Infrastructure expenditures and costs

Practical guidelines to calculate total infrastructure costs for five modes of transport

Final report

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Summary

Background

Transport infrastructures in general, and the Trans European Transport Network (TEN-T) in particular, play an important role in achieving the medium and long-term objectives of the European Union. In view of this, the Commission has recently adopted a revision of the guidelines for the TEN-T. The main consequences of this revision are the need for a better understanding of the investments made by the member states in the TEN-T and the need for ensuring optimal consistency in the reporting by the Members States of such investments.

With Regulation number 1108/70 the Council of the European Communities introduced an accounting system for expenditure on infrastructure in respect of transport by rail, road and inland waterways. The purpose of this regulation is to introduce a standard and permanent accounting system for infrastructure expenditures. However maritime and aviation infrastructure were not included. Further, the need for an effective and easy to apply classification for infrastructure investments concerning all five transport modes was still pending.

Therefore, DG TREN has commissioned ECORYS Transport and CE Delft to study the expenditures and costs of infrastructure, to propose an adequate classification of expenditures, and to propose a method for translating data on expenditures into data on costs.

Objectives

The objectives of the present study are threefold:

- To set out a classification of ***infrastructure expenditures***, in order to increase knowledge of expenditures related to transport infrastructures. This classification should support a better understanding of fixed and variable infrastructure costs;
- To detail the various ***components*** of such expenditures for five modes of transportation, which would enable the monitoring of infrastructure expenditures and costs;
- To set up a methodology to move from annual series of ***expenditures to costs***, including fixed and variable elements.

As the aim of the project is to come up with a system that can be used by infrastructure managers in all 26 countries (i.e. EU25 + Switzerland), we have tried to keep the developed framework practical. The developed classification methodology is therefore as

close to the actual practice of these infrastructure managers as possible, in order to ensure the highest consistency between countries and the modes of transportation.

Approach

The study started with a *review of national practices* for eight selected countries[1], based on existing literature and a questionnaire that was sent to the national statistical offices of the eight Member states. This review aimed at getting an overview of the most *commonly used methods* applied by the countries for the *classification of infrastructure expenditures* and the methods used to estimate capital costs.

In the second part of the study the focus lies on the development of a *practical classification methodology* that can be applied by all countries and for all distinguished modes. Besides, the focus has been on the way to get from *infrastructure expenditures to infrastructure costs*, as many EU Member States administrations have an expenditure-based infrastructure management system. The present state of these expenditure-based infrastructure systems suits the budget-oriented approach that many governments have. It does not, however, constitute a basis for efficient cost allocation, neither does it constitute a basis to monitor infrastructure investments. For this purpose infrastructure managers were contacted and business accounts were analysed in more detail.

Methodology for calculating infrastructure costs

Definitions

Infrastructure expenditures can be classified according to the way they enhance the functionality[2] and/or lifetime of infrastructure (asset approach). According to this classification we define the following types of expenditures:

- Investment expenditures: expenditures on a) new infrastructure with a specified functionality and lifetime or b) expansion of existing infrastructure with respect to functionality and/or lifetime.
- Renewal expenditures: expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities.
- Maintenance expenditures: expenditures for maintaining the functionality of existing infrastructure within its original lifetime.
- Operational expenditures: expenditures not relating to enhancing or maintaining lifetime and/or functionality of infrastructure.3

Expenditures on infrastructure can also be classified according to the way they are influenced by the infrastructure usage viz. transport volume. According to this classification we define the following types of expenditures:[4]

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1 Austria, France, Germany, Sweden, Estonia, Netherlands, Spain, United Kingdom.
2 Functionality consists of capacity, productivity, comfort etc., determining the level of service of infrastructure.
3 These expenditures relate to for instance traffic management, train running diagrams, research and so on.

- Variable expenditures: expenditures that vary with transport volume while the functionality of the infrastructure remains unchanged.
- Fixed expenditures: expenditures that do not vary with transport volume while the functionality of infrastructure remains unchanged, or expenditures that enhance the functionality or lifetime of the infrastructure.

The distinction between fixed and variable expenditures is relevant because it enables an efficient allocation of infrastructure expenditures.[5]

A large share of the infrastructure expenditures is related to the creation, renewal and maintenance of infrastructure assets with an expected lifetime of more than 1 year. This means that the expenditures made in year X do not equal the infrastructure cost for year X, the yearly value for the use of the infrastructure assets.

Infrastructure costs, the periodic (yearly) value for the use of infrastructure assets, consist of

- Capital costs
  - Yearly depreciation costs concerning investments, renewals and maintenance of infrastructure assets;
  - Yearly interest expenditures
- Running costs
  - Yearly recurring (other) maintenance and operational expenditures.

Methodology for calculating total infrastructure costs

General ideas behind the developed methodology for the infrastructure cost registration are:

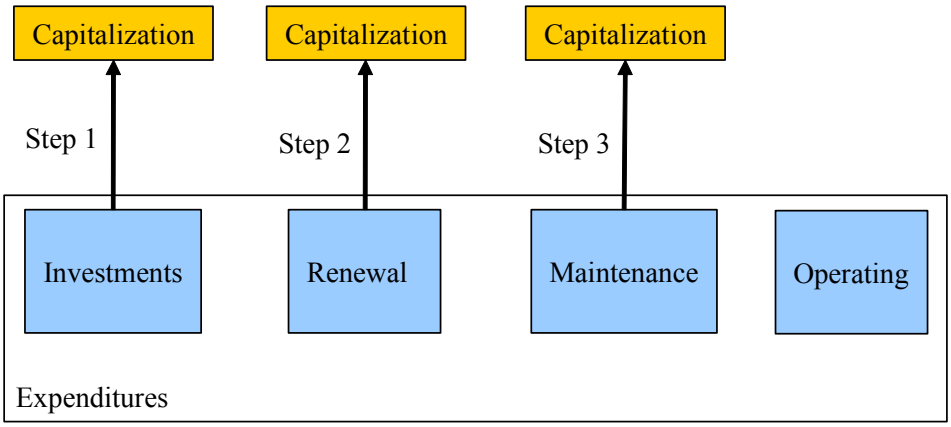
- The methodology must be practicable: it must be an 'easy to use' registration method;
- The methodology must stay as close to the current cost registration practice in the different countries as possible.

Starting point for the calculation of costs are the investment, renewal, maintenance and operational expenditures as registered by the infrastructure administrators in the different countries.

Figure 0.1 Practical methodology to arrive from infrastructure expenditures to costs

[4] CE, VU, 2004: *Onderhoud en beheer van infrastructuur voor goederenvervoer: deelstudie 1: definities en beprijzingsprincipes*, Delft: CE

[5] Link, Heike, et al., 2000: *The accounts approach*, UNITE deliverable 2



Step 1a: Investment expenditures in the current year
In order to determine the total investment costs, not the investment expenditures should be taken into account, but the capital costs of these investments. This means that all the expenditures that are made in connection with the investment should be capitalised, including costs like the acquisition of land, machinery and vehicles. In order to determine the capital costs of investments the following steps have to be taken:

1a.1 Estimate years of service life
Complete the breakdown of infrastructure components and determine how long each component of the infrastructure will last before it has to be replaced. This is the estimated number of years that an asset can be used for the purpose it was designed/constructed.

1a.2 Estimate capital costs
The annual capital costs can be calculated based on the asset value, asset service life and interest rate utilising an equal payment series (meaning a linear depreciation function) discount formula:

$$Annual\ capital\ costs = Asset\ value * \frac{InterestRate}{(1-(1+InterestRate))\text{^}-(ServicelifeofAsset)}$$

Since most countries use linear depreciation functions it is advised to use linear depreciation.

With regard to the interest rate it is advised to use an interest rate of 5%. Since there is no 'official' interest rate known in calculating capital costs, the same interest rate as used in Cost Benefit Analysis for EU-projects is advised.

The capital costs of transport infrastructure are to be calculated based on historic cost prices since the review of national practices seems to prove that most countries use the historic values approach. Also in the IAS/IFRS (International Accounting Standards / International Financial Reporting Standards) historic cost accounting is the preferred method (see annex 7 for further details).

Step 1b: Investment expenditures in the past years
Not only need the capital costs be calculated for new investments in the current year, also the capital costs of previous investments in the infrastructure have to be calculated, using

the PIM method. To calculate these, long investment expenditure time series (30-40 year) for each mode are necessary[6]. For each subsequent year the investments have to be divided according to their life expectancy. In a next step the capital costs can be calculated using the previously mentioned function.

It was found that countries often use the same average lifetime for all or most asset categories and that the variation of lifetimes across countries is large. A taskforce of Eurostat concluded that EU Member States that do not have country-specific evidence for lifetimes should use an estimate of 55 years for roads. A range of 50 to 60 years is acceptable so as to take into account temporal shifts in the composition of new gross fixed capital formation (GFCF).

It was recommended the average lifetime assumptions should be investigated at least every 5 to 10 years. This should include investigating changes in the composition of GFCF in public infrastructure to take account of shifts between 'new construction/reconstruction' and 'major maintenance and repair'.

Step 2 Renewal expenditures

Renewal expenditures are defined as expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities. This definition implies that renewal expenditures can be characterised as expenditures that lead to an extension of life time of assets. For example fixing cracks or potholes in a road surface is ordinary repair intended to keep the surface in good working condition. This does not extend the lifetime of the surface layer. Replacing the total length of road surfaces is renewal.

Where a component of the infrastructure asset is replaced or restored the expenditures should be capitalised, since the expected lifetime will be more than 1 year, using the formula:

$$\textit{Annual capital costs of renewal expenditures} = \textit{Renewal expenditures} * \frac{InterestRate}{(1-(1+InterestRate))\text{^}-(Servicelifeof\,\mathrm{Re}newalwork)}$$

Note: For renewal expenditures the same steps a) *expenditures in the current year* and b) *expenditures in the past years* should be applied as performed for investment expenditures.

Step 3 Operational and maintenance expenditures

Operational and maintenance expenditures comprise expenditures to keep the infrastructure in working order and do not lead to an extension of life time of parts of the infrastructure. These expenditures comprise items such as wages, maintenance of road surfaces, patching and running repairs, police, traffic management, etc. With regard to costs of the (water)police it must be mentioned that during the review of national

[6] The capital cost calculation of previous investments will only have to be done once. When the capital costs of previous investments are known and the expenditures registration in the following years takes place according to the new methodology, no/small additional efforts are needed.

practices it became clear that these costs are not known for almost all of the modes. It is therefore advised not to include the police costs in the operational expenditures.

Operational and maintenance expenditures that have a life time expectancy greater than 1 year should be capitalized, if the life time expectancy is 1 year or less the expenditures only have to be taken into account for the specific year in which the expenditure was made without any capitalisation. Capitalisation of operational and maintenance expenditures is to be done using the formula:

Annual capital costs of operational and maintenance expenditures with life time > 1 year =

$$Maintenance\ expenditures * \frac{InterestRate}{(1-(1+InterestRate))^{\wedge -(ServicelifeofMa\,\mathrm{int}\,enancework)}}$$

Note: For maintenance expenditures with life time > 1 year the same steps a) *expenditures in the current year* and b) *expenditures in the past years* should be applied as performed for investment expenditures.

The sum of all the (capitalised) investments, renewal, operational and maintenance expenditures give the total infrastructure costs for each year.

Methodological aspects per mode

Road

Definition of infrastructure
Based on the current information available the road infrastructure expenditures should be restricted to the main road network, i.e.:

- Motorways (including other road user facilities like parking lots, access roads to parking lots, etcetera) ;
- Main national roads (excluding other road user facilities).

Collection and processing of data
Data available at the national level can mostly be derived from expenditure programmes from the national road manager. Some complications do arise when more than one road manager manages the main road network. For example in countries like Spain and France many motorways are managed by separate (most private) organisations. Although these organisations should be able to provide data, it is unclear to what extent information can be obtained from them.

Infrastructure costs
The general categorization of expenditures as mentioned previously can be used for roads, i.e.

- Investment expenditures;
- Renewal expenditures;
- Maintenance expenditures;

- Operational expenditures.

Investment expenditures concern expenditures on new road construction and extension of capacity of existing road infrastructure. Operational expenditures concern for example staff expenses, overhead expenses, expenses for buildings.

With regard to maintenance and renewal expenditures, many European countries distinguish 'regular' and 'non-regular' costs. For example in The Netherlands the terms fixed and variable maintenance expenditures are applied, structural and operational maintenance in Austria, routine and periodic maintenance in Sweden and routine and special maintenance in Spain.

We propose to categorize 'non-regular' costs as renewal expenditures, prolonging the lifetime without adding new functionalities and 'regular costs' as maintenance expenditures, for maintaining the functionality of existing infrastructure within its original lifetime.

The average life time expectancy of road infrastructure differs between the distinguished countries. For the time being it is therefore advised to follow the conclusion of Eurostat regarding the life time expectancy for roads, i.e. 55 years. Depreciation is advised to be linear and the interest rate 5%.

Fixed and variable infrastructure costs

In none of the countries a division is made between fixed and variable costs[7]. For the moment a feasible and 'easy' application would be to classify all investment and operational expenditures as fixed infrastructure costs. Subsequently variable infrastructure costs include renewal and maintenance expenditures.

Table 0.1 Fixed and variable parts of total road infrastructure expenditures

Cost category	Fixed costs	Variable costs
Investment expenditures	100%	
Renewal expenditures		100%
Maintenance expenditures		100%
Operational expenditures	100%	

Although this method is very simple and maybe not fully right from a theoretical point-of-view (for example road maintenance that is independent from the traffic volume, may be included in the variable infrastructure costs), this method may be very useful and, above all, feasible.

Alternatively with substantial extra effort from infrastructure managers the following categorization could be used, which from a theoretic point of view is preferred.

[7] The use of fixed and variable expenditures in the Netherlands refers to variability in time more than to a response to variation in traffic.

Table 0.2 Suggested structure for road expenditure and cost categories

Category	Investment expenditure		Current expenditure			
	Investments	Renewal	Maintenance		Operating	Total
	Capital costs		Capital costs	Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable		%fixed / %variable	
Road surface	100% / 0%	a% / b%	c% / d%		e% / f%	
Superstructures / Drainage works	100% / 0%					
Bridges / Tunnels						
Lightning, Signposting, Signalling	100% / 0%					
Grass areas, Road edges	100% / 0%					
Road facilities	100% / 0%					
Winter clearance	100% / 0%					
Interest	100% / 0%					
Unallocated overhead						
Total	100% / 0%					

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Impact assessment

The proposed infrastructure definition of the new methodology will in general not lead to much additional work for the different countries since there is a lot of detailed information available. Only detailed information about fixed and variable expenditures is not available in all countries.

In the table below no assessment was made for Estonia, as information is missing for this country. However we think for this country and for the other former accession country more information on expenditures will be missing and thus requires substantial additional efforts to apply to the proposed framework.

Table 0.3 Impact assessment

	A	Ee	F	D	NL	E	S	UK
Infrastructure definition	0	?	0	0	0	0	0	0
Expenditure categories:								
• Investment and renewal	0	?	0	0	0	0	0	0
• Maintenance	0	?	0	0	0	0	0	0
• Operational	0	?	0	0	0	0	0	0
Distinction of expenditure categories in:								
• Life-time expectancy > 1 year/<= 1 year	+	?	+	+	+	+	+	+
• Fixed/ variable expenditures[a)]	++	?	++	++	++	++	++	++
Capital cost calculation of:								
• Previous investments (30-40 year)	+	?	+	+	+	+	+	+
• Current expenditures	0	?	0	0	0	0	0	0

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

a) The scores here refer to the preferred method of splitting into fixed and variable expenditures.

Rail

Definition infrastructure

Clearly there are many different types of railways, from dedicated freight lines to high speed passenger lines. We recommend to distinguish between the different types of lines and have expenditures reported separately. To be able to benchmark between different countries it is best to have separate information for these different types of lines. We recommended splitting at the least:

- Dedicated freight lines.
- High speed passenger lines.
- Mixed network.

Collection and processing of data

The preferred sources of information are the business accounts of infrastructure managers. Information is published yearly and with a high degree of consistency in time series. Moreover, certainly in the situation where there are only few infrastructure managers, information can be collected with relative ease. In addition to the data in the business accounts, some detailed non-published information needs to be obtained through infrastructure managers' staff. Since most information is available internally at the infrastructure manager, we do not expect this to require too much effort on the side of the infrastructure manager.

Infrastructure costs

The following categorisation should be applied:

- Investments: expenditures aimed at new infrastructure or improving the quality or functionality of existing infrastructure over and above its original functionality.
- Renewals: expenditures aimed at replacing existing infrastructure that has reached the end of its designated useful life. These prolong the life expectancy.
- Maintenance: expenditures aimed at infrastructure actually reaching its designed useful lifetime.

Depending on national accounting principles, maintenance and operational expenses together make up running expenses, or part of maintenance is capitalised (Estonia)

Infrastructure costs are available from the business accounts. They are the sum of depreciation and capital costs. All infrastructure managers can provide information on infrastructure costs. However, the different cost figures may not be comparable, due to differing accounting standards. Therefore, we advise to use IAS/IFRS to calculate costs in order to enhance the consistency of the reported costs. IAS/IFRS are the only international standards available, and a number of railway companies already use these standards.

Using IAS/IFRS would straighten out most inconsistencies between reported infrastructure costs. However, on a number of crucial factors in the calculation of infrastructure costs, IAS/IFRS allows several methods. These factors are:

- Depreciation base: historical prices or replacement value;
- Depreciation method: linear or other;
- Lifetimes of asset categories.

When infrastructure managers use different factors, the comparability of the cost figures may become low. We therefore advise to use historical prices as the basis for depreciation. Historical prices can be determined unequivocally and require less effort to determine than replacement values[8].
We advise to prescribe linear depreciation methods. Using a non-linear depreciation method changes the distribution of depreciation over time. In the presence of inflation, the use of different depreciation methods would yield different real (inflation-adjusted) cost figures. This decreases their comparability.
Considering the life-time of assets, we advise not to issue standard lifetimes. There are good reasons why lifetimes vary (variance in quality, environmental and climatological circumstances, infrastructure use, et cetera). Therefore, uniform lifetimes would lead to a distorted view on infrastructure costs. We therefore propose to adhere to the lifetime of assets as reported in the business accounts.

Fixed and variable infrastructure costs
We suggest a matrix structure as in the table below. On the horizontal axis, expenditures are categorised between investments, renewal, maintenance and operational expenses. On the vertical axis a second cost categorisation is applied, related to the different parts of infrastructure.

Table 0.4 Suggested structure for rail expenditure and cost categories

	Investment expenditure		Current expenditure		
	Investments	Renewal	Maintenance	Operational	Total
	Capital costs		Capital costs / Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable
Buildings / Railway stations	100% / 0%	a% / b%	c% / d%	e% / f%	
Civil engineering works	100% / 0%				
Superstructure	100% / 0%				
New construction in progress [a)]	100% / 0%				

[8] Furthermore, from a theoretical point of view, it is wrong to calculate costs by using both replacement values and nominal interest payments. Interest is considered to be a reward for lending capital and a compensation for inflation. Replacement values are adjusted for inflation. So, when calculating costs, replacement values should be used in combination with real interest rates. Interest payments that are available from the profit and loss account should be adjusted for inflation. All these adjustments use arbitrary methods and parameters. Therefore, it is better to use historical cost prices and nominal interest rates.

	Investment expenditure		Current expenditure		
	Investments	Renewal	Maintenance	Operational	Total
	Capital costs		Capital costs / Running costs	Running costs	
Transmission lines	100% / 0%				
Signalling equipment	100% / 0%				
Telecommunications equipment	100% / 0%				
Safety installations	100% / 0%				
Vehicles / rolling stock	100% / 0%				
Plant and machinery	100% / 0%				
Other fixed assets	100% / 0%				
Interest	100% / 0%				
Management of traffic, control and safety systems					
Train running diagrams					
Unallocated overhead					
Total	100% / 0%				

a) In accordance with IFRS, new construction in progress in investment properties is reported in business accounts under the category 'new construction in progress' at the cost incurred until the new investment has been completed. At that moment it is reclassified as investment property under one of the other categories.
Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

We expect most infrastructure managers to be able to provide detailed expenditure figures for most of the cells in this matrix, since detailed information for a large number of expenditure categories is available internally. For infrastructure managers that do not yet distinguish between fixed and variable expenditures, the proposed matrix structure provides a framework for making progress on this subject.

Impact assessment

By using business accounts as the primary source for infrastructure costs, our advice minimises the burden on companies or reporting authorities. However, in order to arrive at a consistent and comparable set of infrastructure costs, we need to advise the use of IAS/IFRS, this may have a considerable impact on the companies that do not currently use IAS/IFRS or have not prepared their bookkeeping systems for IAS/IFRS.

