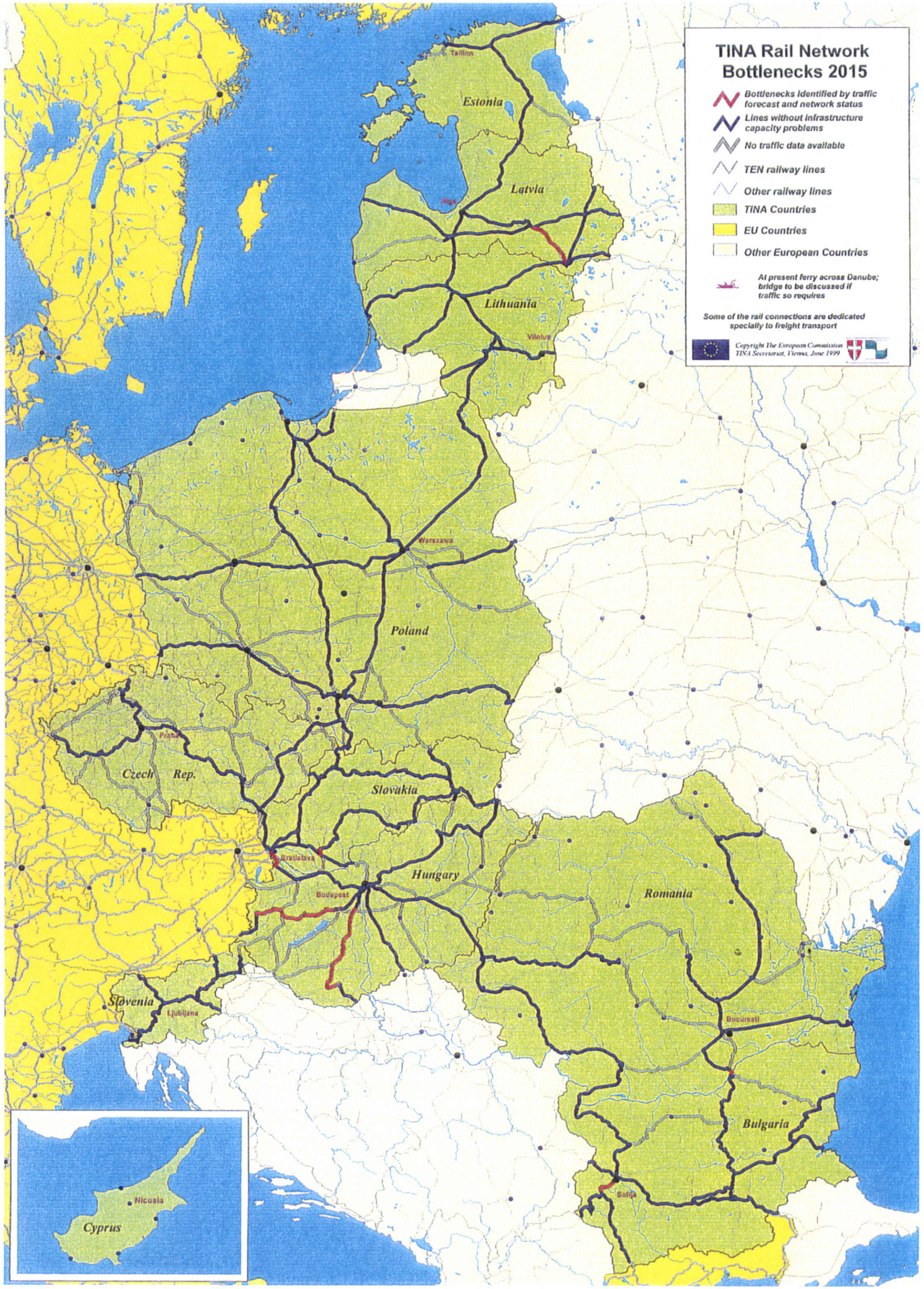
TINA Rail Network
Bottlenecks 2015
Bottlenecks identified by traffic forecast and network status
Lines without infrastructure capacity problems
No traffic data available
TEN railway lines
Other railway lines
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Other European Countries
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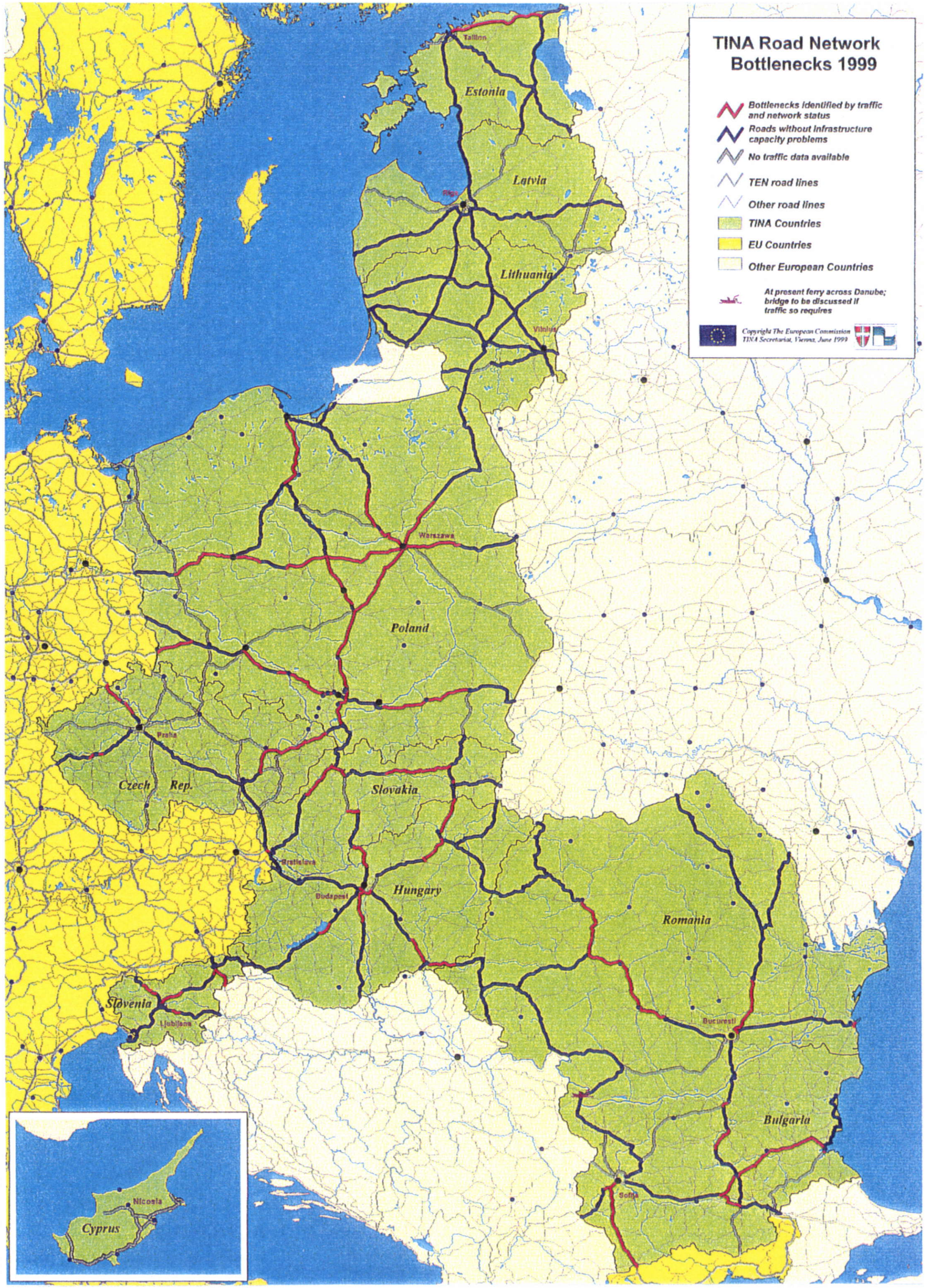
TINA Road Network
Bottlenecks 1999
Bottlenecks identified by traffic and network status
Roads without infrastructure capacity problems
No traffic data available
TEN road lines
Other road lines
TINA Countries
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Other European Countries
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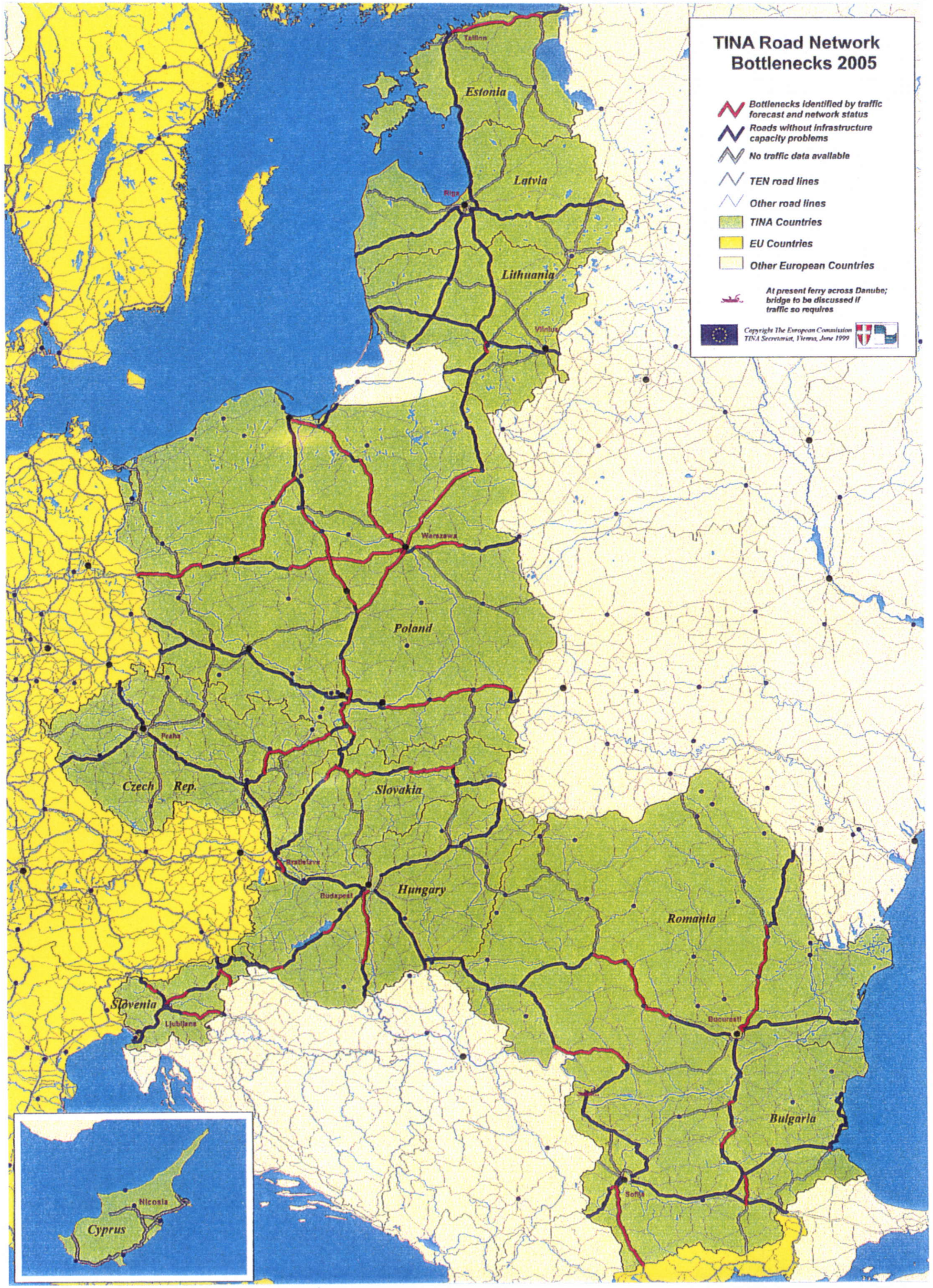
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Bottlenecks 2005
Bottlenecks identified by traffic forecast and network status
Roads without infrastructure capacity problems
No traffic data available
TEN road lines
Other road lines
TINA Countries
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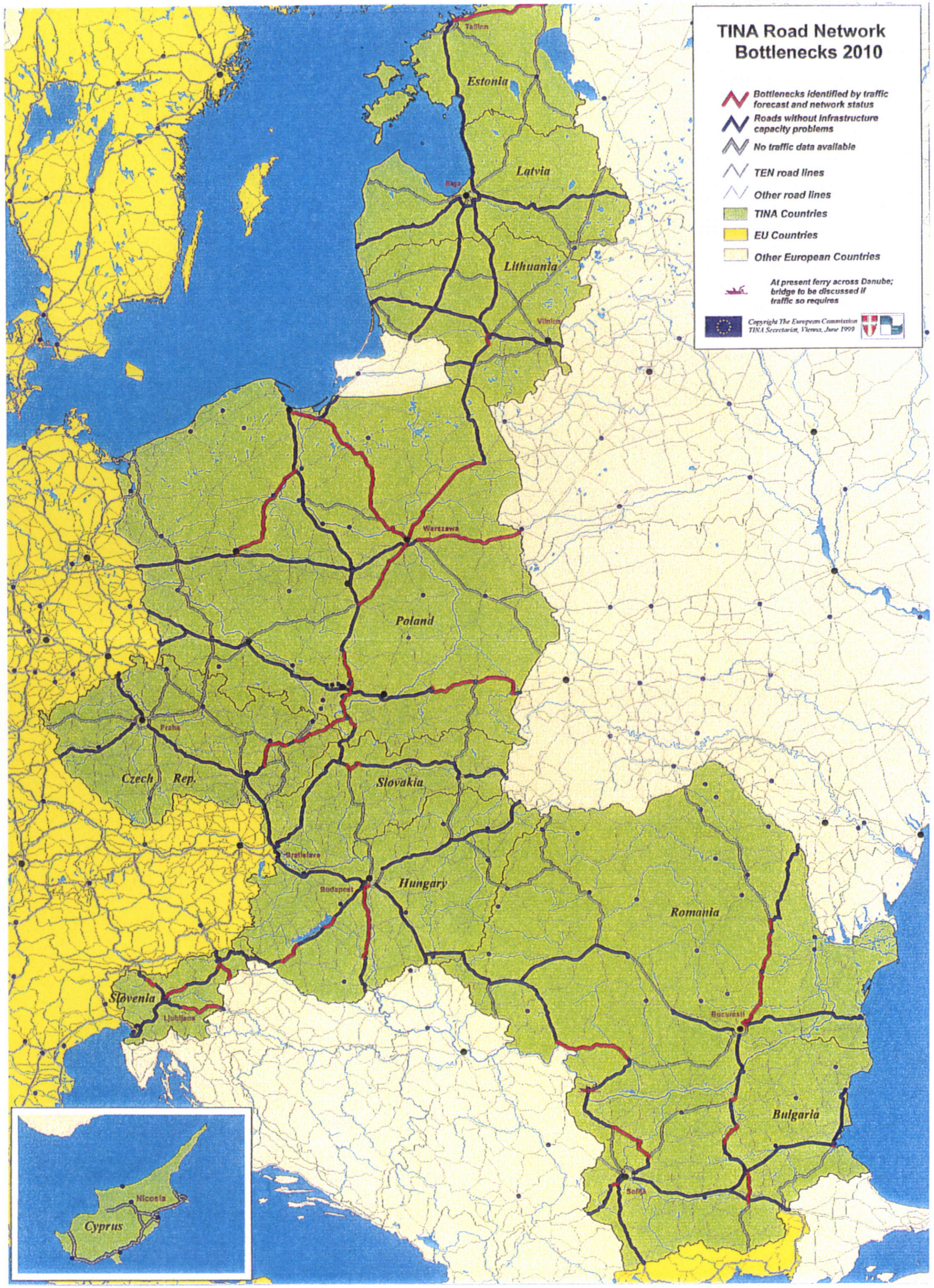

