European Commission

Regional Balkans Infrastructure Study - Transport

Appendix 5 - Final Report

Methods for Project Screening and Pre-feasibility Analysis

July 2003

REBIS transport
Joint Venture

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1 Methods of investment planning

1.1 Introduction

In the Balkan region, transport infrastructure is an important measure to achieve economic development and regional integration.

The Regional Balkans Infrastructure Study - Transport focuses on the countries: Albania, Bosnia and Herzegovina, Croatia, Serbia and Montenegro and the Former Yugoslav Republic of Macedonia (FYRO Macedonia).

The objective of this note on methods of investment planning is to provide a description, and documentation, of the applied methodology, which is used to assist in the preparation of an investment plan for short-term priority projects. This plan will furnish the EU Commission, IFIs and other donors with a consolidated list of suitable projects for financing.

The procedure for assessing investment projects and their selection across transport modes is based on the method used for the TIRS project[1], work carried out on TINA[2] and the consultant's own experience from similar studies and research works. As emphasised in the terms of reference, the objective is not to identify a new method, but rather to make a synthesis of previous work and experience.

The method is a two-step procedure:

- Firstly, a screening tool based on a number of aggregated criteria is defined and used for a large, gross list of identified projects.

- Secondly, once projects have been selected and screened, pre-feasibility studies are carried out for a subset of selected projects.

The pre-feasibility guidelines comprise a genuine analysis based on data collection, while inputs for the screening tool are based on existing data, a dialogue with national authorities and expert assessments.

[1] *Transport Infrastructure Regional Study in the Balkans.*

[2] *Transport Infrastructure Needs Assessment, Final Report, October 1999 (Appendix II).*

The criteria used in the screening tool are encompassed in the following five topics plus a criterion related to the speed of the projects implementation:

1. Economic appraisal (cost-benefit assessments, including safety impacts)
2. Financing viability (sustainability and additivity of donor funds)
3. Environmental effects
4. Functionality and coherency of the network (including strategic issues e.g. connecting border regions)
5. Readiness of the authority

In the screening process, a numerical score is assigned for each project based on a preference scale defined for each criterion within each of the five above mentioned topics.

The speed of the projects implementation will be considered independently to the other criteria and will not be encompassed in the numerical score assigned to the project.

The screening tool methodology is described in Chapter 2. Chapter 3 shows the pre-feasibility guidelines and data requirement. Annex 5.1 includes the assumptions of the multi-criteria analysis used for the screening tool, and Annex 5.2 illustrates the methodology for obtaining the data, estimation and unit costs, in order to ensure consistency of the assessment and to allow comparison of the results within the five countries.

1.2 Definition of methods of investment planning

1.2.1 Screening tool and process

The objective of the screening process is to assess and rank all identified projects in a standardised manner based on existing information. The screening results are then used to select projects for a more thorough analysis in terms of a pre-feasibility study. Investment projects for Albania, Bosnia and Herzegovina, Croatia, Serbia and Montenegro and FYRO Macedonia will be screened independently of the countries or the modes.

As in the TIRS project, the screening tool is based on a multi-criteria analysis. At this stage, this type of analysis is used more frequently than conventional cost benefit analysis, particularly because the quantified data are not always available and/or reliable, and moreover the main and most important criteria are the facilitation of international and regional communication and the readiness of the project in order to promote quick implementation.

The criteria and sub-criteria to be evaluated have been defined according to the five topics mentioned above and the speed of implementing the project. The selection of the five topics has been made based on previous studies and the experience and research work of the consultants.

The screening tool will assign, to the various transport projects, a score representing the performance of the project for all of the five topics. Based on the overall score, the projects will be ranked in three groups and further divided according to the speed of their implementation. Based on this classification, pre-feasibility studies will be carried out for a selected sub-group.

In the screening phase, there will be no prioritisation of alternative modes or alternative solutions for the same project in the same corridor.

Basis for the assessment

The status of the projects is quite varied, and very few projects have been studied in detail or had their costs assessed. On the contrary, most of the projects are very roughly defined. The assessment is based on the data available to the project at the time of the evaluation.

This information can be an existing project sheet from the TIRS report, e.g. a minimum description of the project with information on location, type of investment, extent of project (e.g. length of road), contact authority and person and/or any available study related to the project, etc.

In order to enable comparison of projects, an Excel sheet has been developed. The criteria and sub-criteria have been assessed by going through available documents and, when necessary, interviewing the persons who have defined the project and recording their answers in so-called project fiches and the Excel sheet for the project.

Chapter 2 defines the criteria and sub-criteria as well as the scale and weighting to be used in order to evaluate the overall score of the project by means of the screening tool.

The different steps of the screening tool are to:

- evaluate, within the given scale, each criterion separately within each of the five topics
- assign different weight to the criteria within each group and to the different groups
- classify the projects in three groups based on the total score including the weighting, i.e. rank the projects on the basis of the result of the screening tool
- establish a two-dimensional classification by further dividing the projects into three groups on the basis of implementation time

Annex 5.1 shows the assumptions made for the weighting of the criteria.