However, from the interviews with infrastructure managers it is clear that internally these categories are clearly distinguished. The consistency in definitions of these cost categories (e.g. investments, renewal, maintenance and operational) is large. Investments are related to enhancement or improvement of current infrastructure or to totally new pieces of infrastructure. Renewals replace existing infrastructure and do not add new functionalities, but prolong the life expectancy. Maintenance is intended to actually reach

the life expectancy infrastructure was designed for. Operational expenditures relate to traffic management, train running diagrams, research and such.[9]

Although the applied terminology differs between business accounts, we feel confident that most infrastructure managers would in principle be able to adhere to the categorization without too many problems[10]. The categorization available internally at infrastructure managers is much more detailed than the categorization presented in the business accounts.

Table 0.5 Summary of impact assessment railways

	Impact							
	A	**D**	**EE**	**ES**	**F**	**NL**	**SE**	**UK**
Infrastructure categorization (Road surface, superstructure etc)	0	0	0	0	0	0	0	0
Cost categories:								
• Investment	0	0	0	0	0	0	0	0
• Renewal	0	0	0	0	0	0	0	0
• Maintenance	0	0	0	0	0	0	0	0
• Operational	0	0	0	0	0	0	0	0
Expenditures categories :								
• Investment expenditures	0	0	0	0	0	0	0	0
• Running expenditures	0	0	0	0	0	0	0	0
• Fixed expenditures	++	++	++	++	++	0	++	0
• Variable expenditures	++	++	++	++	++	0	++	0
Capital cost drivers:								
• Apply IAS/IFRS	++	+	0	++	++	+	++	0
• Life time expectancy	0	0	0	0	0	0	0	0
• Depreciation	0	0	0	0	0	0	0	+
• Interest rate	0	0	0	0	0	0	0	0

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

Inland waterways

Definition of infrastructure

For the new registration methodology it is recommended to define inland waterways as inland waterways **excluding** inland ports. Based on the requirements of the EC infrastructure regulation 1108 a common classification of inland waterways is based on the accessibility by vessels with a dead weight metric tonnage:

- From 250 up to but excluding 400 t (CEMT I)
- From 400 up to but excluding 650 t (CEMT II)

[9] Note that in some cases, expenditures on low-value assets (e.g. up to € 400 in Austria and 10.000 EEK in Estonia) are expensed as incurred in the reporting period, irrespective of their normal useful life.

[10] Note that this does not hold for the distinction between fixed and variable expenditures, on which not all infrastructure managers already have detailed insight.

- From 650 up to but excluding 1.000 t (CEMT III)
- From 1.000 up to but excluding 1.500 t (CEMT IV)
- From 1.500 up to but excluding 3.000 t (CEMT Va)
- Equal to or exceeding 3.000 t (CEMT Vb, VI and VII)

This classification has been determined by the Conference Europeenne des Ministres de Transport (CEMT) and all inland waterways in Europe have been classified according to the CEMT criteria.

Collection and processing of data
The relevant data should not be collected from national statistical bureaus but from regional waterway authorities. In France this means the VNF, in Germany the Wasser- und Schifffahrtsdirektionen (7) and in The Netherlands the Provinces (12).

Infrastructure cost
Enough detailed infrastructure expenditures are available for the inland waterways. In order to determine the infrastructure costs it is however not necessary to collect data on such a detailed scale. Regarding the classification of expenditures for inland waterways it is advised to use the general expenditure categories.

The investment expenditures all have a life-time expectancy greater than 1 year and therefore have to be capitalized to order to calculate investment costs. With regard to the average life expectancy of inland waterways (when calculating the capital costs) we have seen that different numbers are currently used in the relevant countries[11]. Overall most EU-countries apply a life time in between 40 and 80 years for waterway infrastructure, which arrives at an average lifetime of 60 years. For the time being it is advised to follow this average lifetime, if more specific information on a certain asset is available in a country and there are good reasons to diverge from the average lifetime of 60 years for this particular asset, these specific figures could be applied. Depreciation is advised to be linear and the interest rate 5%.

Renewal expenditures comprise expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities. Here one can think for example of the replacement expenditures for a lock. These expenditures are also expected to have a lifetime expectancy greater than 1 year. In practice the difference between renewal and investment expenditures can be difficult.

With regard to maintenance expenditures a distinction must be made between maintenance expenditures with a life time over one year (and that have to be capitalized) and expenditures with a life time less than one year: these costs should be recorded in the period incurred (for example yearly dredging costs). If the maintenance work is done by 'external' people the salaries of these people have to be included in the maintenance expenditures.

[11] With the Netherlands and Finland applying relatively short lifetimes for waterways and ports (35 years) and Germany, Ireland and Italy applying relatively long lifetimes for waterways and ports (80 years). These are average figures, lifetimes may differ a lot depending on the type of investment (e.g. some types of earthworks or drainage have an lifetime expectancy of more than 100 years).

The operational expenditures are characterised as expenditures not related to enhancing or maintaining lifetime and/or functionality of the infrastructure. Expenditure categories like 'subsidies' are not to be taken into account, nor taxes paid, reservations made or write-off costs.

There is no common breakdown of expenditures within most countries, let alone across countries. Based on the information available at waterway authorities with some efforts the following categorisation could be used and is therefore recommended.

Table 0.6 Suggested structure for inland waterway expenditure and cost categories

Category	Investment expenditure		Current expenditure		
	Investments	Renewal	Maintenance	Operating	Total
	Capital costs		Capital costs / Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable	
Locks	100% / 0%	a% / b%	c% / d%	e% / f%	
Bridges	100% / 0%				
Canal Banks	100% / 0%				
Radar, traffic guidance	100% / 0%				
Beacons, buoys	100% / 0%				
Service vessels (e.g. patrol service vessels)	100% / 0%				
Dredging	100% / 0%				
Housing (e.g. at locks)	100% / 0%				
Interest					
Unallocated overhead					
Total	100% / 0%				

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Fixed and variable infrastructure costs

In none of the countries a division is made between fixed and variable infrastructure costs.

Based on the cost-allocation approach in a recent study by ECORYS and METTLE, the following figures regarding the splitting into a fixed and variable part of the total infrastructure expenditures on inland waterways, are derived from three Dutch case studies.

Table 0.7 Fixed and variable part of infrastructure expenditures on inland waterways

Cost category	Fixed	Variable
Investment and renewal expenditures	100%	-
Maintenance expenditures	70-85%	15-30%
Operational expenditures	70-85%	15-30%

Source: 'Charging and pricing in the area of inland waterways – practical guideline for realistic transport pricing', ECORYS, METTLE, 2005

Impact assessment

The proposed infrastructure definition of the new methodology will result in additional work for the VNF in France since they will have to split the costs between inland waterways and inland ports. For the infrastructure managers in Germany and The Netherlands no impacts result from the infrastructure definition used in the new methodology.

The distinguished expenditure categories in the new methodology are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current expenditure categories into the distinguished categories of the proposed methodology.

The distinction of the proposed three expenditure categories into expenditures made for assets with a lifetime expectancy greater than one year or equal/less than one year will result in additional work since this distinction is not made now. These efforts are however not expected to be substantial. With regard to the distinction between fixed and variable expenditures it is advised to use the percentages that were established in a previous study (see previous table). The resulting additional efforts for infrastructure managers are expected to be small.

Table 0.8 Impact assessment on the efforts countries/infrastructure managers will have to make as a result of the proposed methodology for the registration of expenditures on inland waterway infrastructure

Impact of	F	D	NL
Infrastructure definition	+/++	0	0
Expenditure categories:			
• Investment and renewal	0/+	0/+	0/+
• Maintenance	0/+	0/+	0/+
• Operational	0/+	0/+	0/+
Distinction of the expenditure categories in:			
• Life-time expectancy > 1 year/<= 1 year	+	+	+
• Fixed/ variable expenditures	0/+	0/+	0/+
Capital cost calculation of:			
• Previous investments (30-40 year)	++	++	++
• Current expenditures	+	+	+

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

The capital cost calculation of previous investments is expected to result in substantial additional efforts to be made by the infrastructure managers. Long time investment series will have to be constructed and this will be a time consuming effort. In a next step the capital costs of these investments will have to be calculated which is also time consuming. One remark has to be made however: the capital cost calculation of previous investments will only have to be done once. When the capital costs of previous

investments are known and the expenditures registration in the following years takes place according to the new methodology, no/small additional efforts are needed.

The calculation of capital costs of current expenditures will also result in additional efforts since this is not done at the moment by the infrastructure managers. These efforts are not expected to be substantial.

Air

Definition of infrastructure
Only flight related infrastructure should be included in the analysis: infrastructure serving aviation including ground handling and air traffic control. This means that airport operators must make a split in their expenditures regarding flight and non-flight related activities. As discussed in section 3, we can assume that in the near future the majority of infrastructure managers will be able to make such distinction.

Collection and processing of data
The preferred sources of information are the individual business accounts of airport operators as these accounts provide much detailed information and are published on an annual basis. In our view these accounts provide the best available information to establish overviews of air transport infrastructure expenditures and costs in EU-countries.

Currently the published accounts do not present all relevant details or segments for the purpose of this study. Non-published cost accounting matters must be collected from financial staff of individual operators, which is not always an easy task for reasons of business strategy (non public information) and/or staff availability.

In most business accounts, air traffic control expenditures are not included. This activity is often being performed by separate (public) air traffic control organisations. In order to include these expenditures relevant data should additionally be collected from these organisations.

Infrastructure cost
As the accounting system of all (major) airport operators will shortly comply with IAS/IFRS standards, any recommendation from our side regarding cost categories and the calculation of costs should in principle not conflict with IAS/IFRS.

We suggest a matrix structure as in the following table. Included here are the main categories of assets with different lifetime expectancies.[12] In practice it may be necessary to define more subcategories, corresponding with specific lifetime expectancies.

[12] We refrain from prescribing specific lifetime expectancies for specific assets as these are also influenced by the drivers for difference in infrastructure expenditures (please refer to table 2.1 in section 2.2).

Table 0.9 Suggested structure for flight-related air transport expenditure and cost categories

Category		Investment expenditure		Current expenditure			
		Investments	Renewal	Maintenance		Operational	Total
		Capital costs		Capital costs	Running costs	Running costs	
		%fixed / %variable	%fixed / %variable	%fixed / %variable		%fixed / %variable	%fixed / %variable
Land		100% / 0%	a% / b%	c% / d%		e% / f%	
Terminal building and pier		100% / 0%					
Other buildings, plants		100% / 0%					
Airfield	Runway surface	100% / 0%					
	Runway bases	100% / 0%					
	Taxiways and aprons	100% / 0%					
New construction in progress[a)]		100% / 0%					
Roads		100% / 0%					
Installations, equipment		100% / 0%					
Other fixed assets		100% / 0%					
Airport police		100% / 0%					
Interest		100% / 0%					
Management of traffic control and safety systems							
Unallocated overhead							
Total expenditures		100% / 0%					

a) In accordance with IFRS, new construction in progress in investment properties is reported in business accounts under the category 'new construction in progress' at the cost incurred until the new investment has been completed. At that moment it is reclassified as investment property under one of the other categories.
Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Capitalised expenditures into investments, renewal and (partly) maintenance form capital costs. Running costs consists of the operational expenditures and the part of maintenance expenditures that are not capitalised.

Fixed and variable costs

In principle the suggested format for registration of expenditures and costs in the previous table can be extended towards differentiation between fixed and variable components. For each cell this split should then be filled in. As mentioned previously however, currently no split between fixed and variable expenditures or costs exist in the business accounts. Also under IAS/IFRS standards such a split is not intended. In this respect it can be expected that airport infrastructure managers will not change their accounting system voluntarily (having complied to IAS/IFRS already), but only if a legal obligation would require such change. Please refer also to the impact assessment in the next section.

Impact assessment
The proposed infrastructure definition will not result in additional work for airport operators as most of them have already shifted or are expected to shift towards differentiating between flight-related and non flight-related infrastructure (and related activities).

The suggested asset based expenditure categories (investments, renewals, maintenance and operations) are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current different expenditure categories into the three distinguished categories of the proposed methodology.

A split of expenditures in fixed and variable components however will result in major efforts for airport operators as this is no common practice nor prescribed under IAS/IFRS rules.

Concerning the calculation of capital costs, in addition to the general IAS/IFRS-rule concerning the classification of assets with different life time expectancies, some effort may be required for establishing the required (comparable) classifications. Furthermore the required split between yearly and non-yearly maintenance expenditures in order to capitalize part of these expenditures will take some effort. Finally a split between fixed and variable costs will be difficult for the same reasons as the split between fixed and variable expenditures.

Table 0.10 Impact assessment for airport operators / infrastructure managers of the proposed methodology (base case = IAS/IFRS)

Impact of	IFRS-based accounting
Infrastructure definition	0
Expenditure categories (A):	
• Investment and renewal	0/+
• Maintenance	0/+
• Operational	0/+
Expenditure categories (B):	
• Fixed/ variable expenditures	++
Capital cost calculation:	
• Differentiation of asset life time expectancy	0/+
• Capitalization of maintenance > 1 year life-time expectancy	+
• Fixed/variable costs	++

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

Maritime

Definition of infrastructure
It is recommended to limit the analysis to seaports. Furthermore, because of consistency it is recommended not to include costs for harbour master and superstructure.

Collection and processing of data

Maritime infrastructure is not covered by regulation 1108/70 and data availability at European and national level is therefore very limited. Information regarding expenditures will predominantly have to be based on business accounts of individual or groups of ports.

Infrastructure cost

In order to monitor infrastructure costs and expenditures on maritime transport the same classification in four categories should be made as for the modes above: investments, renewals, maintenance and operational expenditures.

Expenditure categories that should be included are:

- Quays & berthing
- Maritime access
- Land & land access
- Other civil engineering works
- Equipment (floating craft, etc.)
- Other investment

Table 0.11 Suggested structure for seaport expenditure and cost categories

Category	Investment expenditure		Current expenditure		
	Investments	Renewal	Maintenance	Operational	Total
	Capital costs		Capital costs / Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable	
Quays & berthing	100% / 0%	a% / b%	c% / d%	e% / f%	
Maritime access (fairway, dredging, signals)	100% / 0%				
Land	100% / 0%				
Superstructure (cranes, terminals, etc.)	100% / 0%				
Land access	100% / 0%				
Other civil engineering works (piping, etc)	100% / 0%				
Equipment (e.g. ice breakers, service vessels, etc.)	100% / 0%				
Interest	100% / 0%				
Unallocated overhead					
Total	100% / 0%				

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Although the precise categorisation in the business accounts differs somewhat between countries, no major problems are expected if managers were required to report in standardised categories. The reason is that much more refined categorisations are often available internally at port authorities (infrastructure managers).

Fixed and variable infrastructure costs
There is no information available with respect to the distinction between fixed and variable expenditures. We suggest using case studies for a first rough distinction, but ideally infrastructure managers will start studying fixed and variable expenditures.

Business accounts of port authorities are readily available sources of information that can supply many of the data needed to make cross-country comparisons of seaport infrastructure expenditures and costs.

Impact assessment
The proposed infrastructure definition will not result in additional work for port authorities, as most of them are not responsible for maritime infrastructure at sea.

The suggested asset based expenditure categories (investments, renewals, maintenance and operations) are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current different expenditure categories into the three distinguished categories of the proposed methodology.

A split of expenditures in fixed and variable components however will result in major efforts for port authorities as this is no common practice nor prescribed under IAS/IFRS rules.

Concerning the calculation of capital costs some effort may be required for establishing the required (comparable) classifications of assets with different lifetime expectancies. Furthermore the required split between yearly and non-yearly maintenance expenditures in order to capitalize part of these expenditures will take some effort. Finally a split between fixed and variable costs will be difficult for the same reasons as the split between fixed and variable expenditures.

Table 0.12 Impact assessment on the efforts countries/infrastructure managers will have to make as a result of the proposed methodology for the registration of expenditures on maritime infrastructure

Impact of	EE	F	D	NL	E	S	UK
Infrastructure definition	0/+	0	0	0	0	0	0
Expenditure categories (A):							
• Investment and renewal	+	0	0/+	0/+	0	0/+	0/+
• Maintenance	+	0	0/+	0/+	0	0/+	0/+
• Operational	+	0	0/+	0/+	0	0/+	0/+
Expenditure categories (B):							
• Fixed/ variable expenditures	++	++	++	++	++	++	++
Capital cost calculation:							
• Differentiation life time expectancy	+	0/+	0/+	0/+	0/+	0/+	0/+

• Capitalization of maintenance	++	+	+	+	+	+	+
• Fixed/variable costs	++	++	++	++	++	++	++

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

1 Introduction

1.1 Background

Transport infrastructures in general, and the Trans European Transport Network (TEN-T) in particular, play an important role in achieving the medium and long-term objectives of the European Union:

- they facilitate the establishment of the internal market by ensuring free and uninterrupted movement of passengers and goods;
- they stimulate cohesion between countries and regions;
- they play a key role in achievement of the Lisbon agenda, i.e. the EU becoming the most dynamic and competitive economy of the world.

In view of this, the Commission has recently adopted a revision of the guidelines for the TEN-T. The main consequences of this revision are the need for a better understanding of the investments made by the member states in the TEN-T and the need for ensuring optimal consistency in the reporting by the Members States of such investments.

1.2 The past: the 1970 regulation

With Regulation number 1108/70 the Council of the European Communities introduced an accounting system for expenditure on infrastructure in respect of transport by rail, road and inland waterways. The purpose of this regulation is to introduce a standard and permanent accounting system for infrastructure expenditures, as from 1 January 1971 onwards. Article 2 of regulation 1108 mentions that *'irrespective of the accounting rules applied in the Member States, expenditure to be recorded for any one year shall be expenditure incurred during that year on the construction, running and administration of infrastructure'*.

Regulation 1108 thus requires a division in expenditures for construction, running and administration of the infrastructure. Amortisation of and interest on loans contracted for the purpose of financing infrastructure expenditures shall not be included.

More in detail the breakdown for rail should be:

1 Investment expenditure (expenditure on new construction, extension, reconstruction and renewals)
2 Current expenditure (expenditure on maintenance and operation).

For roads:

1 Investment expenditure (expenditure on new construction, extension, reconstruction and renewals)
2 Current expenditure (expenditure on maintenance and operation) split into
   a Maintenance of the carriageway surface
   b Other current expenditure
3 Traffic police
4 General expenses

For waterways:

1 Investment expenditure (expenditure on new construction, extension, reconstruction and renewals)
2 Current expenditure (expenditure on maintenance and operation) split into
3 Traffic police
4 General expenses

Annex II of the regulation presents a country specific breakdown into infrastructure categories for rail, road and inland waterways.

1.3 Objectives

The objectives of the present study are threefold:

- To set out a classification of ***infrastructure expenditures***, in order to increase knowledge of expenditures related to transport infrastructures. This classification should support a better understanding of fixed and variable infrastructure costs;
- To detail the various ***components*** of such expenditures for five modes of transportation, which would enable the monitoring of infrastructure expenditures and costs;
- To set up a methodology to move from annual series of ***expenditures to costs***, including fixed and variable elements.

The key outcome of the project is the achievement of a common framework for assessing the capital and running costs related to the TEN-T networks, for road, rail, inland waterways, maritime transport and aviation, based on annual infrastructure expenditures in the EU25 and Switzerland. The framework is developed in a way that:

- Various transport modes are covered;
- All infrastructure expenditure categories are covered;
- Current national practices of classification systems and methodologies presently being used by national governments in relation to the Systems of National Accounts (SNA) are being met.