TINA Road Network
Bottlenecks 2010
Bottlenecks identified by traffic forecast and network status
Roads without infrastructure capacity problems
No traffic data available
TEN road lines
Other road lines
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Other European Countries
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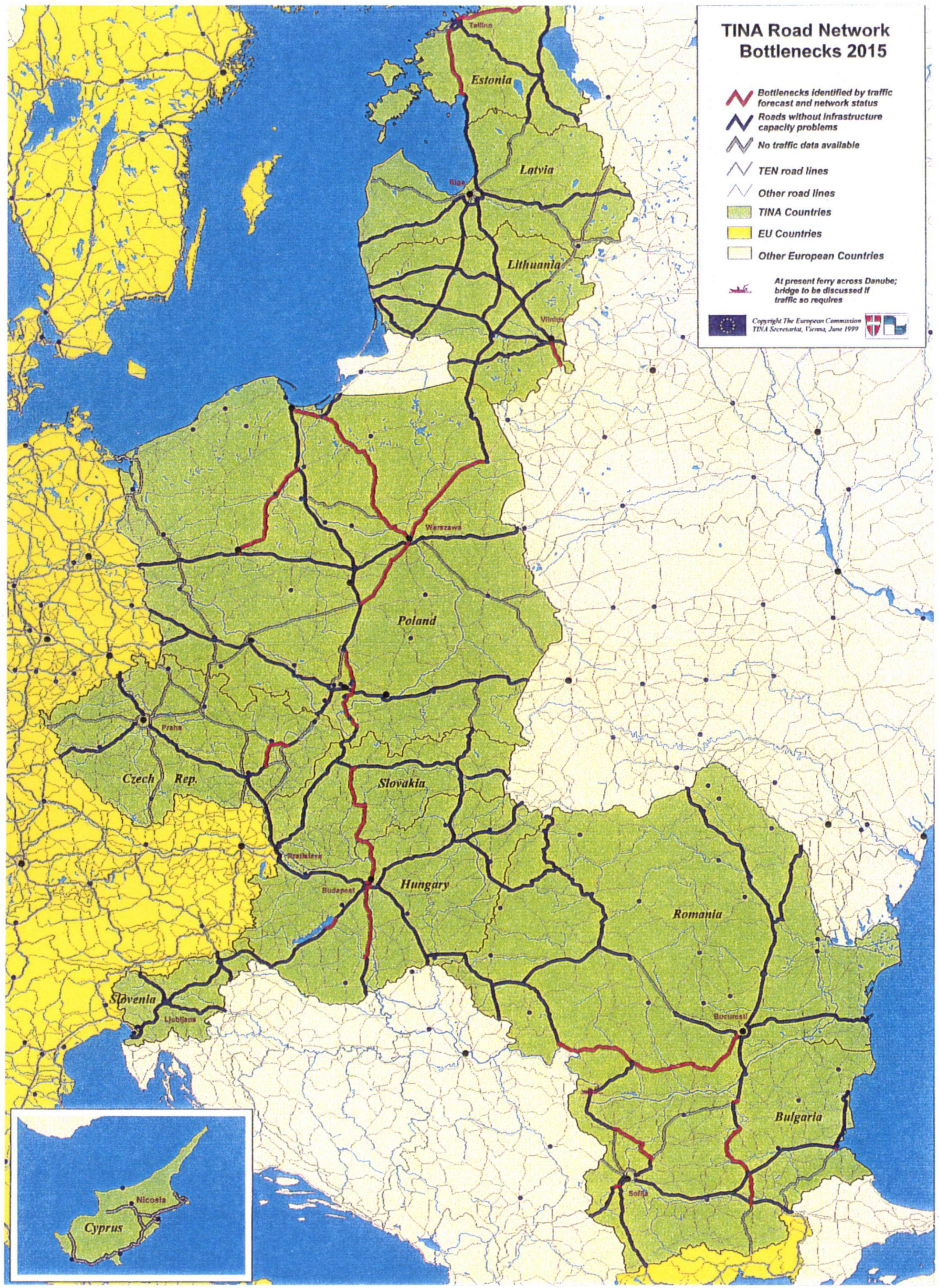