1.2.2 Pre-feasibility guidelines

The purpose of these guidelines is to provide some guiding principles for the collection and the computation of the data needed for pre-feasibility studies. In contrast to the screening tool, the pre-feasibility guidelines describe how to perform the process of the pre-feasibility analysis.

It is presumed that a feasibility study, i.e. more in-depth analyses, will be performed afterwards before the final decision is taken.

In the guidelines as well as in the pre-feasibility analysis, no consideration has been given to the distribution of projects among the countries.

The data requirements of the pre-feasibility study are the following:

- The present traffic level must be known, and forecasts of future traffic must be estimated.
- The benefits of the investment need to be identified. This includes time savings, savings in vehicle operating costs, savings in accidents in terms of persons and equipment, etc.
- Possible savings in maintenance costs must be identified based on a technical assessment of the current and expected future situation of the infrastructure.
- Investment costs must be estimated on basis of relevant technical assessments.

The pre-feasibility study is only performed for the projects selected in the screening process.

The pre-feasibility study involves a wide range of experts including relevant technicians (pavement, designers, geotechnical etc.).

Based on the same principle as those used in the screening phase, a score is shown for each criterion, side by side with the quantitative or monetary estimations resulting from the pre-feasibility study.

The guidelines for the pre-feasibility study are presented in Chapter 3. The main purpose of this chapter is to ensure a common understanding of the pre-feasibility study and common utilisation of different criteria, as well as a common method of estimating e.g. unit costs. The estimation of the unit costs used in the pre-feasibility study has been co-ordinated among the five countries.

1.2.3 Overview of the screening tool and pre-feasibility guidelines

Table 1.1 gives an overview of the criteria included in the method for investment planning for both the screening phase and the pre-feasibility phase. The way in which the criteria will be measured is also indicated. See respectively Chapter 2 and Chapter 3 for a more detailed description of the criteria for the screening tool and the pre-feasibility guidelines.

Table 1.1 Definition of criteria in method of investment planning.

Definition of criteria	Screening	Pre-feasibility
I: Economic appraisal		
I-a: Existing traffic level*:* indicates the existing level of traffic using the infrastructure	AMI	EMI
I-b: Forecasted change in the existing traffic level*:* indicates the changes in the existing level of traffic	AMI	EMI
I-c: Capacity assessment: compares the forecasted traffic level to the capacity of the existing infrastructure	QA	EMI
I-d: Benefits of implementation*:* measures the socio-economic benefits of a project through e.g. savings in operating costs, time savings	QA	MOI/EMI
I-e: Safety assessment: indicates the improvements in terms of safety for equipment and persons.	QA	MOI/EMI
I-f: Investment costs: indicates the investment cost per km for different types of project	AMI	MOI
II: Financial viability		**MOI**
II-a: Co-financing from local sources and IFIs: is used to identify the status of the financing plan and the financial viability of the project	QA	EMI
II-b: Sustainability: indicates the capability of the implementing authority to finance future operation and maintenance of the infrastructure	QA	EMI
III: Environmental effects are aimed at assessing the consequences of the project in terms of environment	QA	**QA/MOI**
IV: Functionality and coherency of the network	**QA**	**EMI/QA**
IV-a: Type of relation: shows the international importance of the link from a political and an economic point of view	QA	QA
IV-b: Relative importance of international demand, passenger traffic: indicates the amount of international transport out of the total transport demand associated with the project for passengers	AMI	QA
IV-c: Relative importance of international demand, freight traffic: indicates the amount of international transport out of the total transport demand associated with the project for freight	AMI	QA
IV-d: Interconnection of existing networks: indicates the extent to which the project is improving communication between two regional/national networks	QA	QA
IV-e: EU standards of service of the existing infrastructure: indicates the level of service of the existing facility compared to EU standards	QA	QA

Definition of criteria	Screening	Pre-feasibility
V: Readiness of the authority indicates the technical capacity of the authority to carry out the project	**QA**	**QA**
VI: Speed of implementation: indicates how fast the implementation of the project can be initiated	**QA**	**QA**

Key: **MOI** = Monetised impacts (monetary values); **QA** = Qualitative assessment; **EMI**= Estimated measured impacts (quantitative values); **AMI =** Approximated measured impacts based on a pre-defined scale.

2 Screening tool

2.1 Methodology

The objective of the screening process is to select those projects for which a pre-feasibility study will be performed and to assist in the development of the investment plans. The screening tool is based on a multi-criteria analysis in order to short-list a limited number of investment projects for subsequent detailed appraisal, thanks to the pre-feasibility study.

The performance matrix, or consequence table, is a standard feature of multi-criteria analysis, where each row describes a project and each column describes the performance of the project in relation to each criterion.

In fact, the numerical analysis is applied in two steps:

- **The scoring step**: The information from the performance matrix will be converted into consistent numerical values, by using a cardinal scale between 0 and 100. 0 representing the worst possibility and 100 the best. The same scale is used for all criteria.

- **The weighting step**: The weighting is firstly assessed within each of the five groups of related criteria and then among the sub-groups of criteria.

Mathematical routines combine these two components to give an overall assessment of each project under appraisal. The method used here is a simple weighted average score. As the sum of weight between sub-criteria and the sum of weight between criteria are equal to one, the maximum total score is 100.