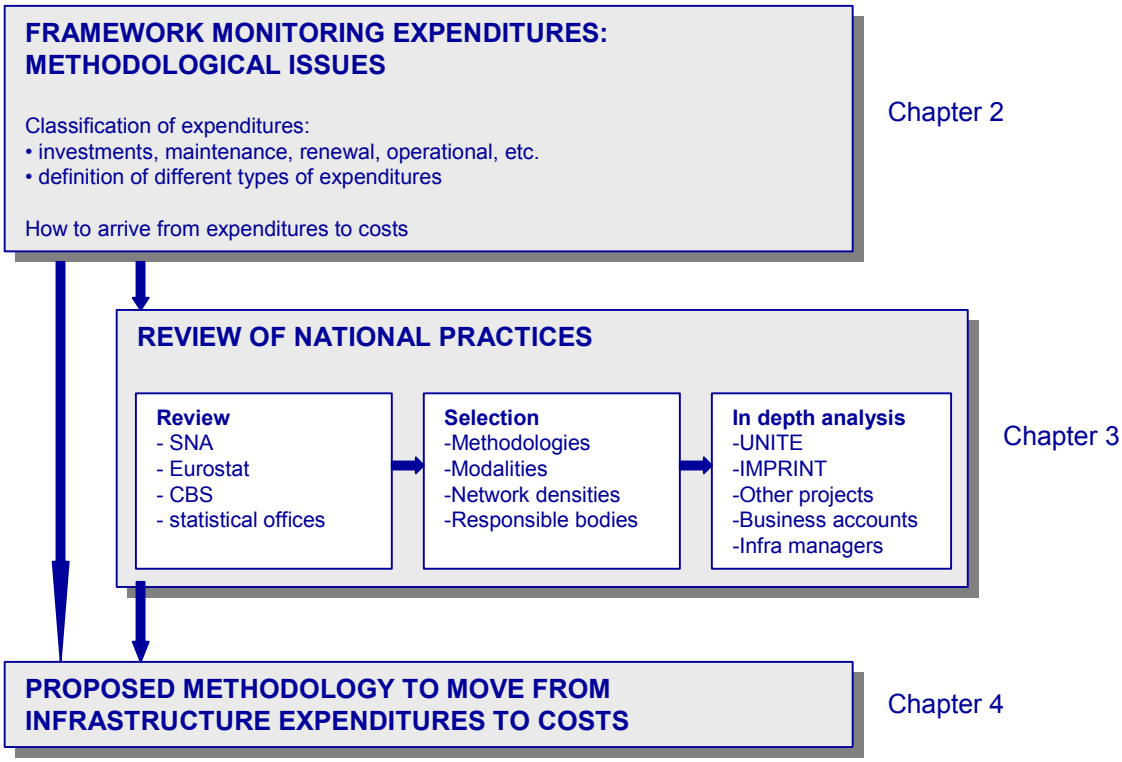
As the aim of the project is to come up with a system that can be used by infrastructure managers in all 26 countries (i.e. EU25 + Switzerland), we have tried to keep the developed framework practical. The developed classification methodology is therefore as

close to the actual practice of these infrastructure managers as possible, in order to ensure the highest consistency between countries and the modes of transportation.

1.4 Approach and structure of the report

The following figure presents the applied research approach for this study:

Figure 1.1 Overall approach of the study



The study starts in chapter 2 with a description of relevant **methodological issues** concerning infrastructure expenditures and costs. This chapter provides a methodological basis for the following sections.
A **review of national practices** regarding the registration of infrastructure expenditures is done for eight selected countries in chapter 3. This review aims at getting an overview of the most **commonly used methods** applied by the countries for the **classification of infrastructure expenditures** and the methods used to estimate capital costs.

In the fourth chapter of the study the focus lies on the development of a **practical classification methodology** that can be applied by all countries and for all distinguished modes. Besides, the focus has been on the way to get from **infrastructure expenditures to infrastructure costs,** as many EU Member States administrations have an expenditure-based infrastructure management system. The present state of these expenditure-based infrastructure systems suits the budget-oriented approach that many governments have. It does not, however, constitute a basis for efficient cost allocation, neither does it constitute a basis to monitor and compare infrastructure costs in the different EU-countries.

2 Methodological issues

2.1 Introduction

In this section we present definitions and classifications of infrastructure expenditures and infrastructure costs, providing a methodological basis for sections 3 and 4.

2.2 Infrastructure expenditures

Infrastructure expenditures consist of the amount of money that actually has been spent by infrastructure managers.

For the purpose of this study two types of expenditures classification are being distinguished:

- Asset related: expenditures on investment, renewal, maintenance and operations of infrastructure.
- Usage related: fixed and variable expenditures on infrastructure.

2.2.1 Investments, renewals, maintenance and operational infrastructure expenditures

Definition
Infrastructure expenditures can be classified according to the way they enhance the functionality[13] and/or lifetime of infrastructure (asset approach).

In economics an investment is the accumulation of some kind of asset which is expected to have a future return. In the area of transportation infrastructure, the asset is a piece of infrastructure with a certain functionality and lifetime and the return is an infrastructure service, such as the possibility to travel between two places by a specific mode at a specific level of comfort.

According to this classification we define the following types of expenditures:

- Investment expenditures: expenditures on a) new infrastructure with a specified functionality and lifetime or b) expansion of existing infrastructure with respect to functionality and/or lifetime.
- Renewal expenditures: expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities.

[13] Functionality consists of capacity, productivity, comfort etc., determining the level of service of infrastructure.

- Maintenance expenditures: expenditures for maintaining the functionality of existing infrastructure within its original lifetime
- Operational expenditures: expenditures not relating to enhancing or maintaining lifetime and/or functionality of infrastructure.[14]

Drivers for infrastructure expenditures

Expenditures for infrastructure with the same functionality can be different amongst countries viz. infrastructure managers. Drivers for such differences are mainly the following:

Table 2.1 Main drivers for differences in infrastructure expenditures

Expenditure drivers
• Construction standards (legal obligations for safety, degree of technical progress applied to infrastructure construction, special standards for mountainous areas or ecological sensitive areas) • Type of infrastructure: construction and maintenance (motorways/other, high-speed train lines/other, tunnels/bridges, underground system/above ground system, canals) • Levels of wages and prices per country • Expected traffic mix and occupancy • Weather and climate • Population density (land costs)

Source: UNITE D2: The Accounts Approach

Differences exist with regard to social and natural factors that influence the level and composition of the capital stock in transport infrastructure. Factors such as population density, climate, hydrology or topography have for example an impact on the length of the road or waterways network per capita, on the need for many bridges or tunnels (and the costs per kilometre of road, rail etc.) or on the need for protection structures against floods or avalanches.[15]

Method for classification

In practice infrastructure expenditures can consist of combined investment, renewal and / or maintenance activities: infrastructure managers plan these activities to be executed in an efficient way to improve functionality as well as to extend lifetime[16], to minimise total expenditures and / or inconvenience for infrastructure users.

If necessary, in order to disentangle expenditures, two approaches are possible:

- Assess for each project (or expenditure category) whether it is an investment, renewal or maintenance expenditure.

14 These expenditures relate to for instance traffic management, train running diagrams, research and so on.

15 Source: 'Conclusions and recommendations of the GNI Committee's Task Force on the consumption of fixed capital on roads, bridges, etc', Eurostat, November 2003.

16 For instance a renewed road surface may also reduce noise and enhance drainage; new rail crossties may permit trains to run faster, et cetera. At times it may even be impossible to perform maintenance without affecting the quality of infrastructure, as some products or materials used in the original infrastructure may no longer be available.

- Assess which percentage of a project (or expenditure category) should be considered an investment, a renewal and maintenance.

Basically both approaches will have to make use of expert judgements to be able to make the required distinction.

2.2.2 Fixed and variable infrastructure expenditures

Definition
Expenditures on infrastructure can also be classified according to the way they are influenced by the infrastructure usage viz. transport volume. According to this classification we define the following types of expenditures:[17]

- Variable expenditures: expenditures that vary with transport volume while the functionality of the infrastructure remains unchanged.
- Fixed expenditures: expenditures that do not vary with transport volume while the functionality of infrastructure remains unchanged, or expenditures that enhance the functionality or lifetime of the infrastructure.

The distinction between fixed and variable expenditures is relevant because it enables an efficient allocation of infrastructure expenditures.[18]

Method for classification
Two formal methods exist to distinguish fixed and variable expenditures:

- The **econometric approach** - where the total expenditure is considered to be the dependent variable (which is to be 'explained') and transport outputs (e.g. train-kilometres) are among the independent[19] variables. Based on cross sectional and / or time series data an econometric analysis can be used to determine and estimate a total expenditure function from which variable expenditures may be derived.
- The **engineering approach** - where total expenditures are disaggregated into sub-categories, and for each of these categories, separate analysis provides the share of variable expenditures within each category.

Characteristic for the econometric approach is that the starting point is total expenditures and it subsequently determines to what extent variables can 'explain' the variation in these expenditures for different line segments or time periods. The analysis results in parameter values that indicate the way in which the chosen variables influence total expenditures. On the other hand, the engineering approach starts from a theoretical model with different hypotheses/assumptions and then tries to estimate the parameters accompanying the hypotheses.

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17 CE, VU, 2004: *Onderhoud en beheer van infrastructuur voor goederenvervoer: deelstudie 1: definities en beprijzingsprincipes*, Delft: CE

18 Link, Heike, et al., 2000: *The accounts approach*, UNITE deliverable 2

19 In the econometric model, variations in the dependent variable are explained by variations in independent variables. 'Independent' refers to the fact that these variables are not influenced by the so-called dependent variable.

The engineering approach typically analyses single infrastructure sections or lines, starting bottom up and subsequently generalises the results. In contrast, the econometric approach starts top down from the total expenditures, or total expenditure components, and seeks for a functional form explaining the variation in total expenditures for different line segments of time periods. From the parameters in this expenditure function, approximations of variable expenditures can be derived.

Within both approaches expenditure functions can be derived by using either cross-section analysis or regression analysis based on time series.

From a theoretical point of view, both the econometric and the engineering approach are valid methods to estimate fixed and variable expenditures. However, the econometric approach has rarely been applied other than for rail. From a theoretical perspective the econometric approach is generally preferred, since it provides objective evidence of expenditure causes, as one looks for real figures on specific cost drivers. For the engineering approach 'subjective' assumptions on causal relationships are an inevitable input. Moreover, the econometric approach is best for obtaining general information about cost elasticity's.

Both the econometric and the engineering method suffer from heavy data requirements, which often cannot be met by the available statistics. Most, if not all, studies that use one of these methods are case-studies on relatively small segments of an infrastructure. The results of these studies are then extrapolated to larger parts of the infrastructure.

As a result of the deficiencies of both the econometric and the engineering method a third method can be used to differentiate between fixed and variable expenditures. This method uses practical experiences, simple calculations and/or expert judgements to establish the variability of each expenditure category in the available statistics.[20] We will refer to this method as the **cost allocation approach**.

The cost allocation approach, by its nature, has no formal procedures like the other two approaches. As a consequence, it does not produce objective or reproducible results. This is a major disadvantage. However, the data requirements for the cost allocation approach are much easier to meet than the data requirements of any of the two other methods.

2.3 Infrastructure costs

Definition
A large share of the infrastructure expenditures is related to the creation, renewal and maintenance of infrastructure assets with an expected lifetime of more than 1 year. This means that the expenditures made in year X do not equal the infrastructure cost for year X, the yearly value for the use of the infrastructure assets.

[20] See for example Booz Allen & Hamilton, 1999: *Railway infrastructure cost causation, Report to Office of the Rail Regulator*; Booz Allen & Hamilton, 2000: *Usage costs: issues raised in the Regulator's consultation*

Infrastructure costs, the periodic (yearly) value for the use of infrastructure assets, consist of

- Capital costs
  - Yearly depreciation costs concerning investments, renewals and maintenance of infrastructure assets;
  - Yearly interest expenditures
- Running costs
  - Yearly recurring (other) maintenance and operational expenditures.

Cost drivers

The drivers for (differences in) infrastructure expenditures as listed in table 2.1 also influence infrastructure costs. On top of this we can identify specific drivers that can lead to major differences in the calculation of infrastructure costs between countries viz. infrastructure managers. These specific cost drivers are listed in the following table 2.2.

Table 2.2 Main drivers for infrastructure costs

Infrastructure costs	Cost drivers
• Depreciation	• Life-expectancy of assets • Valuation at historical costs versus replacement costs • Linear versus non-linear depreciation • Time span between maintenance expenditures
• Interest	• Interest rates

Sources: UNITE D2: The Accounts Approach, Ecorys/CE Delft

- *Life-time expectancy:* the life-time expectancy of infrastructure assets as well as the components of specific assets can be very different (e.g. earthwork, foundation, surface layer, etc.). In order to establish correct depreciation costs these differences in lifetimes should be accounted for.
- *Historical costs versus replacement costs:* valuation of assets can be done using *historical costs* or *replacement costs*. When calculating on the basis of replacement costs, assumptions are made regarding the future value of the asset. These can be different between countries viz. infrastructure managers. However the International Financial Reporting Standards (IFRS) deal with how a 'fair value' should be established (IAS 16), leading to more consistency in this respect (see annex 7 for background information on IAS/IFRS standards).
- *Linear versus non-linear depreciation:* when using *historical costs* for valuation of assets, depreciation costs can be calculated by different types of depreciation functions (linear or non-linear), resulting in different depreciation estimates.[21] In order to compare countries viz. infrastructure managers, one single depreciation method should be applied. In principle both linear and non-linear function could do.
- *Time span between maintenance expenditures:* maintenance expenditures are meant to maintain viz. restore the original functionality of infrastructure. However like investments and renewals these maintenance expenditures – or at least part of it - are not made on an even basis every year, but in 'waves'. To establish the yearly costs, maintenance expenditures should be capitalized.
- *Interest rate:* for private infrastructure managers the actual interest expenses are considered to be also the interest costs. For other infrastructure managers, especially regarding road and inland waterways, there is no 'official' interest rate that should be used by all countries in calculating capital costs. In order to determine such a common interest rate, we can look at the interest rate that is advised in Cost-Benefit Analysis. For EU-projects an interest rate of 5% is advised[22]. This discount rate in the economic analysis of investment projects (i.e. social discount rate) attempts to reflect the social view on how future benefits and cost should be valued against present ones.

Method for classification of capital costs

For some transport modes capital stock and corresponding capital costs can be derived based on the business accounts of individual infrastructure managers. This holds specifically for railways, airports and harbours.

For other transport modes other methods should be used to quantify the capital stock. The Perpetual Inventory Method (PIM) is the one used by most OECD-countries for this purpose. The main principle of the PIM method is to calculate the asset's value by cumulating the annual investments and subtracting either the value of those assets that exceeded their life-expectancy (written down assets) or the depreciation. In order to use PIM a long investment time series must be available.

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21 Please refer to annex 2 where more details are provided concerning this issue.

22 'Guide to Cost-Benefit Analysis for investment projects', Prepared for: Evaluation Unit, DG Regional Policy, European Commission.

The Perpetual Inventory Method

The main idea of the perpetual inventory concept is to capitalize time series of annual investment expenditures by cumulating the annual investments and by subtracting the value of those assets which exceeded their life-expectancy (written down assets) as expressed in the equations below:

$VG_{t+1} = VG_t + I_{t,t+1} - A_{t,t+1}$ (1)

$VN_{t+1} = VN_t + I_{t,t+1} - D_{t,t+1}$ (2)

with:

VG_t : Gross value of assets at time t

VN_t : Net value of assets at time t

$I_{t,t+1}$: Investments during t, t+1

$A_{t,t+1}$: Written down assets during t, t+1 (assets which exceeded life-expectancy)

$D_{t,t+1}$: Depreciation during t, t+1

As shown in these formulas the perpetual inventory method can be applied for estimating the gross value (gross concept) and the net value (net concept) of infrastructure assets. The gross value contains the value of all assets which still exist physically in the considered year, e.g. which have not yet exceeded their life expectancy. Thus, $A_{t,t+1}$ denotes those assets which could not be used any longer or which were shut down. It is assumed that the assets are properly maintained and can be used until they exceed their defined life-expectancy.

Within the net-concept the annual depreciation $D_{t,t+1}$ are considered. The net value of assets describes the time-value of all assets which have not yet exceeded life-expectancy. According to the international conventions of the System of National Accounts (SNA) see for example UN (1993), most countries use a linear depreciation method.

The general principle as described above can be refined by more sophisticated approaches which use probability functions for the written down assets. In contrast to simple perpetual inventory models, the refined models assume that the life expectancies of assets within an investment vintage are dispersed over the mean value. This approach considers the fact that the investment spent for an asset group consists of parts with different life expectancies which are dispersed within an interval around the mean.

The perpetual inventory model requires in general long time series on annual investment expenditures, information on life expectancies of assets, and initial values of the capital stock (except when the investment time series is as long as the life expectancy). Due to the fact that the use of probability functions in the refined concept implies that not single assets but technically homogeneous groups of assets (earthworks, bridges/tunnels, terminal buildings, pavement and equipment) are considered, investment time series for asset groups (for example pavement, tunnels/bridges, equipment) have to be available.

Source: UNITE D5 – Annex 1: German Pilot Accounts

In order to produce accurate capital stock estimates the following information is needed to apply PIM:

- Long investment expenditure time series for each mode (30-40 year). Investment expenditures comprise expenditures on new construction, extension, reconstruction and renewals. Non-transport related capital costs are to be excluded (for example investment made in embankments to prevent flooding or investments made in the commercial part of airports such as shops, etc.);

- Life expectancy of the infrastructure as a whole or of infrastructure components (in this case also the investments per infrastructure component over time need to be known);
- Depreciation over time (linear, geometric);
- Interest rate (opportunity cost).

Obsolescence or catastrophic losses may occur also for infrastructure and should be taken into account when important. For example regional railways may be abandoned. According to the OECD manual, obsolescence is defined as occurring when an asset is retired before its physical capability is exhausted, and should be included in capital stock data where the asset's owner can be expected to anticipate it[23].

If any long investment time series does not exist, but a good cross-sectional database for one year is available, the synthetic method could be applied for capital valuation. Capital costs can than be calculated by using annuities. If neither the perpetual inventory approach nor the synthetic method can be applied, use of indicators like capital values per km from other countries is a possible approach.

Synthetic method

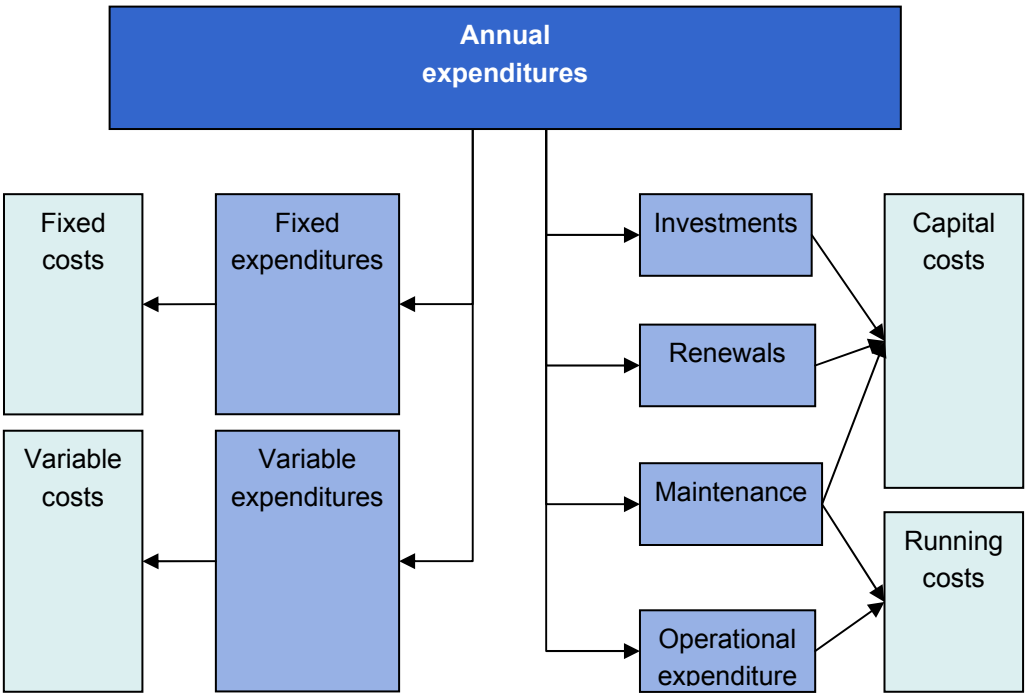
The synthetic method is another method (besides the PIM method) to value an existing infrastructure network. The synthetic method values the infrastructure network by estimating what it would cost to replace the relevant network with assets of equivalent quality. The method therefore involves measuring the existing physical assets. In the case of road infrastructure this would mean measurement in terms of road length of particular types, bridges, etc. and then multiplying these measures of physical assets by unit replacement costs, such as the cost of constructing a motorway with the same physical characteristics as the existing one.

[23] Source: 'Survey of national practices in estimating service lives of capital assets', Joint UNECE/Eurostat/OECD meeting on National Accounts, Geneva, April 2004.

2.4 Recapitulation

Total infrastructure costs consist of capital costs (concerning depreciation and interest of previous investments, renewals and non-yearly maintenance) and running costs. Starting point for the calculation of costs are the investment, renewal, maintenance and operational expenditures as registered by the administrators in the different countries (see also figure 2.1). Furthermore expenditures and costs can be divided into a variable part (influenced by transport volume) and a fixed part (not influenced by transport volume).

Figure 2.1 Components of the total infrastructure costs



Chapter 3 describes the current practice in different EU countries with regard to the registration of infrastructure expenditures. Also the determination of the capital costs is reviewed. Based on the current practices in the different EU countries and methodological issues as described above, an expenditure and cost registration methodology is developed in chapter 4.