TINA Road Network
Bottlenecks 2015
Bottlenecks identified by traffic forecast and network status
Roads without infrastructure capacity problems
No traffic data available
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Other road lines
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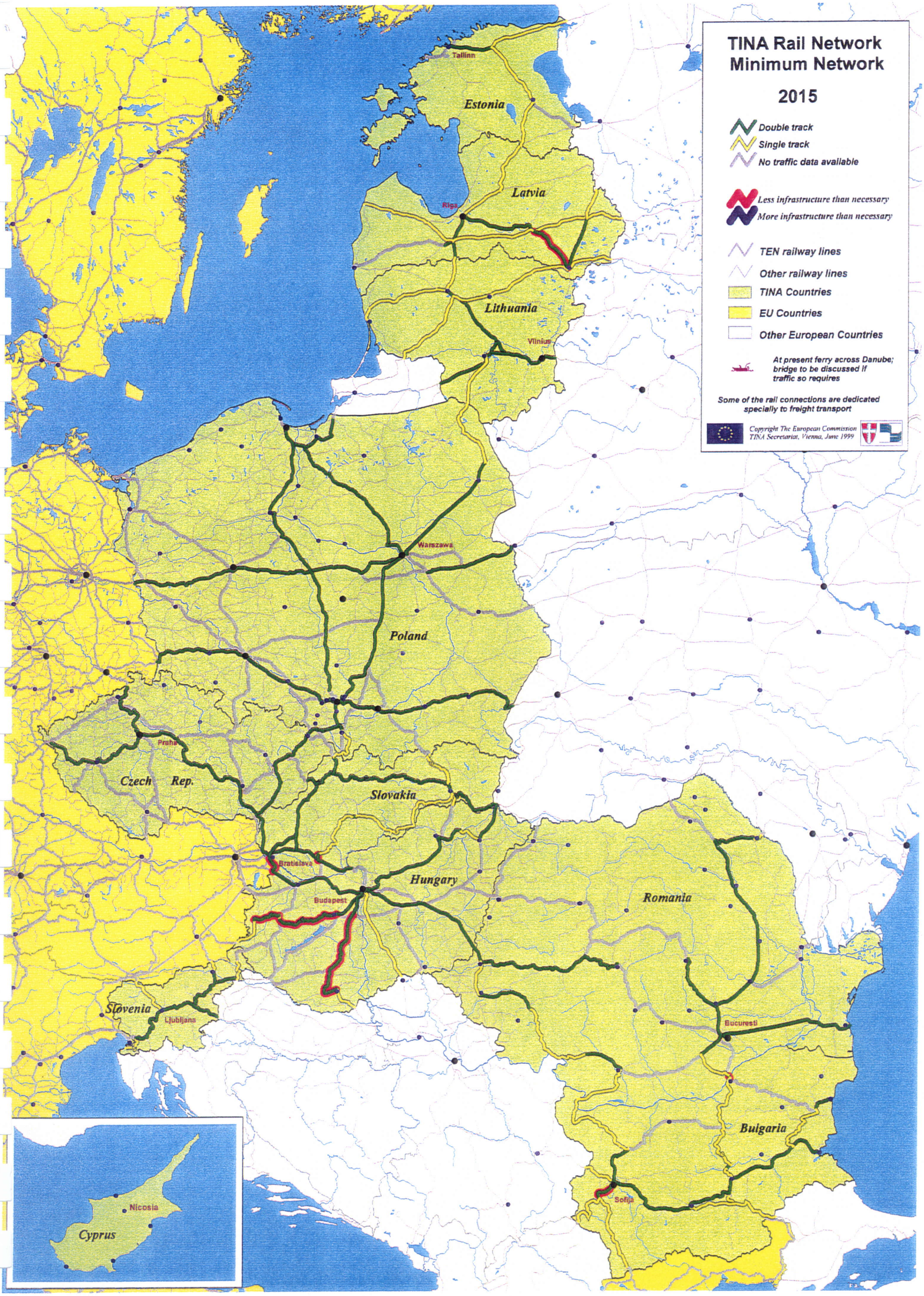
ANNEX X – "MINIMUM NETWORK" FOR RAIL AND ROAD IN 2015