Note that criterion IV-a *The type of relation* is a "go" /"no-go" option, which means that if the project is not among the agreed REBIS core networks, the total score of the project will be equal to zero. Therefore, the weight attributed to this criterion has been set at 0, as all the projects considered will get the same score from this criterion and other projects will not be considered, anyway.

A sensitivity analysis has been performed in order to establish the final weights used for the screening tool.

The projects will be divided into three groups depending on their total score.

Once this has been done, the projects within each group will be screened based on the implementation timing *(Criterion VI Speed of implementation)*, e.g., projects of group 1 will be further divided into fast implementation time (less than one year), average implementation time (between one and four years) and long implementation time (more than four years).

An Excel file (illustrated in Figure 2.1) is provided in order to show the performance matrix and the results.

Project number	Project with profile 1A	Project with profile 2A	Project with profile 3A	Project with profile 1B	Project with profile 2B	Project with profile 3B	Project with profile 1C	Project with profile 2C	Project with profile 3C
No. 1						X			
No. 2						X			
No. 3					X				
No. 4						X			
…									

Note: Profiles:
1 = score > 75; 2 = score 65-75; 3 = score < 65
Speed of implementation:
A = ready in short term; B = ready medium term; C = only in the long run

Figure 2.1 Results of performance matrix.

The results of the actual screening of identified projects are presented in Appendix 6: Project Screening/ Project Details.

2.2 Description of criteria

This section describes the criteria, sub-criteria as well as the categories used in order to define the preference scale. The letters A to F are used for presentation purposes, only. The applied numerical scales and weights are shown in Annex 5.1.

2.2.1 Criterion I: Economic appraisal

I-a: Existing traffic level

Traffic level aims at identifying the present level of traffic using the infrastructure. If no traffic data is available, an assessment must be made.

If the present traffic level is biased due to temporary circumstances, it should be adjusted to reflect the most usual traffic level.

Table 2.1 I-a: Categories used to represent the current traffic levels.

	Highway (vpd)	Border crossing (vpd)	Railway (trains/day)	Port (million t/year)	River port (million t/year)	Airport (million pass./year)
A. Very high	>10,000	>2,500	>100	>8	>2	>3
B. High	6-10,000	1,500-2,500	60-100	4-8	1-2	2-3
C. Medium	3-6,000	800-1,500	25-60	1.5-4	0.5-1	1-2
D. Low	<3,000	<800	<25	<1.5	<0.5	<1

vpd: vehicles per day; pass.: passengers; t: tonne.

I-b: Forecasted change in traffic level

Forecasted change in traffic level shows the forecasted changes in traffic, using the existing infrastructure, in five years' time (can be based on the results of Task 2: Forecasting model for passengers and freight transport for national and international traffic). The percentage increases indicate the estimated total increase over a five year period.

Table 2.2 I-b: Categories used to represent the forecasted traffic levels.

A. Large increase	More than 25%
B. Moderate increase	From 15 to 25 %
C. Slight increase	From 5% to 15 %
D. Almost no change or decrease	From -5% (or any decrease) to 5%

I-c: Capacity assessment

Capacity assessment compares the forecasted traffic level to the capacity of the existing infrastructure. The ratio of forecasted traffic to the capacity is greater than 1 (capacity problem), less than 1 (no capacity problem) or equal to 1 (capacity problem possible in the medium term). This criterion indicates the problem of congestion due to the existing infrastructure's condition and the consequences in term of decreasing speed.

Table 2.3 I-c: Categories used to represent the capacity levels.

A. Very large capacity problem	Capacity problem now, and the project will increase capacity
B. Large capacity problem	Capacity problem in 5 years' time, and the project will increase capacity
C. No problem/ not relevant	No capacity problem and/or the project will not increase capacity

I-d: Benefits of implementation

Benefits of implementation measures the socio-economic benefits of a project through e.g. savings in operating costs, time savings, etc. For example, in the case of road traffic, the benefits must be measured as savings per vehicle, and for railway traffic as savings per train in order to reflect the marginal benefit for infrastructure users without taking the number of travellers into consideration. For ships or vessels the benefit must be measured in a similar way.

The evaluation of this criterion is based on expert assessment and must be considered as a qualitative assessment of the socio-economic benefits which will be monetised in the pre-feasibility study. Note that the screening does *not* comprise an estimation of the rate of returns. The percentage values presented in Table 2.4 only indicate *savings* in travel time and VOC.

Table 2.4 I-d: Categories used to represent the benefits of implementation (benefits in time savings and savings in vehicle operating cost per vehicle).

A. Very high benefit level Time savings and savings in vehicle operating cost >25%	Re-establishment of a damaged connection that cannot be used at the moment. The benefit will be high time savings and savings in e.g. vehicle operating costs
B. High benefit level Time savings and savings in vehicle operating cost: 25-15%	Extensive rehabilitation leads to significant savings in vehicle operating costs and travel time
C. Medium benefit level Time savings and savings in vehicle operating cost: 15-10%	Rehabilitation leads to savings in vehicle operating costs and travel time
D. Low benefit level Time savings and savings in vehicle operating cost: 10-5%	Minor improvements through e.g. surface improvements
E. No significant benefits <5%	No obvious benefits for the infrastructure users are observed

I-e: Safety assessment

Safety assessment indicates the improvements in terms of safety for equipment and persons.