3 Infrastructure expenditures: review of national practices

3.1 Introduction

In-depth analysis for a selection of countries

For a selection of eight countries an in-depth analysis on infrastructure accounting was conducted. The set of eight countries have been chosen in a way that it addresses differences in:

- Methodologies to determine capital and running costs (depreciation, asset life, interest rate);
- Modalities: the set should cover all modalities at least in two or three different ways;
- Network densities: the set should cover both countries with high and low network densities;
- Geographical situation: the set of countries should cover various geographical (and meteorological) situations;
- Administrative bodies responsible for the accounting systems: the set of countries should cover public administration as well as privately managed transport infrastructures;
- The following set of countries has sufficient variety of situations in terms of the previous mentioned aspects: **Austria, France, Germany, Sweden, Estonia, The Netherlands, Spain and the UK**.

This has resulted in the decision that a total of 8 countries have been analysed thoroughly. An overview of these selected countries and modes is given in table 3.1. Current practices regarding infrastructure accounting for inland waterways are only analysed for France, Germany and The Netherlands since in the other countries this transport mode does not or only plays a minor role. The same accounts for Austria with regard to maritime transport.

Table 3.1 Selected countries and modes for which national practices are reviewed

Country	Road	Rail	Inland waterway	Air transport	Maritime transport
Austria (A)	√	√		√	
Estonia (EE)	√	√		√	√
France (F)	√	√	√	√	√
Germany (D)	√	√	√	√	√
Netherlands (NL)	√	√	√	√	√
Spain (E)	√	√		√	√
Sweden (S)	√	√		√	√
United Kingdom(UK)	√	√		√	√

In order to give in a short period a comprehensive idea of the most commonly used methods applied by the selected countries, a review of national practices on infrastructure accounting has been carried out. Three approached have been followed to identify national practices:

- A review of the literature;
- A questionnaire to statistical offices or ministries of transport.
- Interviews with infrastructure managers

Literature review

To conduct the review of national practices the following sources were used:

- UNITE pilot accounts for 18 countries (1998);
- IMPRINT deliverables (D1 to D6);
- Final report of the expert advisors to the high level group on infrastructure charging (April 1999);
- Survey of national practices in estimating services lives of capital assets (Eurostat/OECD, April 2004);
- Conclusions and recommendations of the GNI Committee's Task Force on the consumption of fixed capital on roads, bridges etc (Eurostat, November 2003);
- Summary results of the second Eurostat questionnaire on CFC on public infrastructure (Eurostat);
- Transport statistics common questionnaire (Eurostat, UNECE, ECMT).

With respect to the data sources, the following remarks can be made. First of all, the UNITE analysis has base year 1998 and could therefore been seen as slightly outdated. This is however judged to be not that relevant when we are considering the structure of Member States' infrastructure accounting practices (which don't change often) and not the costs themselves. On the other hand the potential impact of Directive 2001/12/EC requiring the up keeping and publishing of separate profit and loss accounts and separate balance sheets 'for business relating to the management of railway infrastructure' cannot be deduced from the UNITE deliverables. Also, the UNITE methodology need not necessarily reflect the data availability at national level at the statistical bureaus[24].

Questionnaires

In parallel to the detailed literature study, a questionnaire has been developed and sent to eight statistical offices of ministries of transport. This voluntary questionnaire was developed by ECORYS/CE Delft with support of Eurostat (Unit D4 on Energy and Transport) for the purpose of this study (see returned and completed questionnaires in Annex 1). With regard to this questionnaire it has to be mentioned that five out of eight questionnaires had been returned at the moment this final report was written[25].

[24] From other studies we have been involved in, we have learned that at the Ministries of Transport, more detailed information on publicly governed infrastructure is available than at the national statistical bureaus. Of course National Statistical Bureaus compile their data through these organisations as well.

[25] Completed questionnaires for all five modes of transport have been returned by the national statistical offices of Estonia, Sweden, France and the UK. The Central Bureau for Statistics in the Netherlands returned a completed questionnaire for road transport infrastructure.

The returned questionnaires however proved not to be sufficient to get a clear understanding of the data availability at sub-national levels. Therefore, in second instance additional information was obtained from published business accounts of infrastructure managers and interviews with financial staff of infrastructure managers.

Contacts with infrastructure managers/business accounts

Because the questionnaire results where not satisfying with regard to the level of detail that could be obtained, supplementary efforts aimed at contacting infra managers across the countries and for the various transport modes, in order to obtain more detailed information on infrastructure expenditure practices (i.e. from business accounts). This approach ensures to be as close to the actual practice of these infrastructure managers as possible, in order to ensure the highest consistency between countries and the modes of transportation.

Each of the next sections summarizes the current practices on infrastructure accounting per mode of transport, which are being applied in these eight countries. Subsequently, for each transport mode the most important bottlenecks can be identified when comparing Regulation 1108 requirements with these national practices. Because Regulation 1108 does not hold for maritime and air transport infrastructure the information for both transport modes is very limited on beforehand. Nevertheless, an accounting framework should be developed for maritime and air transport infrastructure, so bottlenecks arising from national practices should be identified for both modes of transport as well. Further, from the national practices a general picture can be drawn on what should be good or least attainable practices regarding infrastructure accounting principles.

In the next sections for each transport mode the national practices have been described. Each mode specific section is divided into three subsections, which deal with:

- the data sources being used to compile data;
- the facts that were found;
- the conclusions.

3.2 Road infrastructure

3.2.1 Data sources used to compile data

The in depth analysis of the data availability for road infrastructure has been based mainly on the UNITE deliverables and extensive contacts with representatives of road infrastructure organisation across Europe (see annex 4 for list of contacted persons). Other, more recent, sources, such as the Conclusions and recommendations of the GNI Committee's Task Force on the Consumption of fixed capital on roads, bridges etc (Eurostat 2003) and the Final report of the expert advisors to the high level group on infrastructure charging (April 1999) have also been taken into account. A report on calculating transport infrastructure costs from DIW[26] was also used. Lastly, additional

[26] DIW (1999), Calculating transport infrastructure costs - Final report of the expert advisors to the High Level Group on infrastructure charging (Working Group 1).

information obtained through the questionnaire has been taken into account in the current analysis.

3.2.2 Expenditure categories

All of the selected countries can make a division in the expenditures for investments and maintenance, at least for the main road network. Additionally, many countries are also able to distinguish expenditures for operation and administration. Under regulation (EEC) No 1108/70 Member Countries should keep detailed records of investment expenditures (new construction, extension, reconstruction and renewals), current expenditures (maintenance, operation), traffic police and general expenses. However, there was no proof found that road expenditures are registered in this detailed way in the selected countries. Generally spoken, investment and maintenance expenditures are distinguished and subsequently split out to subcategories in some countries. The applied definitions differ considerably between the selected countries (see in more detail the next section).

Most countries do have a distinction between capital costs (investment, depreciation and interest) and running costs. In Estonia, the only investment costs or capital costs available are costs for new investments and replacements and interest and depreciation on new investments and replacements.

Further to that, regulation 1108/70 states that expenditures should be categorized to the 'type' of road, therefore the road network needs to be divided into a number of categories. The categories of roads differ per country (see annex II of the regulation).
With regards to categorization of roads, only Estonia is unable to categorize the expenditures per road type. All other countries are able to make a division between the main road network and other roads[27]. Some countries are able to split figures on the main road network for motorways and main national roads.

In the UNITE reports, it seems that the data registered do not provide necessarily the same level of detail as indicated in the regulation 1108/70. For example, in UNITE France distinguished motorways, national roads and local roads. In the EEC regulation, local roads for France need to be split into two different categories (*Chemins departementaux* and *Voies communales*).

Expenditures should be reported in relation to road type. In addition to this, the Eurostat report[28] indicates that preferably countries should register costs in relation to the component of the infrastructure. For roads this would mean distinguish costs of earthworks, foundations, bridges, tunnels and surface layers separately. Only Germany has this kind of detailed information available at this moment.

[27] Please note that at the national level (for example Ministry of Transport or the national road authority) mainly information about the national road network is known

[28] GNI Committee's Task Force on the consumption of fixed capital on roads, bridges etc., Eurostat 2003.

3.2.3 Investment and running expenditures

In the previous section it is concluded that all countries are able to distinguish investment, maintenance, operation and administration expenditures. This can at least be done for the national road network. For these roads it should be possible for all countries in the EU to distinguish investment and running expenditures. An overview of investment and running expenditures in the selected countries is presented hereafter.

In **The Netherlands** investment expenditures concern all expenditures related to an extension of the road infrastructure capacity. This does not only concern new roads, but also widening of existing roads (from 2 to 3 lanes per direction for example). All other expenditures are maintenance expenditures. In The Netherlands fixed and variable maintenance expenditures are distinguished. Fixed maintenance is also known as 'yearly' maintenance and concerns relative small-scale maintenance works. Variable maintenance is also known as 'non-yearly' maintenance and concerns large-scale maintenance[29]. Fixed and variable maintenance expenditures are divided over 5 subcategories:

1. Road surfaces;
2. Road exploitation (expenditures for buildings, sites, energy, research etc);
3. Traffic provision expenditures for lightning, signposting, signalling etc);
4. Landscape & Environment (expenditures for minimizing detrimental effects, waste management);
5. Engineering works.

Austria distinguishes expenditures for construction, structural maintenance and operational maintenance:

- Construction concerns expenditures on new construction and extension of capacity of existing infrastructure
- Structural maintenance (*Bauliche Erhaltung*) concerns measures to improve and maintain the existing infrastructure like carriageways, tunnels and bridges.
- Operational maintenance (*Betriebliche Erhaltung)* concerns the provision of a permanently operational and efficient network. Importance is given to continuous improvement of safety and convenience use. Operational maintenance consist e.g. of winter maintenance, road facilities, tunnel operation, maintaining grass areas, emergency service, repairs.

In the **United Kingdom** the Highways Agency divides road expenditures under five main categories (sub-programmes). These are (1) Maintenance, (2) Small Improvements (Schemes <£5M), (3) Technology Improvements, (4) Traffic Manager and (5) Major Improvements (Schemes >£5m).

Expenditures are subsequently regarded as capital (investment) or resource expenditures. Capital is about improving the asset and thus increases its value. Resource expenditures are about maintaining the value and keeping it safe and available for use.

[29] The use of fixed and variable expenditures in the Netherlands refers to variability in time more than to a response to variation in traffic.

Below the sub-programmes are shortly described and is indicated whether it's a capital or resource expenditure.

(1) The Maintenance Programme aims to keep the network in a safe and serviceable condition at minimum whole life cost and with minimum disruption. Three kinds of maintenance are distinguished.

Renewal of Roads and Structures (Resource):
- Resurfacing/overlay/reconstruction of carriageways, footways and cycle tracks;
- Replacement/repair of drainage, earthworks, signs, street lights, traffic signals etc.;
- Repair/replacement/reconstruction of road/pedestrian/cycle/equestrian bridges, tunnels, culverts, retaining walls and gantries and their components;
- Protection/preventative maintenance such as waterproofing and painting of steelwork;
- Upgrading substandard features such as under-strength piers and parapets.

Current Maintenance (Resource):
- Routine work to keep the roads and structures assets clean, tidy and safe such as litter picking, drain cleaning, sign washing, grass cutting, hedge/shrub trimming, etc.;
- Safety/detailed inspections/patrols and asset condition surveys;
- Temporarily/permanently repairing hazardous defects quickly e.g. potholes;
- Clearing ice and snow;
- Dealing with incidents/accidents/spillages.

Renewal of Technology and Winter Assets (Capital):
- Repair/replacement of communication cables, cabinets, emergency telephones etc.;
- Repair/replacement of buildings/equipment in maintenance depots and winter maintenance plant such as loaders and de-icing salt spreaders.

(2) The Small Improvement Programme is mainly made up of:
- Local network management schemes (Capital & Resource): Schemes aimed at reducing accidents, improving the environment, reducing congestion etc.;
- Research & Development (Resource) research projects from new materials, through safety and operational analysis to user behaviour;
- Information technology: Development, implementation and upgrading of asset management and business systems.

(3) The Technology Improvements Programme (Capital & Resource) consists of schemes mainly aimed at reducing accidents and reducing congestion such as queue/incident detection/warning system, cameras and driver information systems/equipment. Pilots to test new techniques such as ramp metering/control and active traffic management are also part of this programme.

(4) The Traffic Manager Service Programme (Resource & Capital) is made up of traffic officers (and their vehicles and uniforms) assisting the operation of trunk roads / motorways particularly by assisting in the clearing of incidents / accidents. Operation of regional control centres, that provide the means of detecting incidents/accidents and disseminating information to drivers to ease congestion, is part of the programme too.

(5) The Major Improvements Programme (Resource & Capital) finally consists of major road improvements to improve safety, reduce congestion and improve the environment. This programme also includes the purchase of land for the improvement/operation of trunk roads/motorways and selling of surplus land bought for/released by the improvement/operation of trunk roads/motorways.

In **Sweden** road infrastructure expenditures are split up into investments and running expenditures. Running expenditures are classified in routine maintenance and periodic maintenance and are subsequently divided into subgroups:

Routine maintenance (effects less than one year) concerns the following subgroups:

- Surface road: fast actions to handle sudden arising problem on surface roads (for example cracks and unevenness, surface abrasion, street cleaning).
- Gravel road: fast actions to handle sudden arising problem on gravel roads (for example grading, dust abatement, street cleaning).
- Bridge and tunnel: actions to keep tunnels and bridges accessible. Some actions of traffic safety are also included.
- Road equipment: management of traffic information facility, roadside infrastructure, lighting appliance, service area etc.
- Winter: winter road maintenance aims to keep roads safe and available at settled level.
- Ferry: transportation of vehicle, persons and goods over rivers, small lakes, to island in the archipelago etc. in order to keep a road continues. In Sweden these ferries are free of charge and considers as a part of the road.

Periodic maintenance concerns the following subgroups:

- Surface road: maintenance of road surface, substructures, superstructures and draining system
- Gravel road: maintenance of road surface, substructures, superstructures and draining system
- Structures: maintenance of bridges, tunnels, ferry quay,
- Road equipment: maintenance of road equipment

Investment expenditures concerns expenditures on new construction and extension of capacity of existing infrastructure.

In **Spain** the road network is divided into different networks according to their area of responsibility. The State Road Network *Red de Carreteras del Estado* consists of 24,105 kilometres and is managed by the Roads Head Office *Dirección General de Carreteras*. The State is in charge of managing and financing the network by means of the general budget, or the company awarded the concession. The remainder of the roads depend on the Autonomous Communities (Autonomous Network), on the County Councils (Provincial Network) and on the Insular Town Councils (Canary Islands Road Network). Categorization of the investments and the conservation procedures are more or less the same in each of these three levels.

Investment is normally organized through two independent programmes:

- Programme for new building works. This deals with the construction of new roads, variants and cross streets in urban centres and with the improvement of any roads.
- Programme for the Maintenance and Operation of Roads. This programme takes care of the maintenance of surface drainage conditions, of the improvement of road safety conditions and of the conservation and improvement of the road surface, variants and roads by means of the contracted integral management.

The programme for Maintenance and Operation comprise routine maintenance, special maintenance and improvement of safety conditions.

Routine maintenance activities are those, which delay any deterioration that appears in the roadways because of use and time. This includes any negative impacts that the surroundings may have had on the roadway and which prevent its proper use, although these impacts may not have caused deterioration. Routine maintenance activities are:

- Inspection and maintenance of the roadway surface and of the road verge;
- Inspection and maintenance of the drainage networks (ditches, pipes, kerbs, drains, etc.);
- Inspection and maintenance of the edges, central reservations and slopes;
- Inspection and maintenance of road signs and equipment, lighting installations and ventilation installations;
- Inspection and maintenance of changeable road signs and of the security in tunnels and urban zones;
- Inspection and maintenance of factory works and other installations.

Special Maintenance concerns activities that deal with improvements in roads that are nearing or have already reached their life expectancy. For example, apart from periodic repairs some special interventions are planned which adapt the characteristics of the road to growing demand in the necessary sections.

Improvement of the safety conditions is a third programme aiming to improve safety conditions. Amongst the interventions in this programme is the treatment or elimination of accident black spots.

In **Germany** the *Bundesministerium für Verkehr, Bau- und Wohnungswesen* (Ministry of Transport, Building and Housing) is responsible for the main road network (*Bundesstraßen*) in Germany. The road network concerns of motorways (about 12.000 kilometers) and national roads (about 41.000 kilometers). The remaining road network (over 550.000 kilometers) is managed by lower governments.

With regard to building and management expenditures are categorized as follows:

1. Road management & road exploitation
2. Road design
3. Road investments and road improvements
4. Remaining expenditures

As in many other countries investments and large-scale investments are separated from running expenditures like road management and road exploitation. With regard to road

management and road exploitation expenditures are separated to road traffic infrastructure items (*Straßenverkehrsanlagen)* and other infrastructure items (*Nebenanlagen)*.

With regard to the *Straßenverkehrsanlagen* three types of expenditures are distinguished:
- Road lane infrastructures like lines, crash-barriers and guard-rail
- Constructions like bridges, tunnels and noise walls
- 'Remaining' expenditures for plantation, foundation, traffic management systems etc.

The expenditures for *Nebenanlagen* concern expenditures for parking lots, filling stations, rest areas, motels/hotels etc.

In **France,** with regard to the national road network, two types of roads are distinguished:
- The national toll-free road network with a length of about 13,000 kilometers, consisting of no-toll motorways and main national road. The French road authorities manage these roads.
- Toll motorways, with a length of about 8,000 kilometers that are managed by commercial companies by concession contracts.

The classification of road infrastructures also depends on whether the network is a tolled one (operated by toll motorways concessionaires) or not.

From the beginning of 2006 a lot of changes will occur in France with the regard to the organization and management of the national road network. So will the national road network be reduced from 36,000 kilometers to 21,000 kilometers. Subsequently also the responsibilities in local road administration will be transferred from around 100 country directorates *"directions départementales de l'équipement*" to 11 interregional road directorates "*directions interrégionales des routes"*. As already holds for toll motorways, management will change from territorial management to itinerary/route management.

Classification of road expenditures France is breaking with the tradition of expenditure-oriented budgets by drawing up a programme-oriented budgets based on public policy objectives. New budget process has started in 2005 to become effective at the beginning of 2006, it will be accompanied by new government accounting standards (close to those of French general accounting plan of companies and of international accounting standards).

Three types of expenditures are distinguished with regard tot national toll-free road network:

- Capacity investment: These expenditures on infrastructure development concern new construction and extension of capacity of existing infrastructure.

- Maintenance and operational expenditures. Five types of expenditures are distinguished:
  - Rehabilitation and preventive maintenance
  - Engineering works, split into:
    - Expenditures for maintenance and rehabitation,

        - Expenditures for tunnel safety
    - Safety provisions
    - Expenditures by 'local offices' and winter clearance:
        - Expenditures for plantation, foundation, traffic management systems, signalling etc.
        - Expenditures for winter clearance
    - Other maintenance and operational expenditures on buildings, modernisation of material, movement of buildings etc)
- Other expenditures on staff, taxes, overhead expenses, general surveys, etc.

Concessionaires manage the toll motorways and are commercial companies that have to produce general accounting. Concession contracts also ask concessionaires for some more detailed accounts to describe the specificities of their activities (like financing plans). These contracts lead to functional accounts showing the following aggregated expenditures:

- Investments:
    - New investment: preliminary works (for example surveys, land acquiring, etcetera), building works
    - Investments on operating networks: widening of the motorway, improving of standards improving, new rest places, etc.
- Renewing of fixed assets : e.g. tolling equipments
- Major repairs: Renewal of roadways and structures of bridge and tunnels, mainly by periodic maintenance
- Routine maintenance and operational expenses: local repairs, information of users on traffic conditions, winter maintenance, cleaning rest-places, etcetera.
- Staff expenses
- Overhead expenses
- Taxes, fees, corporate tax
- Financing cost
- Profit margin

Despite exhaustive attempts no detailed information on this topic was received from **Estonia**.

3.2.4 Fixed and variable expenditures

None of the eight selected countries account fixed and variable road infrastructure expenditures on a regular - say yearly - basis. As far as known information available on these costs is almost everywhere the result of analyses undertaken in theoretical projects like UNITE. National governments don't have straight information on the fixed and variable costs of road infrastructure.

It's not fully clear why governments don't collect these data. In our view this can be explained largely by the difficulties that arise by the required methods. As previously has been described, from a theoretical point-of-view the econometric and the engineering approach are the most preferred methodologies to determine fixed and variable costs of

infrastructure. In the UNITE-project both approaches have been used. But both methods request a lot of data and are both very difficult to undertake.