TINA Rail Network
Minimum Network
2015
Double track
Single track
No traffic data available
Less infrastructure than necessary
More infrastructure than necessary
TEN railway lines
Other railway lines
TINA Countries
EU Countries
Other European Countries
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Ljubljana
Bucuresti
Bulgaria
Sofija
Nicosia
Cyprus

TINA Road Network
Minimum Network
2015
4-lane motorway
3,4-lane expressway
2-lane road
No traffic data available
Less infrastructure than necessary
More infrastructure than necessary
TEN road lines
Other road lines
TINA Countries
EU Countries
Other European Countries
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ANNEX XI – INTEROPERABILITY, ENVIRONMENTAL PROTECTION AND SAFETY ASPECTS, REGARDING THE DESIGN OF THE TINA NETWORK

Introduction

Common Transport Policy is one of the key elements of the European Community and its single market, in accordance to Article 3 of the Treaty[8] and Articles 74 to 84[9], which define the framework for its implementation. With the Maastricht Treaty, further provisions were adopted concerning Trans-European Transport Infrastructure. According to Article 251 of Amsterdam Treaty strengthen the role of the European Parliament in the decision making process.

The present Chapter presents the relevant European Union legislative and institutional framework (*acquis communaitaire*) and international agreements which refer to interoperability, environment and safety aspects for each transport sector (road, rail, inter-modal, inland waterway, maritime and air transport) and concern the implementation of the TINA infrastructure network. The *acquis* includes relevant Directives, Regulations and Decisions adopted on the basis of the relevant provisions of the Treaty, and any other relevant EU documentation.

The process of approximation/ harmonisation of the TINA countries to the *acquis communautaire* in the transport sector (a necessary prerequisite for their accession to the EU) consists of: (a) the transposition of them into the national legal system by using the appropriate national procedures and mechanisms; (b) their implementation by providing the institutions and budgets necessary to carry out the laws and regulations; and, finally (c) their enforcement, by providing the necessary controls and penalties in order to ensure that compliance to the law has taken place fully and properly.

The key objective of this Chapter is to identify the implications of the adoption of the *acquis communautaire* for interoperability, safety and environment to the TINA infrastructure Network and the resulting -potentially imposed- technical overall standards.