Table 2.5 I-e: Categories used to represent the safety assessment.

Will the project improve safety?
A. Yes
B. No

I-f: Investment costs

In the screening phase, the aim is to show the relative importance of investment costs in order to indicate whether the project is expensive or cheap, taking into consideration the type of project and the usual cost of similar projects, as well as taking due account of its magnitude (e.g. its length for linear infrastructure).

Table 2.6 I-f: Scale to categorise relative importance of investment costs.

	Rehabilitation /upgrading of highways m EUR / km	New 2-lane highway or single carriageway m EUR / km	Complete four-lane motorway m EUR / km	Rehabilitation /upgrading of railways m EUR / km	New single-track rail line m EUR / km
A. Low	<0.5	<1.2	<2.2	<0.45	<1.0
B. Average	0.5-0.75	1.2-1.6	2.2-2.8	0.45-0.7	1.0-1.5
C. Expensive	0.75-1.5	1.6-2.5	2.8-5	0.7-1.5	1.5-3
D. Very expensive	>1.5	>2.5	>5	>1.5	>3

2.2.2 Criterion II: Financial viability

II-a: Financing and co-financing from local sources and IFIs

Financing and co-financing from local sources and IFIs is used to identify the status of the financing plan and the financial viability of the project.

Table 2.7 II-a: Categories used to represent the level of financing and co-financing from local sources and IFIs.

A. Good	Realistic financing plan
B. Medium	Indication of possible local or international sources of financing via grant or loans
C. Low and risky	No indication, so far, on the financing plan

II-b: Sustainability

The *sustainability* is evaluated based on the *operation and maintenance costs* which give an indication of the capability of the implementing authority (e.g. local road administration) to finance the future operation and maintenance of the infrastructure.

The evaluation must take into consideration any fees or charges paid by the infrastructure users to the operator or owner, and the money allocated by the implementation authority for operation and maintenance.

Table 2.8 II-b: Categories used to represent the capability of the implementing authority to finance future operation and maintenance costs.

A. Good	Operation and maintenance costs will be covered, in the future, by public budget, users' fee and other possibilities of financing
B. Medium	Possibility of covering O&M costs, in the future
C. Low and risky	Uncertain

2.2.3 Criterion III: Environmental effects

The environmental effects aim at assessing the importance of the project for protection/improvement of the environment or, conversely, negative effects.

Changes in safety for travellers and equipment are evaluated in the criterion safety assessment, sub-criterion I-e.

Table 2.9 III: Categories used to represent the environmental effects.

A. Large beneficial effect (positive effect):	Substantially improved environment e.g. through cleaning up of polluted areas, or substantially lower level of noise (in urban areas)
B. Moderate or slightly beneficial effect (positive effect):	Moderately or slightly improved environment including reduced risk of environmental accidents through e.g. spill of oil products or moderately lower level of noise (in urban areas)
C. Neutral effect (no effect)	No direct or indirect influence on neither environment nor the level of noise (in urban areas)
D. Moderate or slightly negative effect (negative effect)	Negative effect on the environment e.g. by damage to nature reserves or by increase in the level of noise (in urban areas).

2.2.4 Criterion IV: Functionality and coherency of the network

IV-a: Type of relation

Type of relation aims to show the international importance of the link or the itinerary associated with the project, politically as well as economically.

It is used to discriminate between projects within and outside the corridors.

The projects which are not within the proposed core networks will not be considered in the screening process.

Table 2.10 IV-a: Categories used to represent the type of relation.

A.	In the proposed core networks
B.	Not in the proposed core networks

IV-b: Relative importance of international demand, passenger traffic

The relative importance of international demand, passenger traffic indicates the amount of international transport out of the total transport demand associated with the project for passengers. The relative importance of passenger traffic is evaluated for traffic using the infrastructure in five years time.

Table 2.11 IV-b: Categories used to represent the relative importance of international demand in relation to passenger traffic.

A. Very high	More than 25% of total traffic
B. High	From 15 to 25% of total traffic
C. Medium	From 7 to 15% of total traffic
D. Low	Less than 7% of total traffic

IV-c: Relative importance of international demand, freight

The relative importance of international demand, freight indicates the amount of international transport out of the total transport demand associated with the project for freight. The relative importance of freight traffic is evaluated for traffic using the infrastructure in five years time.

Table 2.12 IV-c: Categories used to represent the relative importance of international demand in relation to freight.

A. Very high	More than 25% of total traffic
B. High	From 15 to 25% of total traffic
C. Medium	From 7 to 15% of total traffic
D. Low	Less than 7% of total traffic

IV-d: Interconnection of existing networks

Interconnection of existing networks aims to indicate the extent to which the project improves the communication between two regional/national networks, thus facilitating the development of trade between two regions/countries.

Table 2.13 IV-d: Categories used to represent the interconnection of existing networks.