3.2.5 Capital costs

As far as known capital costs are not determined at a regular basis in all distinguished countries. For many countries only information is available out of the so-called Pilot Accounts of UNITE. The accounts show that the asset-lifetime expectancy and the intervals of life expectancy used to calculate the value of the assets differ considerably throughout Europe. In some cases this can be explained due to climate circumstances, in other cases it is harder to explain. Besides, valuation data come from different types of sources, for instance business accounts of the Swedish National Road Administration and national statistics in other countries.

Table 3.2 Assumptions used in UNITE to calculate the capital costs of motorways/roads

Country (item)	Average life expectancy (years)	Interval of life expectancy	Interest rate
Austria (Motorways):			3,5%
-Earthwork		30-90 yr	
-Surface		15-40 yr	
-Pavement		10-25 yr	
-Slope protection		50-80 yr	
-Bridge		60-75 yr	
-Bridge equipment		15-30 yr	
-Tunnel		90-100 yr	
-Tunnel equipment		15-30 yr	
-Noise protection		15-30 yr	
-Equipment		10-30 yr	
-Buildings		50-100 yr	
-Machines		8-13 yr	
France			3%
- Motorways	275 yr for 69% of the cost 19 yr for 31% of the cost		
- National and local roads	324 yr for 48% of the cost 18 yr for 52% of the cost		
Germany			3%
-Earthworks, drainage etc	116 yr	20 - 180 yr	
-Tracks	35 yr	5 - 55 yr	
-Engineering work (tunnels, bridges)	68 yr	5 - 110 yr	
-Equipment	18 yr	1 - 30 yr	
Netherlands	45 yr		3%
Spain	40 yr		3%
United Kingdom			3%
-Road pavement	20-25 yr		
-Road surface	10 yr		

The most common practice for depreciation of infrastructure seems to be the linear depreciation derived from a direct evaluation of the existing road network. However different practises exist within the Member States, some states apply a geometric depreciation function for the road infrastructure.

In the UNITE project a discount rate of 3% was used. As far as known only in Austria a higher discount rate was used, based on practical experiences.

In the UNITE project the Perpetual Inventory Method (PIM) was used where possible to determine the capital costs of roads. In most countries, PIM could be applied; however, for Estonia it was impossible due to lack of sufficient time series. In some other transition economy countries statistical surveys are currently used to calculate capital stocks. In Austria the synthetic method and annuity method are used to estimate capital costs. In Estonia, there is not enough information available to apply PIM, no proof was found that any other method is used to estimate capital costs.

3.2.6 Conclusions

The description of road infrastructure costs and expenditures in this section shows that all countries are able to distinguish between investments and maintenance expenditures. Many countries are also able to split maintenance expenditures into more 'regular' and 'non-regular' maintenance, although all countries apply different definitions. In the Netherlands the terms fixed and variable maintenance are applied, structural and operational maintenance in Austria, routine and periodic maintenance in Sweden and routine and special maintenance in Spain.

A division into investments, 'regular' and 'non-regular' maintenance could be the basis for a rough framework to be developed, but it is clear that much more consistency is needed in definitions currently being used in the various countries. This aspect and the data availability are probably the most challenging subjects in order to arrive at a harmonised EU framework for monitoring road infrastructure expenditures.

3.3 Rail infrastructure

3.3.1 Data sources used to compile data

The in depth analysis of the data availability for rail infrastructure has been based on a variety of sources. In first instance, account was taken of aggregate data sources; these include:

- Literature review, such as
  - UNITE deliverables;
  - NERA (2004);
  - Data reported to Eurostat;
- Questionnaires.

These sources proved not to be sufficient to get a clear understanding of the data availability at sub-national levels. Therefore, in second instance additional information was obtained from published business accounts of infrastructure managers and contacts with (financial staff of) infrastructure managers (see annex 4 for list of contacted persons in the area of rail infrastructure).

Facts

In general, the level of detail in the data available at national level is poor. The analysis of the UNITE results and the information from the questionnaires clearly points out that there is at best only a very rough distinction in investments and running expenditures at national level available.

Regulation 1108/70 requires Member States to prepare infrastructure expenditures accounts for investment expenditure (expenditure on new construction, extension, reconstruction and renewals) and current expenditure (expenditure on maintenance and operation) separately. Information at Eurostat is however limited. The Eurostat website indicates that for the eight selected countries, only Germany, Sweden and Spain distinguish between running and investment expenditures on rail infrastructure in the data reported to Eurostat.

The returned questionnaires confirm this picture: In Estonia no data on railway infrastructure is collected at national level, in France only total investments are collected and for the UK a total amount for investments and expenditures is reported[30]. Dutch national statistics distinguish between 'investments' and 'maintenance & operation'.

The information available in national statistics often stems directly from the business accounts of infrastructure managers. Classification of, for example, (multi-annual) maintenance expenditures do not so much depend on the definition at the national statistical bureau. Instead, any distinction between investments and running expenditures in national statistics is implicitly based on the definitions underlying the business accounts. Therefore, it is not so much data on actual expenditure that is available at national level, but expenditure information that has already been processed by the infrastructure managers. This holds for almost all countries under study[31].

Focus on business accounts

The preferred sources of information are the annually published business accounts. The primary focus in the remainder of the analysis will therefore be on the information in the business accounts and at the infrastructure managers. The choice for business accounts is made for the following reasons.

- The level of detail available in national statistics does not allow for a robust determination of fixed and variable expenditures.

[30] Information is collected via a survey of private companies and included expenditures on fixed assets, rolling stock, renewals, new routes, but also electrification, signalling and buildings. It is published split by Rolling stock and other.

[31] For France, our sources are inconsistent. In UNITE (Deliverable 8, annex 4) it is indicated that the information reported through the 'Comptes de transport de la Nation' and the 'Comptes satellites de transport' are not exactly the same as the firm accounts. The questionnaire in contrast indicates that no corrections take place at national level. We have not been able to get a decisive answer.

- By staying close to the source, the exact definitions underlying the classification in investments and running expenditures can be determined and compared.

This choice has some further advantages. Since business accounts are published yearly and are regulated by national or international accounting principles, continuity and consistency within the time series is generally good. Also, in many countries, the majority of the tracks (up to 90% or more) are governed by one railway company. Business accounts are therefore able to provide sufficient coverage of infrastructure.

To assess the comparability and consistency between countries, a more detailed analysis is necessary. In the next sections, further comparisons between business accounts from infrastructure managers from different countries will be made.

3.3.2 Expenditure categories

Expenditures can be classified in many different ways. In the first place, there is a division between expenditures for the purpose of investments, renewals, maintenance and operational expenditures. It is important to see whether countries use consistent definitions because the distinction affects the calculation of assets value and capital costs. In the second place, expenditures can be divided within these 4 categories. Investments for example can be related to the track itself, to superstructures, but also to software and office furniture. Consistency in categorization improves the transparency and comparability of cost calculations. It can be seen, for example, whether similar depreciation rates are used in different countries. Clearly this influences the outcome of the calculation of the asset value and thus indirectly the capital costs. This classification is also useful because the shares of fixed and variable expenditures differ between expenditure categories.

A third possible distinction is related to Directive 2001/14/EC on railway infrastructure charges. This directive distinguishes different services to be supplied to railway undertakings, notably:

- A minimum access package.
- Track access to services facilities and supply of services.
- Additional services.
- Ancillary services.

One of the classifications applied by the Dutch infrastructure manager relates expenditures to the services provided, as defined in the Directive.

We will now first describe the ideal data availability situation and the data available from business accounts in general. We will assess how these compare and also discuss consistency between infrastructure managers in sections 3.3.3 and 3.3.4.

3.3.3 Investment and running expenditures

Information in business accounts differs substantially from the ideal situation. It often does not relate to actual expenditures for these four categories. Instead, it provides

information on running expenditures and capital costs, in the form of capitalised expenditures. Running expenditures are comprised of the operational expenditures, and dependent on the accounting principles, none, part, or all of the expenditures on maintenance. Capital costs relate to investments, renewals and (dependent on the accounting principles, none, part or all of the) maintenance.

Both capitalised and running expenditures are sometimes further divided into subcategories such as buildings, superstructure, engineering works for capitalised expenditures. Subcategories applied for running expenditures are for example management of traffic control, train running diagrams and safety for running expenditures. Capitalised expenditures are generally not categorised according to investments, renewals and maintenance in business accounts. Such a split is however important to determine the share of fixed and variable expenditures. Whereas investments are totally fixed, maintenance and also renewals expenditures may be partly variable.

Assessment of consistency between business accounts: investment, renewal, maintenance and operational expenditures

As mentioned above, in the business accounts a clear cut distinction between investment, renewal, maintenance and operational expenditures is often not available. Only the distinction between running expenditures that go to the income statements, and capitalised expenditures (often named 'investments' in business accounts), which are capitalized and put on the balance in the form of assets is made.

However, from the interviews with infrastructure managers it is clear that internally these categories are clearly distinguished. The consistency in definitions of these categories is large. Investments are related to enhancement or improvement of current infrastructure or to totally new pieces of infrastructure. Renewals replace existing infrastructure and do not add new functionalities, but prolong the life expectancy. Maintenance is intended to actually reach the life expectancy infrastructure was designed for. Operational expenditures relate to traffic management, train running diagrams, research and such. Note that in some cases, expenditures on low-value assets (e.g. up to € 400 in Austria and 10.000 EEK in Estonia) are expensed as incurred in the reporting period, irrespective of their normal useful life.

In practice it is not always easy to distinguish between renewal and investment. Renewal will often involve some added functionality due to technical progress. Also, large investment projects may include some renewal of current tracks for example. The British and Dutch infrastructure managers have indicated that in such instances they classify part of the project as renewal, and part as investment expenditures.

Business accounts are not fully consistent in the treatment of maintenance expenditures. The Dutch, German, Spanish, Swedish and British infrastructure manager classify all maintenance expenditures as running expenditures. In contrast, the business account of the Estonian infrastructure manager reads that only maintenance with a periodicity shorter than one year is included in the running expenditures and that maintenance and inspections with a longer periodicity are capitalised and depreciated according to the periodicity of inspection.

The Swedish infrastructure manager stands out in taking the full expenditure on renewal in the first year. In contrast to all other countries, renewal expenditures are not capitalised in Sweden.

From a theoretical economical perspective, the applied definitions and treatment of multi-annual maintenance may not be entirely correct, because multi-annual maintenance should be booked as operational expenditures. However, we feel there are enormous advantages of adhering to the distinctions as they are applied within business accounts, as described above. First of all, these definitions are generally accepted and infrastructure managers are experienced in applying them. Introduction of new definitions could very well lead to confusion and arbitrary classifications by infrastructure managers. The current definitions are regulated by national and / or international accounting principles[32]. The applied definitions are very consistent between countries. Moreover, expenditure information classified according to these definitions is available or can be made available with a reasonable amount of effort.

Assessment of consistency between business accounts: accounting standards

Infrastructure managers use various accounting standards when preparing their business accounts. Some use their national accounting standards, while others use the International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS). Table 3.3 shows which accounting standards are used by the contacted infrastructure managers.

Table 3.3 Accounting standards

Country	Infrastructure manager	Accounting standard	Remarks
Austria	ÖBB	Austrian accounting standards	
Estonia	Eesti Raudtee	IAS/IFRS	
France	RFF	French accounting standards	
Germany	DB Netz AG	German accounting standards	Holding company DB AG presents its accounts in accordance with IAS/IFRS
Spain	Renfe	Spanish accounting standards	
Sweden	Banverket	Swedish accounting standards	
The Netherlands	Prorail	Dutch accounting standards	Will prepare accounting system for a possible transfer to IAS/IFRS
United Kingdom	Network Rail	IAS/IFRS	

[32] As of January 2005, publicly traded companies shall prepare consolidated accounts in conformity with International Accounting Standards (IAS) or International Financial Reporting Standards (IFRS) by Regulations 1606/2002 and 1725/2003. Both the UK and German infrastructure manager have indicated that they are preparing a shift to international IAS/IFRS accounting standards. The Dutch infrastructure manager will also integrate IAS/IFRS into its books.

The use of different accounting standards results in differences in the valuation of assets. For example, IAS/IFRS prescribes that the lifetime of each component is assessed yearly, and that the depreciation and asset value are updated accordingly. Dutch accounting standards permit the use of average lifetimes for assets and prescribes depreciation accordingly. In complex infrastructures, where different components have different lifetimes, valuation according to IAS may yield different values than valuation according to Dutch accounting standards.

Companies that are listed on stock exchanges within the EU have to present their accounts in accordance with IAS/IFRS from 2005 onwards. Other companies have no legal obligation to do so. However, companies which need access to the international capital market may be pressured to switch to IAS/IFRS. Companies that aspire after flotation of their capital will also need to use IAS/IFRS.

Subdivision of expenditure categories

As indicated above, business accounts do distinguish between running expenditures and investments, which include renewals and possibly part of the maintenance expenditures[33] (those with a lifetime longer than one year). These investments are often subject to a more detailed categorisation[34]. This categorisation usually consists of some 5 to 10 different categories, but infrastructure managers use an even more detailed categorisation internally. For France, the in the business account presented 11 categories are in fact based on 77 categories in use internally. In the Netherlands 125 categories are distinguished internally. In Sweden there are over 60 asset categories and over 30 operational expenditure categories. The published categorisations are not entirely consistent between different infrastructure managers. Each infrastructure manager uses its own terminology and therefore straightforward comparisons cannot readily be made. However, it is clear that there are large overlaps in the categorisation in use.

As mentioned above, companies that comply with IAS/IFRS or are preparing for a transfer to IAS/IFRS have to use at least as many categories as there are different lifetimes in their assets. On top of that, they often use a categorisation that serves their management purposes.

Below the subcategories that are often mentioned in business accounts have been presented.

- Buildings / railway stations (excluding retailing)
- Civil engineering works / Structural works (e.g. tunnels and bridges)
- Superstructure (e.g. rail and sleepers)
- New construction in progress
- Transmission lines
- Signalling equipment
- Telecommunications equipment
- Safety installations

[33] Maintenance expenditures with a lifetime longer than 1 year. Maintenance expenditures with a lifetime below one year are always booked as running expenditures.

[34] For each category, the depreciation period is listed in the business accounts. The depreciation periods will be further compared in the section on capital costs.

- Vehicles / rolling stock for maintenance
- Plant and machinery
- Office, computer and other equipment, tools

Please note that in some business accounts, several categories are combined and / or feature under a different name and also other categories are included. For example, in Estonia transmission lines and tracks have been taken together, and there is no separate category for structural work such as tunnels and bridges. However, since Eesti Raudtee uses IAS, it must be able to make this subdivision internally. Similarly, in Austria safety and telecommunications installations are presented together and it is in first instance not clear under which category signalling equipment falls. Only in the Netherlands railway stations as categorized separately[35], in other countries there is a category 'Buildings'. In the UK, railway stations themselves are included but the space therein used for retailing is reported separately under investment properties.

Finally, some countries have categories that do not feature in any other country. For example, in Sweden there is a category named 'Improvements to others' property' and France is the only country that separately categorizes 'Level crossings'[36] and 'Landscaping'.

Although the applied terminology differs between business accounts, we feel confident that most infrastructure managers would in principle be able to adhere to the above categorization without too many problems. The categorization available internally at infrastructure managers is much more detailed than the categorization presented in the business accounts.

The infrastructure managers we have spoken judged categorizations to be self-explanatory and could not provide us with detailed definitions of expenditure categories.

3.3.4 Fixed and variable expenditures

None of the countries that responded to the survey indicated that they distinguish currently between fixed and variable expenditures. Nor has information been found in the business accounts.

However, it is clear that this issue attracts more and more interest from infrastructure managers since the introduction of Directive 2001/14/EC. Many countries adhere to the principal that only marginal (or variable) expenditures may be passed on to infrastructure users via infrastructure charges. A notable exception is Germany, where a full cost approach is applied and no distinction is being made between variable and fixed expenditures.

From the interviews with the infrastructure managers we have learned that more information is indeed available. The Dutch infrastructure manager has indicated that it

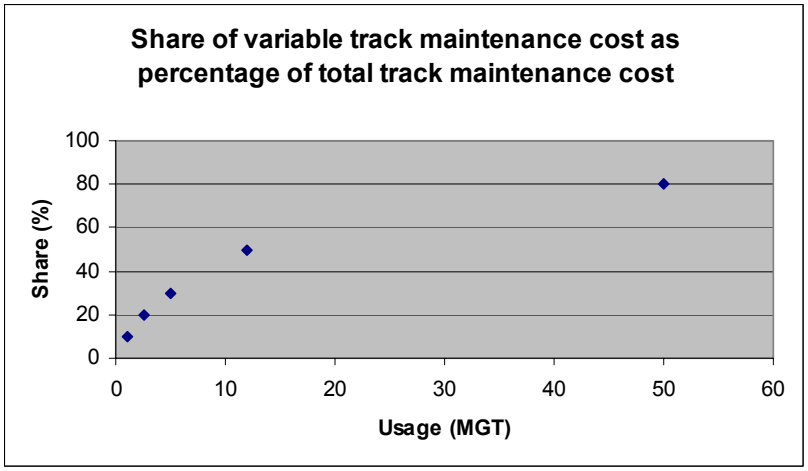
[35] This includes the platforms and the access thereto and the roofing and the public share in railway stations

[36] Note however that level crossings have the same life expectancy as 'track' so taking these categories together does not influence the estimate of capital costs.

has such information at its disposal. The shares of fixed and variable expenditures for different categories of expenditures have been determined by internal experts. The Dutch Office of Transport Regulation has assessed this methodology as subjective and not robust[37].

In the UK the infrastructure charges are regulated by the Office of Rail Regulator. In the past, it has commissioned research into the share of variable costs. This has resulted in several reports and revisions regarding the share of variable expenses in expenditure related to renewal and maintenance. This research (BAH, 1999, BAH, 2000, BAH, 2005) clearly indicates that these shares are to a very large extent dependent on infrastructure use itself. For high traffic loads, the share of variable expenditures increases (see next figure) for the UK. (BAH, 2005) includes a similar exercise based on Australian data indicating the significance of the track infrastructure on the relation between expenditure variability and usage. This is further corroborated by TRL et al. (2001. p116-118), in which a linear regression analysis carried out on French infrastructure expenditures data shows that variable expenditures vary widely with the UIC track category.

Figure 3.1 Relation between share of variable cost and rail usage



Source: CE Delft / ECORYS / Stratec, 2004 based on data from BAH, 2000

This source also reveals some information on the share of variable expenditures for different asset types and expenditure categories, see the table below.

[37] See http://www.nmanet.nl/nl/Vervoerkamer/Publicaties_Spoorwegwet.asp?ComponentID=28446&SourcePageID=18083#1 (in Dutch).

Table 3.4 Variability per asset type

Asset	Activity	Component	% variable
Track	Maintenance		30
	Renewals	Rail	95
		Sleepers	25
		Ballast	30
Structures	Maintenance & Renewal		10
Signalling	Maintenance		5
	Renewal		0
Electrification	Maintenance		10
	Renewal	Alternating Current	35
		Direct Current	41

Source: BAH, 2000, repeated in BAH, 2005

A clear distinction has been made between renewal and maintenance expenditures, and between track (or superstructure), structures (civil engineering works), signalling and electrification (transmission lines). It should be noted that the percentages in table 3.2. relate to the British network, with a traffic load of around 5 million gross tonnes per year. Except for track related cost (see figure 3.2) we do not know how these percentages vary with use. Clearly, for a different quality of infrastructure and different usage levels, these percentages may be very different.

The German infrastructure manager made clear that a distinction between fixed and variable expenditures is not made in Germany. Because a full cost recovery approach is taken at infrastructure charging, information on the share of variable expenditures is not needed.

In Sweden, the infrastructure manager does not make a distinction between fixed and variable costs.

3.3.5 Capital costs

All rail infrastructure managers publish annual business accounts in which they specify capital costs.

Chapter 2 has shown that the calculation of capital costs depends on four parameters:

1. Lifetime expectancy of the asset;
2. Type of depreciation;
3. Interest rate; and
4. Time span between maintenance expenditures.

This section describes how the different infrastructure managers determine these parameters.

Life time expectancy

All infrastructure managers show lifetime expectancies in their business accounts, though often aggregates at higher levels than they use internally. Table 3.5 provides an overview of depreciation periods in different Member States. Land is generally not depreciated.