Interoperability

Interoperability is referring to two types of legislation: (i) the one related to the technical standards, as it is the case of the relevant Union's provisions; the international agreements AGR, AGC, AGTC, AGN; the recommended practices by TER, TEM, UN-ECE WP5 Group; the national standards as the RAS in Germany, and (ii) the other related to the adoption of legislation harmonising the institutional set-up and thus facilitating the travel, as it is the case for vehicle standards, border crossing procedures, operating systems (e.g. ERTMS in Railways).

As it concerns (i), it is recognised that in the TINA countries, the only commonly accepted legislation are the international agreements, which however are not strictly enforced by all states. On the other hand, there are no common EU legislation for technical standards, each member-state employing each own standards, although some of them are quite similar for certain cases. Consequently, it is very difficult to conclude something quite strict for the TINA infrastructure network, as it concerns the details of design. However general implications can be drawn, after careful analysis of the relevant international agreements, technical standards in selective EU member states and best practices:

---

[8] EU Treaty of Maastricht, November 1993

[9] Articles 70 to 80 under the future consolidated version of the Amsterdam Treaty

Roads

The critical question for TINA Road Network is to define the Category of Road under the AGR, since this will determine the technical parameters and consequently the cost of investment. In line with the widely accepted practice, the following procedure can be followed:

Demand for a future year A (based on traffic forecasts, for an accepted level of service) ⇒ determine the average daily traffic in PCUs ⇒ determine the category of road that will accommodate this traffic (e.g. 4-lane motorway, 2 lanes road etc) ⇒ determine the technical parameters corresponding to the chosen road category (design speed, length of straight line alignment, curvatures, max. gradient/slope, lane width, shoulders and median width, type and distance of intersections etc) according to AGR ⇒ design the road alignment and all necessary technical works (bridges, viaducts, tunnels, where necessary) ⇒ estimate the construction cost. (This very broad sketchy procedure can be also kept for other modes, following the relevant international agreement, if any).

This simplified procedure becomes more complicated, since there are no uniform highway design standards for all countries. Consequently, the adoption of each national standard might have different construction (and in the long run) operational cost implications. It might be quite interesting to compare the different national technical standards, and maybe identify the most appropriate for the TINA Network.

It is worth mentioning, that for Motorways (even if they are constructed in stages) the TEM Standards and Recommended Practices do exist (and approved by most TINA countries).

As an example, showing that the reference macro-design parameters should be always fine-tuned at a micro-scale according to the National Standards, a road with an estimated daily volume (both directions) of 20.000 PCUs is considered. According to the definition of WP5, this necessitates a 3 –lane road, which was acceptable in the past, but now for safety reasons has been abandoned by many countries. Thus, a four lane road must be chosen. WP5 specifies only 4 –lanes motorways (min.20.000 - 40.000 PCUs per day). On the other hand AGR distinguishes 4 –lanes roads (2 lanes per direction) with a median (separate carriageways) or not. If this traffic corresponds to less than 1.500 PCUs per hour per direction, then we do not need separate carriageways (according to the design provisions); however, if this traffic during the peak hour exceeds the 1.500 PCUs per hour per direction, then we do need separate carriageways according to safety provisions[10].

To continue with the example, according to AGR the road Category is 4-lane road, and the corresponding design speed could be 100 km/h, resulting in a max gradient of 6%, and minimum radius of 6.000 meters, etc. If any of these two characteristics cannot be fulfilled due to the topography, other more expensive solutions (tunnel, viaduct) must be considered.

As for the relevant EU legislation that has to be adopted, it is worth mentioning the one about goods vehicles dimensions and weights, which will determine the max. axle weight, and thus the type and design of the pavement, and the min. clearance the bridges must have. In addition, harmonisation of customs and passport controls will require less time at the borders, and consequently there will be a reduction of access lanes and parking facilities at the border crossings.

---

[10] Some national standards (e.g. German) provide specific cross-referenced tables

Railways

Railways interoperability is two-fold: infrastructure and operations/rolling stock. UIC (International Union of Railways) provides several standards accepted by all member railways, dealing mainly with the operations, and with infrastructure elements that affect the operations. The detailed railway design is done according to the national standards, and thus –except for the UIC- there is no common standard, except the very general AGC. There is no relevant community legislation, except for Council Directive No. 96/48 on the interoperability of the Trans-European High Speed Rail System, which sets the objective without specifying specific technical standards.

AGC provides a very good reference for general technical standards. It stipulates that main international lines must provide high capacity and a low precision timing of operation. To ensure interoperability, a set of standards relating to number of tracks, vehicle loading gauge, minimum distance between track centres, nominal minimum speeds, etc., are introduced for existing and new lines (the latter are also distinguished in lines for passengers only, or for mixed traffic). (ECE / TRANS 63/ ANNEX II/ Table 1).

As far as it concerns the vehicle loading gauge, the UIC C1 has been chosen as the minimum loading gauge for new main international lines, while UIC B is recommended as sufficient for existing lines. The UIC C1 loading gauge allows the transport of road goods vehicles and road trains (lorry with trailer, articulated vehicle, tractor and semi-trailer) conforming to the European road loading gauge, ordinary road semi-trailers, ISO containers and swap-bodies on special wagons. The UIC B loading gauge allows for the transport of ISO containers, swap-bodies, and semi-trailers on recess wagons and containers/swap bodies. However, since many existing lines do not conform to the UIC B or C1 loading gauges, interoperability of rail transport between different countries is not always ensured. Upgrading to UIC B or C1 standards can be very difficult from the economic and financial standpoints; thus, the problems must be considered on a case by case basis, following a detailed feasibility study.

The choice of the speed has an impact on the choice of the maximum gradient (35mm/m, 12,5 mm/m), with significant effects to the construction costs (lower gradients in mountainous terrain oblige the construction of tunnels and viaducts) and the for the maximum authorised mass per axle.

As for the length of the trains a max. useful siding length of 750meters is accepted with minimum platform length at principal stations of 400meters. The above provisions are very important in promoting interoperability in inter-modal transport.

On the other hand, TER, recognising the high costs for the implementation of AGC (and AGTC) standards, has recommended –at least for the short term period- lower than AGC standards. The TER recommendations refer – among others- to a vehicle loading gauge UIC B, minimum speed of 120kms/hr, minimum useful siding length of 250meters and minimum length of the platforms at the main stations of 500m.

UN/ECE/WP5 attempts to estimate the capacity of railway lines, which depends on infrastructure characteristics, station installations, safety and signalling installations. It is recognised that it not possible to present formulae that can estimate the capacity for every case, since this depends on a lot of technical issues. However, WP.5 proposes some capacity limits for commercial operations of 60-80 trains per day for single tracks and more than 80 train per day (both directions) for double tracks. Thus, the outlined procedure for the rail must be used with caution and with case by case calculations.

Consequently all the above issues are affecting negatively the interoperability along the international main railway lines.