A. Large improvement	Missing connection
B. Moderate improvement	Improve the connection
C. No significant improvement	No Influence

IV-e: EU standards of service of the existing infrastructure

EU standards of service of the existing infrastructure indicate whether the existing facility provides a level of service close to, or far from, the standards defined by the European Union or generally accepted in terms of comfort, speed or safety.

Table 2.14 IV-e: Scale to categorise if the existing infrastructure meets the EU standard of service.

A. Inadequate	Very few standards are met by the existing infrastructure
B. Adequate	Most of the standards are met by the existing infrastructure

2.2.5 Criterion V: Readiness of the authority

Readiness of the authority indicates the technical administrative capacity of the implementing authority (e.g. road administration) to carry out the project. This criterion is to reflect whether there are any administrative obstacles which may make it difficult for the authority to carry out the project, such as undefined or uncertain management organisation, unclear ownership of the infrastructure or lack of staff.

The financial capacity of the authority is not included in this criterion, but in criterion II, "financial viability".

Table 2.15 V: Categories used to represent the readiness of the authority.

A. Very ready	No technical or administrative obstacles
B. Moderately ready	Few obstacles which can be overcome
C. Not ready	Too many obstacles. At the moment, the authority cannot bear the responsibility for the investments

2.2.6 VI: Speed of implementation

The *speed of implementation* is assessed by identifying what needs to be done before starting the project, and what has been achieved, so far. The assessment must reflect both planning, feasibility, detailed design and finalising of the construction.

Table 2.16 VI: Categories use to represent the speed of implementation.

A. Very fast implementation time	Planning, feasibility, detailed design and construction can be finalised in less than 1 year
B. Average implementation time	Planning, feasibility, detailed design and construction can be finalised within 1 to 4 years
C. Long implementation time	Planning, feasibility, detailed design and construction need more than 4 years to be finalised

The assessment can be based on the following list:

Status of project	**YES**	**NO**
An environmental impact assessment has been carried out		
Detailed design		
A realistic financing plan has been prepared		
Negotiations with potential financers		
Outline design		
International standard feasibility study exists		
Local standard feasibility study exists		
Local standard pre-feasibility study exists		
International standard pre-feasibility study exists		
Land acquisition		

3 Pre-feasibility study guidelines

The pre-feasibility guidelines are based on the same criteria as those used in the screening tool. Before defining the use of each criterion, a brief introduction is given to the methodology used for the pre-feasibility.

3.1 Methodology

The purpose of the pre-feasibility study is to perform an initial socio-economic and financial evaluation of the costs and benefits associated with the proposed projects. To support these analyses, technical assessments also need to be carried out, as well as more strategic considerations regarding e.g. priority of roads in networks.

The present guidelines focus on the following analyses:

- Economic appraisal including evaluation of present and future traffic levels, socio-economic benefits including change in operation and maintenance costs, and investment costs.

- Financial viability including consideration of identification of financing sources, operation and maintenance costs, and investment costs.

Both the economic and the financial analyses must be based on a methodology where the costs and benefits of a reference alternative are compared to those of one or more investment alternatives.

The reference alternative represents the most realistic situation if the proposed project is, for some reason, rejected and cannot be carried out. However, it is assumed that it will be possible to maintain the infrastructure at a certain level to ensure future utilisation of the infrastructure without the introduction of any service improving investments.

The investment alternative represents a situation where the proposed investments are carried out according to the project description. If more than one of the project alternatives are proposed, each alternative is compared, one by one, to the reference alternative.

The assumptions to be used in the analyses are listed in Annex 5.2.

3.2 Description of criteria

The presentation of the content of pre-feasibility analyses below outlines the "ideal" level of information.

However, in the REBIS projects, the experience has been that not all types of information could be made available for each project study, and other, or simpler, types of analyses have been performed.

3.2.1 Criterion I: Economic appraisal

The economic appraisal must be performed as a cost-benefit analysis comprising the following elements:

I-a: Existing traffic level
I-b: Forecasted change in the existing traffic level
I-c: Capacity assessment
I-d: Benefits of implementation
I-e: Safety assessment
I-f: Investment costs

First of all, each element must be analysed separately (according to the description below) and, secondly, an overall cost-benefit analysis is performed. To enable a full cost-benefit analysis, the content of some of the elements has been extended as compared to the description in the screening tool.

The following economic performance indicators have been calculated using the moderate economic and traffic growth scenario:

- Net present value (NPV) using 7% pa. real interest rate; and
- The real internal rate of return (IRR)

Furthermore, sensitivity testing has been applied systematically for:

- Increased (+20%) and decreased (-20%) construction cost estimates; and
- High and low economic growth

I-a: Existing traffic level
For all modes, the present traffic level using the infrastructure must be known for the pre-feasibility analysis and the traffic must be split between passengers and freight traffic, accordingly.

The traffic analyses do not include diverted or induced traffic except in special cases such as the construction of new infrastructure.

The minimum requirements of the present traffic level for different modes are described in the following box:

Identification of present traffic level

Road traffic
Recently performed traffic counts must be available. Otherwise, new traffic surveys must be prepared. The aim is that the following data must be available:

- Classified traffic counts for 7 consecutive days in the daytime
- One traffic count during the night
- Vehicle categories must be adjusted to local conditions and, at least, be split between light vehicles, trucks and heavy trucks

Railway traffic
Recent statistics of traffic must be collected from relevant authorities, including average figures (as a minimum) for:

- No. of wagons per train for passenger and freight trains
- Average no. of passengers per train
- Weight of freight per train for freight trains

Waterway and airport traffic
Recent statistics of traffic must be collected from relevant authorities.