Table 3.5 Average of interval of life expectancy

Average or interval of life expectancy	Estonia	Sweden	Austria	France	Germany	Spain	The Netherlands
Buildings	8-50	10-35	25	50	10-50	50	
Civil engineering works			20	70	75-75	75	
Superstructure	8-50	40	25	30-50	20-25	18-40	33[38]
New construction in progress	N/a	N/a	N/a	N/a	N/a	N/a	N/a
Transmission lines	8-50	10-35	15	20			33
Signalling equipment					20-20		11
Telecommunications equipment		5-20	4	15	5-20		
Safety installations			4	15			25
Vehicles / rolling stock	3-15		5	5	15-30	10-30	
Plant and machinery	3-15	3-25	9				
Office, computer and other equipment, tools	3-5	3-25	4	3-7	2-20	5-40	

Note: depreciation rates have been taken from business accounts. Expenditure categories therein have been transferred as good as possible to the categories reported here.

It is clear from Table 3.5 that life expectancies vary considerably between infrastructure managers. This may have several causes: the quality of the assets may vary, environmental circumstances and climate vary, and discrepancies in the categorisation may cause variations.

The table also shows that some infrastructure managers use wide ranges, e.g. 10 to 50 years for buildings in Germany. One of the reasons is that the asset types categorised under each cost category (buildings in this case) may vary. While the foundation and the walls may for instance have life-expectancies of fifty years, elevators may have shorter life expectancies and lighting even shorter. In internal book-keeping systems, these life expectancies are known and applied to value the assets.

Type of depreciation

In the business accounts, two different approaches feature with respect to valuation of assets. Under the historical cost convention method, tangible assets are valued at acquisition (purchase price including non-refundable taxes and other directly attributable expenditures) or production 'cost' and depreciated over a straight line during the economic useful life[39]. Intangible assets are also valued at acquisition costs. This methodology is applied in Estonia, Sweden, Spain, the Netherlands, France, Austria and Germany and is in line with IAS/IFRS. However, IAS/IFRS also allows for other methods.

Depreciation periods differ per cost category. The business accounts generally provide depreciation range per cost category.

[38] Note that the superstructure is depreciated to 60% within the first ten years.

[39] An exception is the depreciation of the superstructure in the Netherlands, which is depreciated to 60% in the first 10 years, and then much slower for the remainder of its useful life.

The British infrastructure manager applies the historical cost convention method, as modified by the revaluation of the railway network to the lower of its depreciated replacement cost (DRC) and the value in use. This is according to the UK generally accepted accounting principles (GAAP). It is not so much the expenditures with which the infrastructure was purchased, but its value in future use that determines the asset value in the books. Depreciation according to this method does not take place per cost category, but is based on the weighted average useful economic life of the entire network. The current estimate is 25 years, this estimate is revaluated periodically in accordance with IAS/IFRS.

Interest rate

In business accounts, the interest rate is the rate or average rate a company pays on capital loans. The interest payments are both listed separately in the profit and loss accounts and reflected in the cost of infrastructure, which is the change in asset value minus the investment expenditures.

Time span between maintenance expenditures

In business accounts, maintenance with a time-span of over 1 year is generally capitalised. The exceptions are often small maintenance expenditures. As stated above, expenditures of up to € 400 in Austria and 10.000 EEK in Estonia are not capitalised.

3.3.6 Conclusions

It can be concluded that the main sources regarding expenditures are not the national statistics but the business reports from the governing companies. These accounts are published annually and are fairly consistent, both in time and between countries.

Most infrastructure managers distinguish between investment, renewal, maintenance and operational expenses, at least internally. The definitions used to distinguish these expenditures are very consistent across infrastructure managers. Except for Estonia, infrastructure managers indicate that maintenance expenditures are not capitalised. Investment and renewal expenditures generally are, with the exception being Sweden, where only investments are capitalised and renewal expenditures are not.

Apart from this categorisation, infrastructure managers also distinguish expenditure categories such as ‘Buildings’, ‘Engineering works’ and ‘Superstructure’. Although the precise categorisation in the business accounts differs somewhat between countries, we expect no major problems if managers were required to report in standardised categories. The reason is that much more refined categorisations are often available internally at infrastructure managers.

There is little information available with respect to the distinction between fixed and variable expenditures. Some infrastructure managers have indicated that they are working on this issue. Studies suggest that the share of variable expenditures may vary strongly with infrastructure use and infrastructure quality.

So, the preferred sources of information on infrastructure costs are the business accounts of infrastructure managers. Information is published yearly and with a high degree of

consistency in time series. Moreover, certainly in the situation where there are only few infrastructure managers, information can be collected with relative ease.

It should be strived for that infrastructure managers apply similar expenditure categories, such as the ones presented above. This eases comparisons between countries.

In addition to the data in the business accounts, some detailed non-published information needs to be obtained through infrastructure managers' staff. Since most information is available internally at the infrastructure manager, we do not expect this to require too much effort on the side of the infrastructure manager.

3.4 Inland waterway infrastructure

3.4.1 Data sources used to compile data

To analyse the data availability for inland waterway infrastructure, the project 'Charging and pricing in the area of inland waterways – practical guideline for realistic transport pricing, final report' by ECORYS and METTLE as well as the UNITE deliverables have been used. Only the countries France, Germany and The Netherlands have been taken into account since in the other countries inland waterway transport does not play a role or is only of minor importance. Information gathering has been supplemented by contacting waterway authorities and infrastructure managers (see annex 4 for list of contacted persons in the area of inland waterway infrastructure).

3.4.2 Expenditure categories

Based on a previous study by ECORYS/METTLE it can be concluded that the data availability at the national level is much less detailed than the information available at a lower level. In the case of France the VNF (Voies Navigables de France) is the organization that has much more information than the 'Ministère de l'équipement'. In The Netherlands much more detailed information can be found with the provinces and regional waterway authorities than with the national statistical institute. In Germany it is the Wasser- und Schifffahrtdirektion (of which there are 7 departments in Germany) that has the best overview of the expenditures.

Regarding the practice of cost categorization in the three different countries we can state that it is heterogeneous. Functional categorization (such as maintenance, operation, renewal, etc.) of the costs is used in Germany and France, asset-oriented categorization (such as bridges, canals) is used in The Netherlands. The next table summarizes the existing expenditure categories that are used at 'the lower level' to categorize the expenditures for inland waterways.

Table 3.6 Existing categories for registration of expenditures for inland waterways

The Netherlands (Prinses Margriet kanaal)	France (Basin Rhone-Saone)	Germany (general)
Investment costs	**Investment costs**	**Investment costs**
Channel	**Maintenance costs**	Investments for inland waterways
Maintenance canal banks	Service of maintenance companies	Purchase of new boats/equipment for maintenance and/or emergencies
Big maintenance canal banks (not yearly)	Embankment	Purchase of land
Dredging	Bridges	Purchase of machines, instruments and equipment (for instance telematic instruments, inventory of bureaus)
Beacon/Concrete	Waterways	Construction of company roads along inland waterways
Equipment costs	**Equipment costs**	**Operational costs 1**
Taxes	Repair and renovation	Costs for personnel
Interest/ subsidies/write-off	Construction	**Operational costs 2**
Other	**Dredging costs**	Administration costs (bureau material, magazines) < € 5.000 per case
Bridges	**Operational costs 1**	Maintenance of company-boats
Equipment costs	Locks	Maintenance of inland waterways
Technical maintenance	Bridges	Expert costs (engineer, etc.)
Big technical maintenance	Dam	Education costs personnel
Civil maintenance	**Operational costs 2**	Exercise costs (of firemen, safety drills, etc.)
Big civil maintenance	Person and goods safety	Maintenance of communication network
Insurance, taxes		
Other		
Locks		
Equipment costs		
Technical maintenance		
Big technical maintenance		
Civil maintenance		
Big civil maintenance		
Insurance, taxes		
Other		
Other		
Gas, water, electricity		
Equipment maintenance		
Furniture and soft furnishing		
Equipment costs		
Cars, Vessels		
Overhead		

The Netherlands (Prinses Margriet kanaal)	France (Basin Rhone-Saone)	Germany (general)
Interest, write-off		
Other		
Reservations		
Source: Province of Friesland	**Source: VNF**	**Source: Bundesministerium fur Verkehr, Bau- und Wohnungswesen**

In all three countries investment costs are a separate cost category. What is meant under investment expenditures is described in the next paragraph. It can also be concluded that the Province of Friesland has the most extensive overview of expenditure categories used. The personnel costs are included in the 'equipment costs' together with accommodation costs and various office costs. Big maintenance costs are costs that are not made on a yearly basis. The cost category 'Other costs' is determined by attributing 75% of these costs to this channel. This percentage is based on historic data. Costs made by the water police are unknown in all three countries.

In the study of ECORYS/METTLE it was also concluded that expenditures do not always reflect true costs: due to for example tight budgets, in some years expenditures were lower compared to what they would have been if no budget constraints would have existed. The expenditures for inland waterways in Germany and The Netherlands exclude expenditures made for inland ports[40]. For France the costs include those made for inland ports.

Another problem was the distinction into expenditures that can be attributed to inland shipping and expenditures for other waterway functions (i.e. drinking water function, quality and amount of water, recreation, dykes to prevent flooding of the land, etc) or 'crossing modality'. For instance bridges cannot be attributed solely to the inland shipping, since it is at least also partly related to the road traffic. With regard to the first aspect it was concluded that in case studies of The Netherlands and France the share of inland shipping costs in the total inland waterway costs amounted between 70 and 80%.

3.4.3 Investment and running expenditures

In France the definitions used to distinguish between investments and maintenance expenditures for inland waterways are similar to those mentioned in the Glossary for transport statistics (3rd edition), i.e.:

- **Investment expenditure:** Expenditure on new construction and extension of existing infrastructure, including reconstruction, renewal and major repairs.
- **Maintenance expenditure:** Expenditure for keeping infrastructure in working order. This includes surface maintenance, patching and running repairs.

[40] In Germany expenditures for inland ports are registered by the *Länder*, in the Netherlands expenditures for inland ports are registered by the municipalities.

In The Netherlands maintenance expenditures concern periodic renewals and improvement works related to the exploitation of waterways (for example remote control of bridges). Compared to the Glossary for transport statistics this definition of maintenance expenditure is broader since improvement works are classified as investments in the Glossary. Expenditures for the replacement of bridges and locks at the end of their life cycle are financed in The Netherlands using different budgets. The same accounts when a waterway is 'upgraded' (broadened to accommodate larger ships), this is seen as an investment expenditure.

It can be concluded that the definitions of investment and maintenance expenditures differ between the three countries. For example (some) improvement works related to the exploitation of waterways (for example introduction of remote control for bridges) are in The Netherlands characterized as maintenance costs (see previous paragraph), but they can also be qualified as investment costs since they improve the quality of the waterway.

3.4.4 Fixed and variable expenditures

In the inland waterway statistics no distinction is made between fixed and variable expenditures. In a recent study by ECORYS en METTLE[41] several case studies have been performed in order to distinguish fixed and variable costs of inland waterways in The Netherlands, France and Germany.

In these case studies the econometric approach proved to be problematic: an adequate sample size with sufficient variability amongst the explanatory variables required disaggregate data for individual stretches of infrastructure and this kind of information was not always available. It became also clear that expenditures on maintenance and renewals are influenced by the financial resources of the organisation responsible: maintenance expenditures were sometimes low due to postponement or maintenance expenditures suddenly increased because there were not enough financial resources to replace parts of the infrastructure leading to higher maintenance expenditures. As a result, the econometric approach did not lead to useful results. The engineering based approach was not practical at all: there was no knowledge available within the organisations to apply this approach.

The cost allocation approach was the method commonly used. This method however requires a thorough analysis of the available data, lots of interaction with the organisation providing the data, and decision making which is always influenced by the judgement of the researcher. Also for this approach the same applies as for the econometric approach: the observed (fixed and variable) expenditures did not always reflect the true costs due to amongst others postponement of infrastructure costs.

Based on the cost allocation approach the following figures regarding the distinction in a fixed and variable part of the total infrastructure expenditures on inland waterways are derived from three Dutch case studies.

[41] *Charging and pricing in the area of inland waterways*, ECORYS, METTLE, Rotterdam, 2005.

Table 3.7 Division of infrastructure costs of inland waterways into fixed and variable costs

Type of expenditures	Fixed costs	Variable costs	Remarks
Maintenance costs canal banks (including personnel costs)	80%-90%	10%-20%	
Dredging cost	80%-90%	10%-20%	
Beacons, concrete	100%	-	
Construction works for shipping	80%	20%	
Maintenance costs radar	100%		
Maintenance costs bridges	80%	20%	If the bridges do not have to be opened for vessels these costs should not be taken into account (and be attributed to cars and trucks)
Other maintenance costs	80%-100%	0%-20%	Depending on what these costs comprise the share should be determined.
Operational costs locks	70%-80%	20%-30%	
Operational costs traffic post	-	100%	
Patrol costs	50%	50%	
Taxes, interest, write-off, other costs	100%	-	
Average	72%-85%	15%-28%	

Source: 'Charging and pricing in the area of inland waterways', ECORYS and METTLE, 2005.

3.4.5 Capital costs

In the three countries that are taken into account regarding inland waterway infrastructure costs, capital costs are not taken into account when determining the total infrastructure costs: only the investments and maintenance and running expenditures are taken into account. In the UNITE study the capital costs of inland waterways for all the three countries were calculated using the PIM.

Table 3.8 Assumptions used in UNITE to calculate the capital costs of inland waterways

	Average life expectancy (years)	Interval of life expectancy	Interest rate
France	158		
Germany	116 (earthworks etc) 47 embankments 66 engineering works 18 equipment	20-180 5-75 1-110 1-30	3%
The Netherlands	35		

The average life expectancy on which the French calculations were based amounts to 158 years (for 100% of the costs). No distinction could be made between ports and canal investments.

In Germany the calculations were made based on an average life expectancy of 116 years for earthworks and drainage, 47 years for embankments, 66 years for engineering works

(locks etc.) and 18 years for equipment. An interval of this life expectancy was also taken into account. The capital costs were calculated separately for inland waterways and inland waterway ports. Non-transport related capital costs (for electric power generation, prevention of flooding) were estimated from a study by the German Ministry of Transport in 1969 (!).

Calculations for The Netherlands used an average life expectancy of 35 years for inland waterways. Investments in ports were not included; the capital costs of these assets were calculated separately, using an average life expectancy of 30 years.

3.4.6 Conclusions

The three countries for which the inland waterway infrastructure expenditures have been analysed are not consistent in their way of presenting infrastructure expenditures for inland waterways: different costs categories are used. However, the data samples collected in the study *Charging and pricing in the area of inland waterway transport* proof, that the waterway authorities in the respective countries can provide detailed infrastructure data which can be aggregated to the expenditure categories as mentioned in chapter 2 and which can, according to our estimation, be split up in costs made for assets with a life-expectancy greater or less than one year. For now capital costs are not calculated in all of the three countries.

Although data availability and the level of detail are fairly good, some of the other data requirements are not being met at this moment:

- There is no distinction into fixed and variable costs;
- There is no distinction into expenditures that can be attributed to vessels and expenditures for other waterway functions (i.e. drinking water function, quality and amount of water, recreation, dykes to prevent flooding of the land, etc) or 'crossing modality'. For instance bridges cannot be attributed completely to the inland shipping, since it is at least also partly related to the road traffic;
- The Netherlands and Germany have split up their costs for inland waterways and inland ports, whereas France has not. In The Netherlands and Germany the costs for inland waterways and inland ports are registered by different organisations.

In the Netherlands and Germany the information was collected through local waterway authorities. In order to arrive at the national figures other authorities have to be contacted as well. At national level detailed information on infrastructure expenditures, which meet the requirements is currently not being registered.

3.5 Air transport infrastructure

3.5.1 Data sources used to compile data

The analysis for air transport infrastructure has been carried out based on the following sources:

- National level: review of UNITE deliverables (5 countries, 2000)
- National level: questionnaire results (4 countries, 2005)
- Individual level: published business accounts (6 airport operators, 2003/2004/2005)
- Individual level: interviews with financial control staff (3 airport operators, 2005)

Literature review and questionnaires

Air infrastructure is not covered by regulation 1108/70 and so data availability at Eurostat as well as in countries' national statistics is generally rather limited. The primary source of information underlying the national statistics level (UNITE deliverables as well as the answers to the questionnaires) are the business accounts of airports and the air traffic control agencies. Exceptions are France and the Netherlands, for which the data have been drawn from the national statistical bureaus[42]. For Estonia, data from a consultancy report and the Ministry of Transport was used.

Please refer to the table below for an overview.

Table 3.9 Overview primary data source air transport infrastructure expenditures

Source	Country	Data collection / data source
Questionnaires 2005	Estonia	Account system of private organisation
	France	Account system of public and private organisations
	Sweden	Account systems of public and private organisations
	UK	Account system of public and private organisations
UNITE, 2000	Austria	Airport operators
	Germany	Airport operators
	Netherlands	Airport operators
	Estonia	Consultancy report
	Spain	Airport operator

At a national level the consistency of data is rather poor, as major differences exist between categories of expenditures and/or costs recorded. Moreover the level of detail is not very extensive as clearly shows from table B6.1 in annex 6. Hence the available data on air transport infrastructure expenditures at a national level are not very suitable for the purpose of compiling and comparing these expenditures and neither for capitalization of expenditures into costs.

Business accounts

The individual business accounts of airport operators provide the most detailed information and are published annually. Some specific non-published cost accounting matters must be collected from financial staff of individual operators.

In most airport business accounts, air traffic control expenditures are not included. This activity is often being performed by separate (public) air traffic control organisations.

[42] For the Netherlands, these data in turn are (partly) based on business accounts of airports.

3.5.2 Expenditure categories

In chapter 2, the following categories of asset related expenditures were identified:

- Investment.
- Renewal
- Maintenance
- Operational

Based on the published business accounts of airport operators we can conclude that the actual split up of expenditures resembles this categorization except for a clear distinction between investments and renewals. Please refer to table B6.2 in annex 6. However from interviews with infrastructure managers it shows that internally such distinction does exist.

An important issue here is the fact that not all infrastructure expenditures of airport operators are related to air transport itself. A major proportion is non-flight related, for instance retail or real estate management. Airport operators differ in the way they account for their activities. Please refer to table B6.3 in annex 6. From this table we can conclude that – for all published accounts studied – a distinction between flight related and non-flight related activities exists, at least concerning revenues.[43] However based on interviews with infrastructure managers, internally this categorization is also applied regarding expenditures and costs (asset based, please refer also to section 3.5.5.). As more and more airport operators are expected to shift to a 'dual till approach', we expect that in a number of years all airport operators will be able to distinguish between flight and non-flight infrastructure and its related expenditures.

3.5.3 Investment and running expenditures

Please refer again to table B6.2 in annex 6, where a summary is presented of investment and running expenditures included in the published business accounts of airport operators. Based on this information we can conclude that all counties viz. airport operators are able to distinguish between investments and running expenditures. However we would like to make the following remarks:

- In most business accounts, air traffic control expenditures are not included. This activity is often being performed by separate (public) air traffic control organisations.
- Maintenance, being one of the running expenditures, is not always presented separately in the published accounts, but can in principle be isolated.
- More relevant however is the fact that not all operators are clear – at least in their published accounts – what exact definitions they use and based on which criteria an expenditure is booked as a running expenditure or as an investment or renewal that will be capitalized. In the cases where such a distinction has been made, the rule is that all those expenditures are capitalized that lead to increased capacity, productivity or to lengthening of useful lives of assets.
- All maintenance expenditures are considered running expenditures. However this will change as a result of the introduction of IAS/IFRS in the accounting system of airport operators. It is expected that (principal) European airport operators will adapt their

[43] Flight related = aviation or airport plus (ground) handling.

accounting system in 2005 to comply with IAS/IFRS-standards. Under IAS/IFRS all 'major maintenance' expenditures should be capitalized (IAS 16). Concerning IAS/IFRS more details are provided in section 3.5.5.

3.5.4 Fixed and variable expenditures

In none of the published business accounts a distinction between fixed and variable expenditures has been made. The infrastructure managers of Schiphol, Frankfurt and Vienna airport all indicated that also internally there is no information available for such a distinction.