As it concerns the operations, ERTMS/ETCS applications (when they are ready for commercial implementation) will guarantee the interoperability as it concerns the command of the train operations. ERTMS (European Railway Train Management System) is an overlay of ETCS (European Train Control System) including all activities in relation to Train Operations. The system is not ready yet, thus it is not possible to be implemented in short term.

As for the relevant EU legislation that has to be adopted are the EU Directives No. 91/440, No. 95/18 and No. 95/19, that refer to a number of fundamental items for railway exploitation, like the separation of the infrastructure from the operations, rights of access, charging of infrastructure use, etc. The implications will be more felt to the operations: interoperability can be promoted, if EU railway companies share business with railways from Eastern Europe.

In addition the same comment for border crossing procedures (as for the case of roads) apply.

Inter-modal transport

The European Agreement on important international combined transport lines and related installations (AGTC), signed in 1991, attempts to facilitate the international transport of goods, taking into account the expected increase in the international transport of goods as a consequence of growing international trade and the adverse environmental consequences such developments might have. The important role of combined transport to alleviate the burden on the European road network, particularly in trans-alpine traffic, and to mitigate environmental damages has been seriously considered.

The AGTC covers few infrastructure issues, and it deals mainly with the operations. It repeats the general technical specifications of AGC. The provisions will affect the interoperability (as it was also mentioned for the AGC), because several types of loading units (e.g. maritime containers and semi-trailers) will not be possible to be transported in some sections of UIC B lines (due to loading gauge/ gabarit limitations). This is an area where –before any investment- a feasibility study is required, not only covering the infrastructure, but the loading units as well.

For inland Waterways, AGN stipulates the following minimum requirements, which are necessary in order to make a waterway suitable for container transport: inland navigation vessels with a width of 11.4 m and a length of approximately 110 m must be able to operate with three or more layers of containers; otherwise a permissible length of pushed convoys of 185 m should be ensured, in which case they could operate with two layers of containers.

An inter-modal/combined network has as integrated parts the links (e.g. railway lines, inland waterways, and shipping routes) and the nodes (the inland terminals or sea ports). Following the same process as in the road transport, after the estimation of the forecasted volume, the required size of the terminal has to be defined. (the type of railway line will follow the same principles as in rail). The following presentation and Table 4-1 gives correspondence of size and volumes handled[11]:

More specifically, *maritime* terminals are described as:

- Large, if they present an annual volume of more than 600,000 ITUs[12]

[11] Based on several EU sponsored projects: APAS, SIMET, IQ

[12] ITU: Inter-modal Transport Unit, equivalent to TEU for containers

- Middle, if they handle between 100,000 – 600,000 ITUs per year
- Small, if they handle less than 100,000 ITUs yearly.

On the other hand, *continental rail* terminals can be divided in:

- Large, if their annual volume exceeds the number of 70,000 ITUs
- Middle, if they handle between 30,000 – 70,000 ITUs yearly
- Small, if they handle less than 30,000 ITUs per year

As for *inland waterway* terminals, which fall into the larger category of continental terminals, they are divided into the following two categories:

- Large Terminals, if their annual volume exceeds the number of 80,000 ITUs
- Middle Terminals, if they handle less than 80,000 ITUs per year.

The corresponding values for size: required terminal area, number of railway tracks and required land for a greater zone of economic activity (freight village) are given in Table 4-1.

Terminal type	Terminal Area (in sqm)	Freight Village area (rural zone) in sqm	Rail tracks
Small	40000	1 800 000	2*600 m
Medium	80000	3 600 000	4*600 m
Large	More	More	4*600 m

Table 6-1: Corresponding values for terminals

Inland Waterways

The AGN (European Agreement on Main Inland Waterways of International Importance) provides for the network of E waterways, complemented by a system of inland navigation ports of special importance. Each E port should meet certain technical and operational criteria. These criteria ensure that interoperability is achieved and they also tackle environmental protection issues at ports. The main criteria that a river port should meet are:

- It should be situated on an E waterway and connected with the network of other E-modal links.
- It should be capable of accommodating vessels or pushed convoys used on the relevant E waterway in conformity with its class;
- Its aggregate cargo handling capacity should be at least 0.5 million tonnes a year;
- It should provide for the handling of standardised containers (with the exception of ports specialised in bulk cargo handling);
- All the facilities necessary for usual operations in international traffic should be available.

As for the E-inland waterways, AGN stipulates –amongst other- that:

- Inland waterways expected to carry a significant volume of container and ro-ro traffic should meet, as a minimum, the requirements of class Vb. An increase of 7% to 10% in the beam value of 11.4 m of specific vessels navigating on inland waterways of class Va and higher classes may also be envisaged in order to allow for future developments in container dimensions and easy transport of trailers;
- On waterways with fluctuating water levels, the value of the recommended draught should correspond to the draught reached or exceeded for 240 days on average per year (or for 60% of the navigation period). The value of the

recommended height under bridges should be ensured over the highest navigation level, where possible and economically reasonable;

- A minimum bridge clearance of 7.00 m should be ensured on waterways that connect important sea ports with the hinterland and are suitable for efficient container and river-sea traffic;
- Coastal routes are intended to ensure the integrity of the E waterways' network throughout Europe and are meant to be used, within the meaning of this Agreement, by river-sea vessels whose dimensions should, where possible and economically viable, meet the requirements for self-propelled units suitable for navigating on inland waterways of classes Va and VIb.

There is a multiplicity of national legislation about the detailed technical standards of ports (e.g. Recommendations of the Committee for Waterfront Structures - Harbours and Waterways (EAU), German Association of Port Engineers and German Association of Geotechnical Engineers, 1996).

The relevant EU legislation is dealing with the operations and legal documents of the ships, that has no direct effect on infrastructure standards.

Maritime transport (Ports)

Except for the TEN network of sea ports, there is no specific EU or International Agreement relating to the Ports Infrastructure, except for some UNCTAD handbooks. On the other hand there is numerous national legislation covering the ports, mainly dealing with: (i) Technical standards on constructional and computational issues of port and inland waterway structures in general, and (ii) Standards or recommendations focused mainly either on specific constructional issues (e.g. pavements, dredging etc.) or on general and specific planning issues. It is very difficult to draw norms for the size of a port, since it concerns its nature (passenger, cargo or mixed port), the type of cargo ships handled (dry cargo, bulk carriers, container ships, ferryboats/ro-ro etc)

There are several EU legislation referring to the ships operations and related issues (safety, insurance etc), which have no direct effect on Infrastructure technical standards.

Air transport (Airports)

There are no EU technical standards for airport development. The most appropriate international publication, which is more than a norm for the sector is the Airport Development Reference Manual (ADRM) developed by the International Transport Association (IATA). It is underlined that each country applies each own norms.