I-b: Forecasted change in the existing traffic level (future traffic levels)
It is difficult to forecast the economic development in the region due to the unstable situation, both present and past. As traffic forecasts will be based on forecasted future growth in e.g. GDP and population, the uncertainty as to the future traffic is reflected in sensitivity analyses.

Local and international traffic forecasts are distinguished/differentiated where possible.

I-c: Capacity assessment
The capacity of the existing infrastructure must be assessed and analysed in relation to future traffic flows.

If the forecasted, future traffic exceeds the capacity of the infrastructure, it may result in congestion and increase the risk of accidents.

In relation to the economic evaluation, the influence on traffic users must therefore be analysed through an evaluation of e.g. increases in travel time, in vehicle operating costs and in the risk of accidents.

I-d: Benefits of implementation
All *benefits of implementation* must be evaluated to ensure a full cost-benefit analysis. Investment costs are evaluated separately.

Examples of the benefits of two different modes are illustrated in the box below:

Identification of benefits of implementation

Road traffic

- savings in vehicle operating costs for road users
- time savings for road users
- savings in maintenance costs for the road administration
- prevented accidents (equipment and persons)

Railway traffic

- savings in operating costs through time savings for service personnel and savings in capital costs for railway stock[3]
- investments in less staff-intensive equipment may also lead to changes in operating costs
- time savings for passengers and freight
- savings in power consumption e.g. due to improved performance of traffic
- savings in maintenance costs
- prevented accidents (equipment and persons)

The benefits included in the box are **savings in operation and maintenance costs** which will be used in the socio-economic as well as a financial benefit evaluation. These benefits are therefore included in the present criterion (Criterion I) as well as in Criterion II, "Financial viability".

Estimating the monetary value of the benefits is usually performed in two steps:

1 Estimating the extent of the benefit e.g. hours of time savings or number of prevented accidents.

2 Estimating unit costs to valuate the benefit (see Annex 5.2).

[3] *See description in section 3.2.2 and in Annex 5.2.*

Evaluation of time savings

Time savings can be obtained through increased average travel speed once the condition of roads or railway tracks is improved. An increased capacity of the infrastructure is also likely to reduce the travel time.

The benefits of time savings for passengers should be measured in monetary terms whereas time savings for freight can be evaluated qualitatively (see Annex 5.2).

Time savings for rolling stock must be included in evaluation of operating costs.

Evaluation of vehicle operating costs (VOC)

For the pre-feasibility analysis, standardised costs are based on the RED model for evaluation of road conditions in the reference alternative and the investment alternative over the analysed time horizon (25 years).

Road Economic Decision Model (RED)
RED is based on HDM-4 outputs, but is modelled in Excel.

I-e: Safety assessment
The pre-feasibility study must include the safety aspects for travellers, as well as for equipment such as vehicles or railway tracks. Environmental safety should be evaluated under "environmental effects", only.

Evaluation of prevented accidents

From local authorities, accident statistics are obtained for the specific infrastructure section and, subsequently, the accident rate is compared to rates on comparable upgraded infrastructure sections.

If the proposed investments result in accident prevention, the safety aspect must be included in the cost-benefit assessment, which is based on estimated unit costs for different types of accidents.

I-f: Investment costs[4]
Investment costs are estimated on the basis of engineering investigations on the present condition of the infrastructure. E.g. for existing road sections, the

[4] *Changes in operation and maintenance costs are included in Criterion I-d Benefit of implementation.*

pavement and the geometry must, as a minimum, be assessed to propose the extent of the investment and the investment costs. The cost estimates must be directly comparable with cost estimates of other projects and shall, in so far as data is available, be based on local prices.

If no local prices are available for road and railway projects, the investment costs are estimated by using the unit costs estimated under the Phare programme: "Updating of Transport Infrastructure Costs in Acceding Countries", COWI, October 1999.

3.2.2 Criterion II: Financial viability

Analysis of the financial viability is performed as a cash-flow analysis comprising the following elements:

II-a: Financing and co-financing from local sources and IFIs
II-b: Sustainability based on analysis of operation and maintenance costs

Initially, each element is analysed separately (according to the description below) and afterwards the cash-flow analysis is performed.

II-a: Financing and co-financing from local sources and IFIs
Financing and co-financing from local authorities and IFI is analysed qualitatively in order to identify the status of the financing plan and the financial viability of the project. The possibilities of receiving grants and loans for the project are analysed.

II-b: Sustainability
The *sustainability* is evaluated based on *operation and maintenance costs* which give an indication of the capability of the implementing authority (e.g. local road administration) to finance the future operation and maintenance of the infrastructure.

The evaluation will take into consideration any fees or charges paid by the infrastructure users to the operator or owner, and the money allocated by the implementing authority to operation and maintenance.

Maintenance costs
The costs of maintenance are evaluated through the comparison of future maintenance costs in the reference alternative and the investment alternative.