3.5.5 Capital costs

Capital costs, consisting of depreciation and interest costs can be extracted from the business accounts. Concerning the cost drivers we make the following remarks:

- Currently business accounts have to comply with their respective national accounting principles. Starting from 2005 however, all EU companies with a stock market listing, or heading for a stock market listing (like for instance Aeroports de Paris) are obliged to comply with the International Financial Reporting Standards (IFRS). This means that from 2005 on, the annual reports of the EU (principal) airport operators will be based on common IAS/IFRS-principles.
- In all the business accounts we have analyzed, the depreciation method applied to the valuation of assets is the same: fixed assets are carried at historical cost / purchase price depreciated on a straight-line basis over the estimated useful life of the asset. So currently in practice – at least for the business accounts studied – there is no difference in this respect. Under IAS/IFRS depreciation based on historical costs of assets is stated as the preferred method, although IAS/IFRS also allows valuation based on replacement costs (IAS 16).
- Currently the depreciation periods applied by airport operators for the same types of fixed assets are different: fluctuations have been noticed of plus/minus 10 years, leading to differences in annual depreciation costs. Please refer to table B6.4 in annex 6. This fluctuation is the result of a) how assets are categorized in the published business accounts[44] versus the individual asset for which a specific lifetime is applied and/or b) the national accounting principles allowing different life times from country to country. All three infrastructure managers interviewed (Schiphol, Frankfurt, Vienna) indicated that internally much more detailed asset categories are available, with more detailed information on specific depreciation periods depending on the exact asset specifications. Under IAS/IFRS no pre-determined asset categories will be introduced. On the other hand IAS/IFRS also states that assets with different lifetimes should be placed in different categories and be valued accordingly (IAS16). However this will probably still leave room for fluctuations as mentioned above.
- Currently maintenance expenditures (mostly) are not capitalised. As stated in section 3.5.3., under IAS/IFRS this will change as 'major maintenance' expenditures should

[44] For instance: a category 'buildings' with a depreciation period of 5-40 years will be composed of a number of very different types of buildings.

be capitalized. However in practice differences in interpretation may arise concerning to what exactly 'major maintenance' is.

3.5.6 Conclusions

Business accounts of airport operators and air traffic control organisations are readily available sources of information that can supply many of the data needed to make cross-country comparisons of air transport infrastructure expenditures and costs. The level of detail is already fairly good, and the functional breakdown is already close to the expenditure and cost categories as suggested in section 2.

Although data availability and the level of detail are fairly good, some of the other data requirements are currently not fully met:

- There is no distinction into fixed and variable costs;
- Definitions used for maintenance, renewals and investments can be different;
- Allocation of expenditures to flight versus non-flight related infrastructure is not yet applied everywhere.
- Accounting principles which are relevant for assessing capital costs can be different.. EU airport operators with a stock market listing or heading for one, will all adapt their accounting system in order to comply with IAS/IFRS starting from 2005. Under IAS/IFRS common principles will apply concerning a) capitalization of 'major maintenance' expenditures, b) preference for valuation of assets based on historical costs and c) assets with different lifetimes to be valued accordingly. However despite these common denominators there will probably still be room for variations, especially regarding specific lifetimes of assets.

3.6 Maritime transport infrastructure

3.6.1 Data sources used to compile data

The analysis for maritime transport infrastructure has been carried out based on the following sources:

- UNITE deliverables (5 countries, 2000)
- Questionnaire results (4 countries, 2005)
- Detailed Investment Programme of the central Spanish state ports 2002-2006
- Detailed business accounts of port authorities (3 port authorities 2002/2003/2004)
- Interviews with infrastructure managers (see annex 4 for list of contacted persons in the area of maritime infrastructure).

The current practices on maritime transport infrastructure accounting are analysed for all selected countries except Austria, as maritime transport is not relevant for this landlocked country. The management and ownership of the infrastructure in the ports varies from almost every port in private hands (UK) to all ports under government control (France and Spain). When private companies manage infrastructure it is very difficult to obtain long time series of infrastructure costs with consistent and reliable data for this sector.

Generally business accounts are used to provide information on running costs (when available). For capital costs calculations data sources vary across the countries. UK and the Netherlands use business accounts of the individual port authorities, for Germany information from the Federal State Ministries is used, a centralised government agency or ministry provides data for France, Spain and Sweden. For Estonia data from the ministry is combined with data from a study on behalf of the EU[45].

For maritime transport infrastructure Regulation 1108 does not hold. Availability of data at Eurostat is therefore very limited. Data reliability and consistency is very dependent on private sector involvement in ownership/ management of the ports. More private sector involvement generally implies more fragmented data sources, less consistency and different definitions and therefore less reliable information. Data for the UK and to a lesser extent the Netherlands is therefore not as reliable as data for the other countries. Data consistency is a problem in the UK (because central government moved from cash accounting to resource accounting in the late-1990s) and in Estonia. Estonia has data from different sources. Data continuity is questionable in Estonia, because of changes in administration after the independence in 1991.

3.6.2 Expenditure categories

The type of maritime transport infrastructure for which accounting data is available is limited to seaports for all countries except Estonia. For Estonia also data on coastal waterways is available. However the seaport data is limited to ports used for domestic ferry transport, other ports are not included. This implies that costs of maritime access outside the responsible area of port authorities, maritime signals at sea and for some countries also in the access channels cannot be included in the monitoring of maritime infrastructure expenditures and costs, when these are only based on business accounts of port authorities. The same holds for pilot services. In some ports and countries the the harbour master and vessel traffic management systems (VTMS) are under the responsibility of the port authority, in others they are performed by separate public organisations. As a result, the costs are not always incorporated in the business accounts.

3.6.3 Investment and running expenditures

Investment expenditure data is available in all countries except Estonia. For most countries a breakdown of this data in cost categories is limited to the distinction in depreciation and interest costs. Only for Sweden a breakdown of investment in ships, other construction and machinery is available.

All countries considered are able to distinguish investment, maintenance and operational expenditures. However, not all countries have data available on all categories, only France, Spain and Sweden can report complete data for seaports.

In **Sweden** (Göteborg) expenses for improvements of an asset's performance beyond the original level are seen as investments. Expenses for repairs and maintenance are shown as costs. In the **United Kingdom** (Associated British Ports) all tangible assets are stated as

[45] DHV and LT Consultants (1999). Transport and the Environment: A Multy-Country Approach. EC-Phare programme.

costs, with the exception of operational land. In **Germany** annual results of port authorities of Hamburg and Bremen (largest ports in Germany) are included in the annual reports of the respective city-state. Information on only port infrastructure is therefore difficult to obtain. **France** uses the definitions of the *Glossary for transport statistics (3rd edition)*:

- Investment expenditures are expenditures on new construction and extension of existing infrastructure, including reconstruction, renewal and major repairs
- Maintenance expenditures are expenditures for keeping infrastructure in working order.

For the **Netherlands** and **Spain**, just as for the UK, the definitions of the business reports of the port authorities are used, which are laid down by the national accounting principles of the respective countries. For Spain the central government organisation responsible for all state ports uses one breakdown for investment expenditures for all these ports (see table below).

For **Estonia** the definitions used in UNITE are presented (see next table).

Table 3.10 Overview of existing expenditure categories and definitions per country

Country	Expenditure categories	Definition
Sweden	• Investment expenditures: – Ships – Other construction – Machinery • Running expenditures • Other expenditures	• Value of acquisitions less disposals of new or existing fixed assets used repeatedly or continuously in production processes for more than one year • Intermediate consumption • Taxes, labour costs, interest
United Kingdom	No common breakdown available (each port authority uses its own breakdown) Breakdown used by largest organisation[1] • Operational land • Buildings • Dock structures, quays & dredging • Floating craft • Plant end equipment • Construction in progress	-
Netherlands	No common breakdown available (each port authority uses its own breakdown)	-
Germany	No common breakdown available	-
France	Only total investment expenditure available (globally) No (common) breakdown available	-
Spain	The central state port authority in Spain uses the following breakdown of investment costs: • Quays and berthing • Maritime access and signals, shelter • Land • Land access • City port & environment	-

Country	Expenditure categories	Definition
	• ICT investments • Minor investments • Other investments Breakdown of Infrastructure operation costs not available.	
Estonia	Infrastructure operation cost breakdown: • Coastal waterways • Ferry ports for domestic transport	Investment expenditures include new constructions, renovation and acquisitions. Running costs include costs for maintenance, operation and administration/overheads.

1) ABP covers around 45% of all UK trade

Sources: SE: Port of Göteborg, UK: ABP, UNITE, questionnaires.

An approach mentioned previously, which can be used to make this distinction, is to use business accounts as a basis for the classification. Business accounts typically show information on investment on the balance sheet and running costs in their profit-and-loss account. Consequently, it will be relatively straightforward to distinguish between investments and running costs. This conclusion is confirmed in both the UNITE study and the questionnaires, where almost all countries were able to report a distinction between investments and running costs. The only country that could not report investments and running costs was Estonia.

The table presented below gives an overview of the methodology of data collection in each of the selected countries.

Table 3.11 Overview of the methodology of data collection in the selected countries

	S	UK	NL	D	F	E	EE
Methodology							
Distinguish between annual and multi-annual expenditures?	N	N	N	N	N	N	N
Distinguish between variable and fixed expenditures?	N	N	N	N	N	N	N
Distinguish between running expenditures and investments?	Y	Y	Y	Y	Y	Y	Y
Corrections made from multi-annual to yearly expenditures?	N	N	N	N	N	N	N
Data sources							
Account systems of public administrations?	Y	N	N	Y	Y	Y	N
Account systems of private organisations?	Y	Y	Y	N	Y	N	N
Type of organisation?	H/M	PA	PA	FS	PA	PA	-
Other input							
Investment costs from port authorities	Y	Y	Y	N	N	N	N
Investment costs from federal states	N	N	N	Y	N	N	N
Satellite accounts for the transport field	N	N	N	N	Y	N	N
Ministry and publications	N	N	N	N	N	Y	Y

Y = yes, N = no, PA = Port Authority, H = Harbour, M = Maritime Administration, FS = Federal State Ministry

Unfortunately, it is not possible to rely on only one type of data sources. For most countries (individual) business accounts are available, but not for Germany. Furthermore,

the size of the responsibilities of the port authorities varies among countries, especially concerning the role of the harbour master and VTM-systems. More than one type of information source will therefore have to be used, in order to include also the expenses not made by port authorities usually two types of sources have to be used within each country.

3.6.4 Fixed and variable expenditures

None of the countries currently distinguishes between fixed and variable expenditures in their statistics on infrastructure expenditures for maritime transport. This distinction can neither be made based on the information from the business accounts.

3.6.5 Capital costs

Capital costs, consisting of depreciation and interest costs can be extracted from the business accounts. However, long time series are needed to calculate the asset value of the infrastructure based on this information. Furthermore, business accounts of all ports have to be gathered.

Using business accounts can introduce the following difficulties. The business accounts have to comply with their respective national accounting principles. For example, the depreciation method and period varies across the studied business accounts. This will cause discrepancies, although this was not studied in detail for this study. However, maintenance expenditures are not capitalised in the studied business accounts.

Starting from 2005 all EU companies with a stock market listing, or heading for a stock market listing are obliged to comply with the International Financial Reporting Standards (IFRS). This means that from 2005 on, the annual reports of some port authorities (such as Associated British Ports in the UK) will be based on common IAS/IFRS-principles. Under IAS/IFRS common principles will apply concerning a) capitalization of 'major maintenance' expenditures, b) preference for valuation of assets based on historical costs and c) assets with different lifetimes to be valued accordingly. If in the future more port authorities will adopt these new standards, fewer discrepancies will occur in the business accounts. However despite these common denominators there will probably still be room for variations, especially regarding specific lifetimes of assets.

Estimation of capital costs	Capitalisation of the infrastructure investments by a specific method using assumption concerning life expectancies and interest	UK*, NL, D, F, E, S.

* Capitalisation limited to ports covering 45% of trade

3.6.6 Conclusions

Maritime infrastructure is not covered by regulation 1108/70 and data availability at Eurostat is therefore very limited.

Information regarding expenditures can be based predominantly on business accounts. These data sources are however not consistent across the countries. Data availability for Estonia was overall poor and, because of its incidental nature, inconsistent too. For all other countries the level of detail is limited but consistent. Data quality is rather good in most countries, (somewhat) less in the Netherlands and UK and poor in Estonia.

Minimal requirements that are not met by all countries are:

- Infrastructure expenditures available for all seaports;
- A split between fixed and variable costs/expenditures;
- Accounting principles, which are relevant for assessing capital costs, can be different.

The table below gives an overview of the identified 'best and good practice'-components for an accounting system for infrastructure expenditures.

Table 3.12 Best and good practices

Best practise	Description	In countries	Notes
Costs related to infrastructure type	Seaports Coastal waterways Access channels	UK, N, D, F, E, S	Only seaports
Costs related to infrastructure components	Earthworks, etc. Buildings, etc. Quays, etc. Equipment	D	
Cost categorisation	Investment Maintenance Operation	F, E, S	UK data not representative; NL and D no running costs available; EE no capital value calculated
Distinction between fixed and variable costs		-	
Data availability	Data on all ports	D, F, E, S	
Expenditure information at national level		F	National accounts available

Data availability and data reliability are the main bottlenecks for a harmonized approach based on expenditures. Availability of expenditure information at national level appears poor, with France being the only exception. Comparable to air transport, business accounts concerning maritime (sea ports) infrastructure are fairly well available. Because the data that is available at national level is mainly based on the business accounts, an approach mostly based on cost information from business accounts can be justified[46]. Clearly, the consistency and comparability between countries would depend strongly on potential differences in national accounting principles.

Based on the current information available the expenditures can be limited to seaports only.

[46] As Directive 2001/14/EC requires rail infrastructure managers to record and establish the valuation of their assets, a similar directive or regulation may be feasible with respect to infrastructure at seaports. We could imagine a similar requirement being inserted into the document being prepared by DG TREN on seaport charges.

3.7 Conclusions

For the **rail** infrastructure, the **air** transport infrastructure and the **maritime** transport infrastructure it can be concluded that no or only poor quality data on maintenance expenditures are available in **national statistics**. More detailed information can however, for all three just mentioned types of infrastructure, be found in the **business accounts**. The reliability and consistency of data from business accounts can be considered to be good, given that the business accounts are published annually and have to comply with national accounting principles. The efforts to obtain these business accounts are estimated to be relatively low since the number of businesses in these three types of infrastructure is relatively limited.

When using data from business accounts, consistency between countries depends partly on the national accounting principles. Because of IAS/IFRS business accounting principles for the modes rail, air and maritime will converge. Consistency between countries furthermore depends on the exact distinctions made in the business accounts. With regard to this last point the conclusion can be drawn that there are indeed differences in the distinctions made in business accounts between countries. Also definitions used are not always clear.

When using business accounts instead of national statistics on expenditures one must keep in mind that business accounts are focused on costs instead of expenditures. The methodology applied to derive costs from expenditures is regulated by national accounting principles. Taking the 'business account' approach would have the following advantages:

1. The lack of data at national level on expenditures related to maintenance and operation of infrastructure does not result in a lack of data at the level of infrastructure managers;
2. The lack of data at national level on the distinction between fixed and variable expenditures can be bypassed in case accurate data are retrieved;
3. Detailed information regarding the purpose of expenditures does not have to be retrieved (nor does reporting this impose an additional administrative burden on companies)
4. Business reports contain information about aggregated capital costs but expenditures are not disaggregated at the level of these reports.

Almost every country registers the expenditures made for **roads**, so data availability is not an issue, although every country applies its own definition. Capital costs of previous road investments are not calculated. No data is available on fixed and variable road expenditures.

Availability of transport infrastructure expenditure information for **inland waterways** at national level is rather poor. At the level of regional waterway authorities there is however a lot of information available. Especially in Germany and the Netherlands data is scattered because of the existence of different regional waterway authorities. The expenditure categories and definitions used differ between the countries. Capital costs of

previous investments are not calculated, nor are expenditures divided between a fixed and variable part. A typical aspect of inland waterways is that – in contrast to the other modes of transport - an inland waterway has alternative functions besides transport. This means that it has to be clear what part of the costs can be attributed to inland shipping and what part to other functions (drinking water, recreation, etc.)

The next and last chapter of this report starts with outlining a practical methodology to calculate infrastructure costs step-by-step. Subsequently, for each transport mode recommendations are given regarding the definitions and categories which should be applied, and how data can be collected and processed from official publications. Last, an impact assessment has been made for each mode in terms of the extra efforts that are needed from infrastructure managers to modify their current accounting practices into the cost registration framework proposed in this study.

4 Recommendations

4.1 Introduction

The previous chapter reviewed the current national practices regarding the infrastructure expenditure registration for five modes of transport in different countries. In this chapter a uniform cost registration for the transport infrastructure in Europe is developed.

The chapter starts with a general description of the methodology in paragraph 4.2. The different parts of the methodology are further specified for each of the modes in the following paragraphs (par. 4.3 through 4.6). Also attention is given to the question if and, if yes, what part of the expenditures can be qualified as fixed or variable and what are the efforts needed in the different countries to modify their current accounting practices into the cost registration framework proposed here (impact assessment).

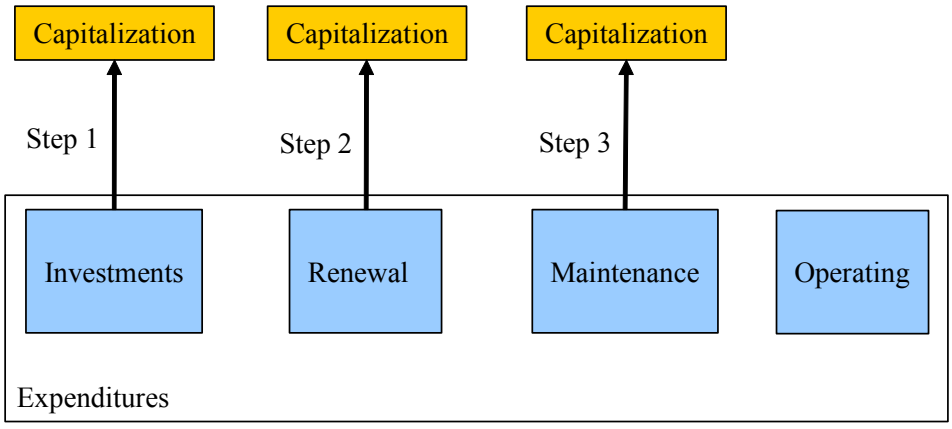
General ideas behind the developed methodology for the infrastructure cost registration are:

- The methodology must be practicable: it must be an 'easy to use' registration method;
- The methodology must stay as close to the current cost registration practice in the different countries as possible.

4.2 Methodology for calculation of infrastructure costs

This paragraph deals with 3 practical steps which should enable infrastructure managers to assess total infrastructure costs. The next figure outlines the three steps schematically:

Figure 4.1 Practical methodology to arrive from infrastructure expenditures to costs



Each of the steps will be explained in more detail hereafter. In order to be as clear as possible and to underline the practicability of the various steps, examples are given by using fictitious calculations.

Note: The 3-step approach is mainly advised for modes where data are gathered through other sources than business accounts (e.g. road and inland waterways). For rail (partly), air and maritime transport the information is gathered through business accounts. Here IAS/IFRS principles should be applied.

Step 1a: Investment expenditures in the current year
As already mentioned in chapter 2, investment expenditures are expenditures made for new infrastructure (=new capacity), expansion of existing infrastructure (=enlargement of capacity) or adding new functionalities to existing infrastructure (for example DRIPS on roads).

In order to determine the total investment costs, not the investment expenditures should be taken into account, but the capital costs of these investments. All the expenditures that are made in connection with the investment should be capitalised including expenditures for the:

- acquisition of land;
- acquisition, construction or replacement of buildings and other structures;
- acquisition, installation or replacement of movable or fixed plant, machinery, vehicles and vessels.

In order to determine the capital costs of investments the following steps have to be taken:

1a.1 Estimate years of service life
Complete the breakdown of infrastructure components and determine how long each component of the infrastructure will last before it has to be replaced. This is the estimated number of years that an asset can be used for the purpose it was designed/constructed.

1a.2 Estimate capital costs
The annual capital costs can be calculated based on the asset value, asset service life and interest rate utilising an equal payment series (meaning a linear depreciation function) discount formula:

$$Annual\ capital\ costs = Asset\ value * \frac{InterestRate}{(1-(1+InterestRate))\text{^}-(ServicelifeofAsset)}$$

In 2003 only three European countries used geometric depreciation functions (see also annex 2 and chapter 2) for public infrastructure: Ireland, Norway and Austria whereas Ireland uses linear depreciation in the case of roads. There is however not a 'best' depreciation function: a study by Eurostat (2003) concluded that there are no grounds to recommend that all countries use linear depreciation or geometric depreciation. However because most countries use linear depreciation functions it is advised to use linear depreciation.

With regard to the interest rate it is advised to use an interest rate of 5%. Since there is no 'official' interest rate known in calculating capital costs (see also chapter 2), the same interest rate as used in Cost Benefit Analysis for EU-projects is advised..

Example

The next table presents an example of the calculation of capital costs of a new road.