The ADRM covers in much detail the types of infrastructure an airport needs according to the passengers and cargo volumes handled, the types of the aircrafts and the air traffic control system in place. To estimate all the above parameters, the collection of very detailed disagregated data is required.

However, in very general terms, the types of aircrafts are determining the length of the runways: from 3000m to 4000m. Usually the width of the runway is 45m, and at a minimum an airport has a principal and a secondary runway. Runways must be at least 75-150m apart and the taxiways 75m apart. As it concerns the capacity of the airport, it measured by aircraft movements (landings and take-offs) per day or hour and the number of passengers.

The aircraft movements depend on the type of the air traffic control system and it varies for one principal runway between 42-53 movements per hour for IFR system and 45-99 per hour for a VFR system, with a total of 170 000- 215 000 aircraft movements per day. As for the terminal handling capacity, it depends on the number of aprons for aircrafts, the channels for passengers handling (check-ins, customs/passport controls, security checks etc). Needless to say that the number and types of aircrafts landing and taking off per day and peak hour determine the size of the terminal and the related areas/equipment for passenger and cargo handling.

In addition, the ICAO, International Standards and Recommended Practices determine the areas in a three dimensional plan around the airport, which have to be free of any obstacles. Consequently all the above are resulting in estimating the infrastructure costs.

Safety

A Community programme of action on road safety was initialised by a Resolution of the Council and of the representatives of the Member States in June 1991. The resolution stated that "*The human suffering and the social cost of road accidents each year cause deaths and injuries unacceptable not only from the moral and political but also from the economic and social points of view. A special effort must be made to improve road safety in all sectors, including vehicle manufacture and equipment. Action should be taken at Community level to intensify national measures.*"

So far safety has been addressed differently for each transport mode in EU legislation and guidelines. The documents primarily discuss technical safety conditions, without at least yet setting any quantified targets in the reduction of particular types of accidents. Safe operation of dangerous carriages is addressed by an extensive documentation.

Most of the legislation deals with the vehicles and vessels and not for the infrastructure. The only case that safety measures involve the infrastructure- in case of accidents- are in the tunnels.

However important implications for the safety considerations are the obligations deriving from the EU directives and Legislation (and of course national ones) as it concerns the technical standards of the vehicles for safety and the protection of the carrying passengers/driver. Compliance of the different vehicles with them will affect the number of accidents and thus will reduce the costs related with the alleviation of accidents.

Road

According to AGR, the required *number of lanes* depends on the traffic flows, and the decision for an additional lane or for upgrading to a higher category is made taking safety into consideration.

- The formation of international roads shall comprise, in addition to the carriageways, verges and possibly a central reserve and special paths for pedestrians and cyclists. Such special paths shall not be permitted within the formation of motorways. They shall not be permitted along an express road unless they are separated from it by a sufficiently wide space. Trams and railways are excluded from the carriageways of all-purpose roads and from within the formation of motorways and express roads. This provision shall not apply to motorways that have been specially designed to allow the installation of a railway.
- On the verge of all-purpose roads, where motor traffic reaches at least 2,000 vehicles per day, *special paths* reserved for pedestrians, cyclists or similar traffic

shall be provided whenever their number reaches 200 units per peak half-hour in one direction or 1,000 units per day in one direction. Cycle tracks shall normally be one-way and shall have a minimum width of 2.20 m. A separating strip with a minimum width of 1 m shall be provided between the carriageway and the special paths.

- Special consideration is given to *shoulders and central reserve*. It is recommended that the shoulders of motorways and express roads shall include on the right side of the carriageway a continuous stopping strip, paved or stabilised, with a minimum width of 2.50 m to permit stopping in an emergency.
- With regard to *horizontal and vertical alignment* there are many detailed guidelines for the technical characteristics caring for safety and comfort for drivers. Such issues are: superelevation, providing for the stability of the vehicle and comfort of the driver under average conditions; the horizontal and vertical visibility, it shall be such as to give the same degree of safety, taking any gradients into account. The minimum visibility distances necessary for overtaking on two-way carriageways are also recommended. When the visibility is insufficient, doubling of the carriageway is recommended at summits and in curves on all-purpose roads with two and three traffic lanes.
- Safety is particularly considered at *intersections*, either at level junctions or at grade-separated junctions. Visibility at approaches to the junction is provided in order to ensure that drivers have enough time to take the decisions imposed by the type of control and the traffic conditions of the moment. Priorities are clearly fixed and waiting zones of sufficient length are provided. Acceleration and deceleration lanes are provided at the entrance to and exit from the carriageway. Directional islands are constructed and clearly marked either by lights or reflectorised.

Special consideration is given in the AGR for safety equipment at international roads. This includes lighting, anti-glare devices and safety barriers.

- Sections, junctions and interchanges on international roads shall be provided with *lighting* whenever the volume of night traffic economically justifies the provision and operation of lighting systems. Such lighting shall be uniform and sufficient to enable motorised traffic to travel without driving lights.
- With regard to *anti-glare devices*, when the volume of night traffic justifies it, plantations or screens shall be provided on the central reserve of motorways and express roads and, if necessary, on their shoulders if the driving-lights of vehicles travelling in the opposite direction on the other carriageway or on another road running alongside the international road, create discomfort on the latter.
- *Safety barriers* shall be provided to avoid collisions with obstacles situated on the shoulders or the central reserve, provided however that the risk and the consequences of a collision with the barriers are less than those of collision with the obstacles that they protect.

Ancillary services such as installations at frontiers, miscellaneous installations, first aid posts and telecommunications are also referred to in the Agreement with issues affecting safety on international roads.

Other international agreements, deal with road traffic and safety, consisting of the Convention of Road Traffic (1968), the Convention on Road Signs and Signals (1968) and their amendments and protocols, and with Minimum Requirements for the Issue and Validity of Driving Permits. Of those relevant for the infrastructure, is the Convention dealing with signs and signals. For the international carriage of dangerous goods by road, the European Agreement ADR applies.

Rail

The existing (national) legislation and UIC standards are related to operations. The safety precautions and standards are very detailed. One of the provisions for carriage of dangerous goods, forbids the crossing by rail urban centres by wagons carrying dangerous/hazardous materials. Consequently, all international railway lines with volumes of dangerous/hazardous materials must have overpasses of urban areas.

As for AGC, it stipulates general guidelines on infrastructure prerequisites, affecting safety of railway transport refer to crossings, minimum distances between track centres and minimum speeds.

New main international lines should be built without any road *level crossings*. On existing main international lines, the systematic replacement of level crossings by over or underpasses is planned, except in the few cases where such replacement is physically impossible.