Rehabilitation of existing facilities is often required due to lack of maintenance. In such situations, the reference alternative defines a situation where the infrastructure is maintained to ensure its future utilisation. It may, therefore, lead to extremely high future maintenance costs and, in the investment alternative, the maintenance costs may, therefore, be significantly reduced.

The maintenance costs are forecasted for the period stated within the time horizon of the pre-feasibility study, i.e. 25 years, and the residual value of capital is computed.

Evaluation of maintenance costs

Rehabilitation of existing infrastructure may raise the standard to a level where routine and periodic maintenance is less extensive and, therefore, result in reduced maintenance costs. On the other hand, the construction of new infrastructure may increase the present level of maintenance costs.

Operating costs

The operating costs are evaluated through a comparison of future operation costs in the Reference Alternative and the Investment Alternative.

The operating costs included in the analysis comprise the operation of privately owned vehicles and of railway rolling stock, ships or airplanes. Further changes in operating costs relating to equipment are also included in the analysis.

The evaluation takes into consideration any fees or charges paid by the infrastructure users to the infrastructure operator.

Evaluation of operating costs

Rehabilitation of e.g. railway tracks or technical failures at stations may improve the reliability and performance of train operation. This can be reflected in the reduced risk of unplanned stops, which means that the same number of train-km can be covered within a shorter space of time.

This results in time savings for service personnel and the rolling stock, including savings in capital costs for railway rolling stock, which may be an important socio-economic as well as financial benefit once the proposed investments result in extensive time savings for railway operation.

Improving traffic conditions may reduce unnecessary energy consumption through acceleration and deceleration and ensure a more optimal flow of traffic. For railway rolling stock, this can be estimated as the average cost of power supply and fuel per hour and per acceleration

Investments in less staff-intensive equipment may also lead to changes in operating costs.

Financing capability of the implementing authority
The capability of the implementing authority, to finance operation and maintenance costs, is assessed by requesting its budget and/or any documents enabling this assessment.

3.2.3 Criterion III: Environmental effects

The environmental effects are evaluated qualitatively. If any quantitative environmental effects are identified, they can be included in the socio-economic evaluation.

III-a: Noise
Noise indicates the consequences of the project measured in terms of noise.

Measured impact: number of properties that will experience significant increases and decreases in noise levels in the design year if the project is implemented.

Table 3.1 Measured impact of noise.

Positive impact:	More properties experiencing a decrease than an increase
Neutral impact:	No significant changes expected
Negative impact:	More properties experiencing an increase than a decrease

III-b: Air pollution (local and global)
Local focus on NO2 (nitrogen dioxide) and PM10 (fine particulate under 10 microns in size) - mainly for road transport.

Global focus on CO2 emitted by the traffic induced

Table 3.2 Measured impact of air pollution.

Positive impact:	More properties experiencing an improvement in air quality than a deterioration
Neutral impact:	No significant changes expected
Negative impact:	More properties experiencing a deterioration than an improvement

Criteria about landscape/townscape, water pollution are only included in the qualitative evaluation when significant influences are identified.

3.2.4 Criterion IV: Functionality and coherency of the network

IV-a: Type of relation

- Qualitative

IV-b: Relative importance of international demand of passenger traffic

- Qualitative and reference to amount of international traffic, if available

IV-c: Relative importance of international demand of freight traffic

- Qualitative and reference to amount of international traffic, if available

IV-d: Interconnection of existing networks

- Qualitative assessment including evaluation of the project in relation to the Pan-European network.

IV-e: EU standards of service of the existing infrastructure

- Qualitative assessment
- Assess if the existing infrastructure meets EU requirements or not

3.2.5 Criterion V: Readiness of the authority

3.2.6 V-I: Speed of implementation

- Qualitative assessment
- Describe and utilise existing analysis and data material
- If pre-feasibility studies have already been prepared for the proposed project, the analysis is reviewed, and if technically possible and justifiable, it is reused

Annex 5.1 Weighting of criteria

The weighting of the criteria has been defined the following way:

	Crit-weight	Sub-crit weight	Numeric scale used for each criterion				
I Economic appraisal	0.50		A. Very High	B. High	C. Medium	D. Low	
I-a Existing Traffic level		0.22	100	75	50	0	
Increase in existing traffic?			A. Large	B. Moderate	C. Slight	D. none or decrease	
I-b Forecasted change in existing traffic level		0.11	100	50	25	0	
Problem of capacity?			A. Very Large	B. Large	C. No problem/ not relevant		
I-c Capacity assessment		0.07	100	75	0		
Level of Benefit?			A. Very high	B. High	C. Medium	D. Low	E. Not significant
I-d Benefits of implementation		0.33	100	75	50	15	0
Safety improvement?			A. Yes	B. No			
I-e Safety assessment		0.10	100	0			
Investment cost?			A. Low	B. Average	C. Expensive	D. Very expensive	
I-f Investment costs		0.17	100	50	25	5	
II Finiancial viability	0.20		A. Good	B. Medium	C. Low and Risky		
II a Co-financing from local & IFI		0.5	100	50	0		
II b Sustainability		0.5	100	50	0		
III Environmental effects	0.05		A. Large beneficial	B. Moderate or slight beneficial	C. Neutral	D. Moderate or slight negative effect	
			100	75	50	0	
IV Functionality and coherency of the network	0.15		A. In the corridors	B. Not in the corridors			
IV-a Type of relation		0	100	0			
			A. Very high	B. High	C. Medium	D. Low	
IV-b Importance of international demand (Pass)		0.2	100	75	50	0	
IV-c Importance of international demand (Goods)		0.2	100	75	50	0	
Improvement of the network?			A. Large	B. Moderate	C. Not significant		
IV-d Interconnection of existing network		0.4	100	50	0		
			A. Inadequate	B. Adequate			
IV-e EU standards of service of existing infrastructure		0.2	100	0			
V Readiness of the Authority	0.10		A. Very Ready	B. Moderately ready	C. Not Ready		
			100	50	0		