Requirements for *minimum distance between track* centres are set. This is the minimum distance between track centres for double-track main lines outside stations. An increase in the distance between track centres presents the following advantages:

- Decrease in the aerodynamic pressure when two trains pass each other, an advantage which increase in proportion to the speed;
- Some relief from the constraints imposed in the transport of out-of-gauge load;
- Possibility of using high-powered mechanised equipment for track maintenance and renewal.

The *nominal minimum speed* determines the geotechnical characteristics of the section (radii of curves and cant), the safety installations (braking distance) and the braking coefficient of the rolling stock.

For the international carriage of dangerous goods by rail, the RID (Regulation concerning the international railway transport of dangerous goods) applies, specifying detailed provisions for this kind of transport.

Maritime transport

They are more related to operations than infrastructure: there are two international conventions, which deal with safety at sea. These are ISM (International Safety Management code), and SOLAS (Safety of Life at Sea). There is also the "Code of Practice for the safe loading and unloading of bulk carriers (PLU code)", signed at the Resolution of the 20th Assembly of IMO, which provides guidelines for the good co-operation between terminals and vessels during loading and unloading of bulk cargo.

Environment

The European Union (EU) framework of environmental legislation is rather extensive in volume but not very precise in its definitions. There exists a set of acts, directives and regulations, which the Member States have enforced to a varying degree in addition or in parallel with their national legislation.

Agenda 21 declaration endorsed by the world's governments at the UN Conference on Environment and Development, in Rio de Janeiro in 1992, has elevated sustainable development to become a recognised part of policy making. From there on the European

Community has developed policies to implement the Agenda and prioritise future policies. Follow-up meetings and further negotiations have taken place (especially Kyoto 1997).

The Luxembourg Conference (1998) on European actions to meet the Kyoto targets defined for the first time some binding levels of CO_2 reductions. The result was that some countries are obliged to reduce total emissions, some may increase total emissions and some maintain the reference level of 1990 emissions. On average the reduction target for the Union is 8 % of the 1990 level of emissions. The target period of implementation is by 2008 – 2012.

Directive 85/337/EEC on the assessment of the effect of certain public and private projects on the environment has recently been amended by Directive 97/11/EC, whose provisions must be transposed and put into force by the 14th of March 1999. The directive embodies the preventive approach to environmental protection by requiring that development projects likely to have significant effects on the environment are subject to an assessment of environmental impacts. The new directive will broaden out the list of projects to be automatically subjected under impact assessment. Among these are construction of roads and sea routes. Thus, any infrastructure project for the TINA network must follow the guidelines of these Directives.

Due to the high importance attached to the environment, the proposed values by WHO for air pollution and for noise by the COMMUTE research project of the European Commission are presented below:

Compound	Guideline value [micrograms/m^3]	Averaging time	Annual ambient air concentration [micrograms/m^3]	Health endpoint
Carbon Monoxide	100 000	15 min	500 – 7 000	Critical level of COHb < 2,5 %
	60 000	30 min		
	30 000	1 h		
	10 000	8 h		
Nitrogen Dioxide	200	1 h	10 - 150	Slight changes in lung function In asthmatics
	40 – 50	1 a		
Ozone	120	8 h	10 - 100	Respiratory function responses
Sulphur Dioxide	500	10 min	5 - 400	Exacerbation of respiratory Symptoms in sensitive Individuals
	125	24 h		
	50	1 a		

Table 6-2: WHO air quality guidelines for transport related air pollution (EURO, 1998)

Source: WHO. (1998). Specific programmes in Environmental Health. Air Quality Management. Air Quality Guidelines and Standards. (www.who.int/peh/specprg.htm)

Theme	Indicator	Targets
Noise	Number of noise sensitive zones touched by transport infrastructure Population within the 65 dB(A)-isophon (Leq) during night-time Population within the 85dB(A)-isophon (Leq) Population within isophons greater than 55 and 65 dB(A) (Leq) Population within isophons greater than 55 dB(A) (Leq)	Population should not be exposed to noise levels higher than 65 dB(A) during night-time Noise level should never exceed a level of 85dB(A). Proportion of the population already exposed to noise levels between 55 and 65 dB(A) should not suffer any increase. Proportion of the population already exposed to noise levels below 55 dB (A) should not suffer any increase above that level.

Table 6-3: Set of Targets for Sustainability of Transportation Development (Adapted from COMMUTE, 1998)

Source: Commute Deliverable 1, 1997, Table 3.6 adapted by CODE-TEN (1999).

Important implications for the environmental considerations are the obligations deriving from the EU Directives and Legislation (and of course National ones) as it concerns the emission of the vehicles and noise (especially for the aircrafts). Compliance of the different vehicles with them will affect the set limits and thus will reduce the costs related with the alleviation of environmental damage.

It must be stressed that most of the above are more pertinent for dense transport networks, as it is the case in Western Europe. It will be interesting to try to develop values for less dense networks and remote areas, as it is the case in several TINA countries. The relaxing of some standards will have a significant effect in reducing the cost of investment.

As for the road infrastructure, the AGR stipulates the following:

- The fundamental characteristics of the construction or improvement of the main international traffic areas are based on modern concepts of road construction technology and do not apply in built-up areas. These will be by-passed if they constitute a hindrance or a danger.
- The protection of the environment shall be taken into account in the surveying and construction of a new international road.
- The construction of an additional lane or improvement to a higher category will be done taking into account construction and environmental costs.
- The co-ordination of the

orizontal and vertical alignment shall be studied not only from the point of view of safety but also from that of the harmonious integration of the alignment with the surrounding land

- All the *elements of the landscape* shall, together with the road signs, contribute to the comfort of the driver and the safety of traffic. It is desirable, in particular, to create good visual guidance by plantations of bushes in harmony with the natural species and to establish, in monotonous flat country, screens of foliage to measure the depth of the field of vision.
- *Plantations of bushes* shall also be provided to protect users against glare, wind and snowdrifts and, where appropriate, to provide persons occupying premises alongside the road with protection from noises and air pollution.
- For safety and aesthetic reasons *roadside advertising hoardings* shall be prohibited on international roads.

The way ahead

The above analysis has highlighted the difficulty in establishing common strategic technical standards for the TINA network. For many of the problems the needed legislation does exist (mainly at national level related to very detailed technical standards). The implementation of the proper framework of standards that can ensure a minimum interoperability for the TINA network, with its peculiarities and the budgetary constraints, should be seen as one of the future priorities. Custom made strategic technical standards for the TINA network are needed; they can ensure interoperability, safety and environmental protection, incorporating best practices at national or international level. A good example for such approach is the Standards and Recommended Practices developed by the UN for the Trans-European North South Motorway (TEM) in the early 80's.

This Report has been written, compiled and edited by the TINA Secretariat, Vienna

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