VI Speed of implementation			A. Less than 1 year	B. Between 1-4 years	C. More than 4 years	

Annex 5.2 Economic and financial assessments

Methodology and assumptions

The economic and financial assessments are based on a comparison of a reference alternative and an investment alternative.

The following must be included in the two assessments:

	Economic assessment	Financial assessment
Investment costs	✓	✓
Changes in maintenance costs	✓	✓
Changes in operating costs		
Privately owned vehicles	✓	
Railway rolling stock, ships, airplanes and equipment	✓	✓
Value of time savings for passengers and freight	✓	
Value of prevented accidents		
Accidents involving humans and passenger cars	✓	
Accidents involving equipment owned by beneficiary	✓	✓
Net increase in revenue from increased traffic		✓
Grants		✓

To ensure consistent pre-feasibility assessments for all projects in the REBIS study, it has been chosen to base the analyses on the following assumptions:

Time horizon: The economic as well as the financial analyses are performed for a 25-year time horizon counting from the present year (2003).

Currency + exchange rates: All sources and rates must be presented in the study. Preferably, the same exchange rates should be used for all studies prepared in one country. A currency converter can be found on the internet at the address: http://www.xe.com/ucc/.

Increase in real prices: Based on the forecasted growth in GDP.

Sensitivity analysis: For the economic assessment, sensitivity analysis is performed for input criteria subject to particular uncertainty. This must include, as a minimum, the sensitivity of economic key results to changes in:

- Forecasted traffic. The impact on the key results is illustrated for an optimistic, a medium and a pessimistic forecast.

- Estimated unit costs. The impact on the key results is illustrated for changes in the most relevant estimated unit costs of -20% and 20%.

Presentation of economic and financial results: For the analyses performed in the economic appraisal (criterion I) and the financial viability (criterion II) the results must, as a minimum, be presented by use of

- Net Present Value (NPV)
- Economic Internal Rate of Return (EIRR)

A 7% discount is used for calculations in all countries. This is in line with what is typically used in the region. Coupled with the calculated IRR - indicating at which rate the net present value will be zero - and the sensitivity tests this provides a good indication of economic performance of the project.

Estimation of unit costs

All unit costs are expressed in real values and projected for the time horizon according to forecasted increase in GDP.

Operating costs

Privately owned vehicles

The operating costs for privately owned vehicles mainly relate to vehicle operating costs (VOC) for road traffic.

The estimates of vehicle operating costs are based on available local data from relevant authorities and on existing feasibility studies. All costs are projected to 2003 levels according to the local increase in economy.

Railway rolling stock, ships, airplanes and equipment

Changes in operating costs can be measured as reduced fuel or power consumption and reduced travel time.

Unit costs of fuel and power are based on local price level.

The value of reduced travel time is measured as the value of time savings for service personnel and the estimated value of savings in capital costs for rolling stock.

Capital costs for rolling stock

Capital costs for railway rolling stock can be expressed as the possible decrease in the cost of wagons rented from foreign operators, as railway operators often rent wagons from foreign operators in the case of international traffic, and the capital costs of the home country operator wagons.

Value of time for passengers and freight

Passengers

The value of time for travellers is based on a mix of two categories: value of working time and value of non-working time.

The values are estimated on the basis of available data from the country and from neighbouring countries.

The same time values are used for different projects in one country. However, there may be differences in the time value for a business traveller using train and using airplane.

Estimation of time value

The time value of business trips in the country can be estimated on the basis of average salaries which reflect the value of time for the employer.

The time value is expected to increase over time as the real income increases in the specific country. This increase is measured as forecasted real GDP growth per inhabitant.

Freight

The value of time for goods is considered low and is not included in the pre-feasibility analysis unless special circumstances speak for it. This could be e.g. upgrades of infrastructure which significantly reduce the travel time for high-value perishable freight.

Value of prevented accidents

Improvements of infrastructure are likely to reduce the risk of accidents. This should be reflected in the economic evaluation through a monetary evaluation.

Persons

Estimation of the average socio-economic costs of injured and dead persons are often subject to uncertainty, especially as the values are often based on different methods, even in neighbouring countries. A standardised approach is used, based on information from many countries.

Equipment

Estimation on the average costs of material damage to cars, railway wagons, ships etc. are based on statistics from relevant authorities, when available.