Table 4.1 Example of the calculation of capital costs for an investment in a new road (interest rate is 3%, linear depreciation)

	New Road infrastructure	Years of service life		
		Initial investment cost		
(asset value)	**Capital costs**			
Road surface	15	€ 100.000	€ 8.377	
Earthworks, drainage, etc		100	€ 5.000.000	€ 158.233
Equipment	5	€ 25.000	€ 5.459	
Total		€ 5.125.000	€ 172.069	

Total investments for the new road amount to € 5.125.000. Taking into account the expected service of the different components, the capital costs in the first year amount to € 172.069. Assuming that no replacement takes place for the item 'equipment' after 5 years, the yearly capital costs drop to € 166.610 (172.069 – 5.459).

An important aspect in the above mentioned example is the fact that the calculated capital costs are based on historic cost prices: the costs that were made in the time the investment was made. When however a new road surface is needed 15 year after the initial investment these costs are likely to exceed the initial € 100.000. This means that when account has to be taken of increasing prices in time, some kind of indexation (deflation) or additional, separate, reservations have to be made (calculations based on replacement value). Indexation of asset value is for example common in furniture insurance: one is insured based on the assumption that if the insurance is needed the same (new) furniture can indeed be bought despite the fact that prices have risen in the mean time. Historic cost accounting is commonly used in business accounting but not in the national accounts.

A decision has to be made whether the capital costs of transport infrastructure are calculated based on historic cost prices or on replacement values. Using replacement values the capital costs represent future expenses for reinvestments, using historic values the capital costs represent expenses for investments made in the past. Since the review of national practices seems to prove that most countries use the historic values approach it is advised to calculate the capital costs based on historic costs. This advice is also in line with IFRS (International Financial Reporting Standards) in which the preferred method is historic cost accounting.

Step 1b: Investment expenditures in the past years

Not only need the capital costs be calculated for new investments in the current year, also the capital costs of previous investments in the infrastructure have to be calculated. To calculate these, long investment expenditure time series (30-40 year) for each mode is necessary[47]. For each subsequent year the investments have to be divided according to their life expectancy. In a next step the capital costs can be calculated using the previously mentioned function.

Example

It is assumed that during a period of 8 years each year an investment has been made of € 100. Of this investment € 50 has an expected life time of 5 years and the other € 50 of 10 years. Using an interest rate of 3% and historic cost prices the capital costs of the assets with a life time of 5 years amounts to € 11 each year (for a 5-year period) and € 6 for the assets with a life time of 10 years. This leads to capital costs of € 17 in the year t-7 to €103 in year t.

Table 4.2 Example of the calculation of capital costs for investments made during a 8 year period (interest rate is 3%, linear depreciation, historic cost prices)

	Year							
	t-7	**t-6**	**t-5**	**t-4**	**t-3**	**t-2**	**t-1**	**T**
Total investments	100	100	100	100	100	100	100	100
Investment with life time of 5 year	50	50	50	50	50	50	50	50
Investment with life time of 10 year	50	50	50	50	50	50	50	50
Capital costs of assets with life time of 5 year	11	11	11	11	11	11	11	11
Capital costs of assets with life time of 10 year	6	6	6	6	6	6	6	6 6
Capital costs in time of investments made in year t-7	11	11	11	11	11	11	11	11
	6	6	6	6	6	6	6	6
Capital costs in time of investments made in year t-6	11	11	11	11	11	11	11	11
		6	6	6	6	6	6	6
Capital costs in time of investments made in year t-5	11	11	11	11	11	11	11	11
			6	6	6	6	6	6
Capital costs in time of investments made in year t-4	11	11	11	11	11	11	11	11
				6	6	6	6	6
Capital costs in time of investments made in year t-3	11	11	11	11	11	11	11	11
					6	6	6	6
Capital costs in time of investments made in year t-2	11	11	11	11	11	11	11	11
						6	6	6

[47] The capital cost calculation of previous investments will only have to be done once. When the capital costs of previous investments are known and the expenditures registration in the following years takes place according to the new methodology, no/small additional efforts are needed.

Capital costs in time of investments made in year t-1								
	11	11						
							6	6
Capital costs in time of investments made in year t								
	11							
								6
Total capital costs	17	34	51	68	85	91	97	103

In 2003 a Task Force initiated by Eurostat prepared recommendations to improve the comparability of estimates of capital costs in public infrastructure across countries. It concluded that the level of detail for estimating the capital costs in transport infrastructure differs across countries in various respects. Some countries use detailed investment series for single categories of infrastructure (road, railway etc.) whereas other countries only have aggregate series. Very few countries are able to decompose public infrastructure assets into their components (e.g. earthwork, foundation, surface layer, etc.).

Eurostat[48] illustrates different levels of sophistication in the specification of the capital costs for the case of roads:

- Theoretically correct method (method 1). Different components of roads are distinguished (earthwork, surface layer, etc.). Different lifetimes and associated retirement functions are used for each component. In this method the lifetimes of individual components may remain constant whereas a calculated average lifetime for each year's capital stock would rise or fall as a function of the composition of new investments[49].
- Separate average lifetimes for each investment year (method 2). Infrastructure is identified per mode (road, rail, etc.), but no components are distinguished. One weighted average lifetime over the components is used for each year's capital stock. The lifetime for new capital stock is changed regularly to be in line with the (estimated) composition of the capital stock by component. E.g. as the main expansion of the road network comes to an end, the lifetime for new capital stock is gradually shortened to reflect a larger share of shorter-lived components in the new capital stock.
- Simple method (method 3). Asset categories for infrastructure are not distinguished. Compositional effects are ignored. One single average lifetime is used and is kept constant over long periods of time.

Based on a sensitivity analysis by Eurostat with data for German motorways it is concluded that in the circumstances of a very major expansion of infrastructure networks, method 1 produces the most realistic results. It is also acknowledged, however, that in

[48] Source: 'Conclusions and recommendations of the GNI Committee's Task Force on the consumption of fixed capital on roads, bridges, etc', Eurostat, November 2003.

[49] Example: A road consists of different components with different lifetimes: earthwork, road base, surface layer, etc. Lifetime of the earthwork and the road base will be some 100 and 50 years respectively whereas the top surface layer will have to be renewed every 10-20 years. In many Member States the focus of new investment shifted somewhat from new construction extending the network in the 1970s and 1980s to maintenance an major repair of the existing stock. In this situation the new GFCF added to the capital stock has a shorter average lifetime.

practice it may not even be possible to estimate separate lifetimes for each year's capital stock as mentioned in method 2.

The Task Force of Eurostat also reviewed available evidence for average lifetimes. In 2003 a questionnaire was sent to Member States regarding, amongst other things, the lifetime assumptions used per asset category, see next table.

Table 4.3 Lifetimes of different asset categories (number of years) in EU Member States

Asset category	B	DK	D	EL	E	F	IC	IE	I	L	NL	N	A	P	FI	S	UK
Roads	65	50		100	65	60	75	50	80	40	35	60	67	40	52	40	75
- motorways	65	50	60		65	60			80		35	60	67			40	
- national roads	65	50	56		65	60	75		80		35	60	67	40		40	
- municipal roads	65	50	55		65	60	75		80		35	60	67	40		40	
Bridges, tunnels	65	50	70	100	65	60		50	80	40	35	60	67	40		40	
Waterways, ports	70		80	100	65	60		80	80	40	35	60		40	35	60	
Airfields					65	60		80	80	40	35			40		50	
Railways					65	60			80	40	35	50			40	65	
Dams/Dykes (flood control)	70	50	70	100	65	60			80	40	35	60			70	55	

Source: 'Summary result of second Eurostat questionnaire on CFC on public infrastructure, DOC.CFC 15, Eurostat, 2003

As can been concluded from the table, countries often use the same average lifetime for all or most asset categories and that the variation of lifetimes across countries is large.

The Taskforce however concluded that EU Member States that do not have country-specific evidence for lifetimes should use an estimate of 55 years for roads. A range of 50 to 60 years is acceptable so as to take into account temporal shifts in the composition of new GFCF.

It was recommended the average lifetime assumptions should be investigated at least every 5 to 10 years. This should include investigating changes in the composition of GFCF in public infrastructure to take account of shifts between 'new construction/reconstruction' and 'major maintenance and repair'.

Step 2 Renewal expenditures

Renewal expenditures are defined as expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities. This definition implies that renewal expenditures can be characterised as expenditures that lead to an extension of life time of assets. For example fixing cracks or potholes in a road surface is ordinary repair intended to keep the surface in good working condition. This does not extend the lifetime of the surface layer. Replacing the total length of road surfaces is renewal.

Where a component of the infrastructure asset is replaced or restored the expenditures should be capitalised, since the expected lifetime will be more than 1 year, using the formula:

Annual capital costs of renewal expenditures =

$$Renewal\ expenditures * \frac{InterestRate}{(1-(1+InterestRate))\text{^}-(Servicelifeof\ Renewalwork)}$$

Note: For renewal expenditures the same steps a) *expenditures in the current year* and b) *expenditures in the past years* should be applied as performed for investment expenditures.

Step 3 Operational and maintenance expenditures

Operational and maintenance expenditures comprise expenditures to keep the infrastructure in working order and do not lead to an extension of life time of parts of the infrastructure. These expenditures comprise items such as wages, maintenance of road surfaces, patching and running repairs, police, traffic management, etc. With regard to costs of the (water)police it must be mentioned that during the review of national practices it became clear that these costs are not known for almost all of the modes. It is therefore advised not to include the police costs in the operational expenditures.

Operational and maintenance expenditures that have a life time expectancy greater than 1 year should be capitalized, if the life time expectancy is 1 year or less the expenditures only have to be taken into account for the specific year in which the expenditure was made without any capitalisation. Capitalisation of operational and maintenance expenditures is to be done using the formula:

Annual capital costs of operational and maintenance expenditures with life time > 1 year =

$$Maintenance\ expenditures * \frac{InterestRate}{(1-(1+InterestRate))\text{^}-(ServicelifeofMaintenancework)}$$

Note: For maintenance expenditures with life time > 1 year the same steps a) *expenditures in the current year* and b) *expenditures in the past years* should be applied as performed for investment expenditures.

Example

In the table below the annual operational and maintenance costs are determined. Since the costs made for wages and technical maintenance have to be made each year, these costs do not have to be capitalised. Major technical maintenance costs have a life time of three years, resulting in a capitalised annual cost of € 17.677.

Table 4.4 Example of the calculation of yearly operational and maintenance costs (interest rate is 3%, linear depreciation, historic cost prices)

Operational and maintenance expenditures	**Annual costs**	**Expenditure**	**Life time (years)**
Wages	€ 100.000	1	€ 100.000
Technical maintenance	€ 50.000	1	€ 50.000
Major technical maintenance	€ 50.000	3	€ 17.677

Total	€ 200.000	€ 167.677

The sum of all the (capitalised) renewal, operational and maintenance expenditures and the capital costs of (previous) investments for the year give the total infrastructure costs.

Example

Based on the previous examples the total annual infrastructure costs for year t can be calculated. These costs amount to € 339.849 for year t and comprise the capital costs of previous investments (period t-7 until t), the capital costs of a new road in year t and operational and maintenance expenditures in year t.

Table 4.5 Example of the calculation of annual infrastructure costs in one year (interest rate is 3%, linear depreciation, historic cost prices)

Cost category	**Annual costs**
Previous investments (year t-7 until year t)	€ 103
Investment for a new road	€ 172.069
Renewal expenditures	-
Operational and maintenance expenditures	€ 167.677
Total	€ 339.849

In previous studies it was found that for a number of reasons operating and maintenance expenditures being registered by administrators do not always reflect the **necessary** yearly infrastructure expenditures. Due to for example budget restrictions actual operating and maintenance expenditures might be too low compared to the amount of money which is really needed, resulting in backlogging. As optional step infrastructure administrators can perform various data checks, and if necessary adapt figures accordingly, in order to translate actual expenditures into annualised expenditures. Annex 5 describes this provisional step.

4.3 Road infrastructure

Definition of infrastructure

Based on the current information available the road infrastructure expenditures should be restricted to the main road network (i.e. motorways and main national roads) in a country.

We recommend splitting infra expenditures for motorways and main national roads separately. This is mainly because of the presence of 'road user facilities' like parking lots, fuel stations, road motels and hotels. With regard to motorways, infra expenditures for these facilities are in general included in general accounts of the national road manager. Besides, commercial companies manage mainly the motorways and not other main national roads.

However, for main national roads the situation is very unclear. As far as known these facilities are in many countries managed by other road mangers. For this it is better to distinguish both motorways and main national roads. For convenience it is recommended to restrict infrastructure expenditures for main national roads to the infrastructure itself and not taking the other road user facilities into account.

Collection and processing of data

Data available at the national level can mostly be derived from expenditure programmes from the national road manager. In general for the managed network every network manger has data available, so data availability itself shouldn't be a issue. Some complications do arise when more than one road manager manages the main road network. For example in countries like Spain and France many motorways are managed by separate (most private) organisations. Although these organisations should be able to provide data, it is unclear to what extent information can be obtained from them.

Infrastructure costs

In chapter 2 we have defined the following types of expenditures:

- Investment expenditures: expenditures on a) new infrastructure with a specified functionality and lifetime or b) expansion of existing infrastructure with respect to functionality and/or lifetime.
- Renewal expenditures: expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities.
- Maintenance expenditures: expenditures for maintaining the functionality of existing infrastructure within its original lifetime
- Operational expenditures: expenditures not relating to enhancing or maintaining lifetime and/or functionality of infrastructure.

This categorization can be used to for road expenditures. By this, investment expenditures concern expenditures on new road construction and extension of capacity of existing road infrastructure. Operational expenditures concern for example staff expenses, overhead expenses, expenses for buildings.

With regard to maintenance and renewal costs as discussed before many European countries distinguish 'regular' and 'non-regular' costs. For example in the Netherlands the terms fixed and variable maintenance are applied, structural and operational maintenance in Austria, routine and periodic maintenance in Sweden and routine and special maintenance in Spain.

We propose to categorize 'non-regular' costs as renewal expenditures, prolonging the lifetime without adding new functionalities and 'regular costs' as maintenance expenditures, for maintaining the functionality of existing infrastructure within its original lifetime.

Renewal expenditures concern for example:

- Renewal of roadways and structures of bridge and tunnels, mainly by periodic maintenance;
- Maintenance of road equipment;

- Maintenance of bridges, tunnels.

Maintenance expenditures concern for example:
- Local repairs like fixing cracks or potholes;
- Winter maintenance;
- Cleaning rest-places;
- Maintaining grass areas.

This categorization is not fixed of course, because maintenance of road equipment or bridges could be categorized under both renewals and maintenance; winter maintenance, cleaning and maintenance of grass areas could be allocated under operational costs as well.

Chapter 3 shows that the average life time expectancy of road infrastructure differs between the distinguished countries. For the time being it is therefore advised to follow the conclusion of Eurostat for roads, i.e. 55 years. Depreciation is advised to be linear and the interest rate 5%.

Fixed and variable infrastructure costs

In none of the countries a division is made between fixed and variable costs. Studies carried out before UNITE tend to use a cost allocation approach instead of the econometric and engineering approach, based on a rather 'simple' division into fixed and variable costs, following a top-down approach. It would require a standard set of cost items with regard to road infrastructure and one 'simply' divides theses costs into fixed and variable infrastructure costs.

Especially in the beginning this method should be as simply as possible. A feasible and 'easy' application of this method would be to classify all investment and operational expenditures as fixed infrastructure costs. Subsequently variable infrastructure costs could include renewal and maintenance expenditures.

Table 4.6 Fixed and variable parts of total road infrastructure expenditures

Cost category	Fixed costs	Variable costs
Investment expenditures	100%	
Renewal expenditures		100%
Maintenance expenditures		100%
Operational expenditures	100%	

Although this method is very simple and maybe not fully right from a theoretical point-of-view (for example road maintenance that is independent from the traffic volume, may be included in the variable infrastructure costs), this method may be very useful and, above all, feasible.

Alternatively with substantial extra effort from infrastructure managers the following categorization could be used, which from a theoretic point of view is preferred.

Table 4.7 Suggested structure for road expenditures categories

Category	Investment expenditure		Current expenditure			
	Investments	Renewal	Maintenance		Operating	Total
	Capital costs		Capital costs	Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable		%fixed / %variable	
Road surface	100% / 0%	a% / b%	c% / d%		e% / f%	
Superstructures / Drainage works	100% / 0%					
Bridges / Tunnels						
Lightning, Signposting, Signalling	100% / 0%					
Grass areas, Road edges	100% / 0%					
Road facilities	100% / 0%					
Winter clearance	100% / 0%					
Interest	100% / 0%					
Unallocated overhead						
Total	100% / 0%					

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Impact assessment

The proposed infrastructure definition of the new methodology will in general not lead to much additional work for the different countries since there is a lot of detailed information available. Only detailed information about fixed and variable expenditures is right now not available in all countries and this implicate much work.

In the table below no assessment was made for Estonia, as information is missing for this country. However we think for this country and for the other former accession country more information on expenditures will be missing and thus requires substantial additional efforts to apply to the proposed framework.

Table 4.8 Impact assessment

	A	Ee	F	D	NL	E	S	UK
Infrastructure definition	0	?	0	0	0	0	0	0
Expenditure categories:								
• Investment and renewal	0	?	0	0	0	0	0	0
• Maintenance	0	?	0	0	0	0	0	0
• Operational	0	?	0	0	0	0	0	0
Distinction of expenditure categories in:								
• Life-time expectancy > 1 year/<= 1 year	+	?	+	+	+	+	+	+
• Fixed/ variable expenditures[a)]	++	?	++	++	++	++	++	++
Capital cost calculation of:								

	A	Ee	F	D	NL	E	S	UK
• Previous investments (30-40 year)	+	?	+	+	+	+	+	+
• Current expenditures	0	?	0	0	0	0	0	0

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

a) The scores here refer to the preferred method of splitting into fixed and variable expenditures.

4.4 Rail infrastructure

Definition infrastructure

Only the infrastructure related to transportation in its widest sense should be included. Business accounts of infrastructure managers may differ in scope. Some infrastructure managers also manage other assets such as real estate and retail in railway stations. Expenditures on these items should clearly be separated from expenditures infrastructure and the running thereof. Passenger information and the part of railway stations related to passenger transport are to be included. We recommended excluding Police expenditures from transport infrastructure, since they are generally not covered in the business accounts therefore make additional data collection necessary, enhancing the effort.

Clearly there are many different types of railways, from dedicated freight lines to high speed passenger lines. We recommend to distinguish between the different types of lines and have expenditures reported separately. The reason is that such different types of lines cannot readily be compared because infrastructure quality differs. Therefore they have very different cost structures. This substantially influences the share of variable and fixed expenditures. To be able to benchmark between different countries it is best to have separate information for these different types of lines. We recommended splitting at the least:

- Dedicated freight lines.
- High speed passenger lines.
- Mixed network.

Collection and processing of data

The preferred sources of information are the business accounts of infrastructure managers. Information is published yearly and with a high degree of consistency in time series. Moreover, certainly in the situation where there are only few infrastructure managers, information can be collected with relative ease.

It should be strived for that infrastructure managers apply similar expenditure categories, such as in table 4.9. This eases comparisons between countries[50].

In addition to the data in the business accounts, some detailed non-published information needs to be obtained through infrastructure managers' staff. Since most information is

[50] The wish for harmonization is endorsed by the ECMT, see CEMT/CM (2005)6, page 9: 'There is ample precedent in regulatory experience […] for requiring that railways report their annual results in a common format that permits analysis of individual railway performance and facilitates comparisons among railways. The burden this imposes on railways in negligible as they should already be collecting this information for proper management of their assets.'

available internally at the infrastructure manager, we do not expect this to require too much effort on the side of the infrastructure manager.

Infrastructure costs

Infrastructure costs are available from the business accounts. They are the sum of depreciation and capital costs. All infrastructure managers can provide information on infrastructure costs.

However, the different cost figures may not be comparable, due to differing accounting standards. Therefore, we advise to use IAS/IFRS to calculate costs in order to enhance the consistency of the reported costs. IAS/IFRS are the only international standards available, and a number of railway companies already use these standards.

Using IAS/IFRS would straighten out most inconsistencies between reported infrastructure costs. However, on a number of crucial factors in the calculation of infrastructure costs, IAS/IFRS allows several methods. These factors are:

- Depreciation base: historical prices or replacement value;
- Depreciation method: linear or other;
- Lifetimes of asset categories.

When infrastructure managers use different factors, the comparability of the cost figures may become low. We therefore advise to use historical prices as the basis for depreciation. Historical prices can be determined unequivocally and require less effort to determine than replacement values[51].

We advise to prescribe linear depreciation methods. Using a non-linear depreciation method changes the distribution of depreciation over time. In the presence of inflation, the use of different depreciation methods would yield different real (inflation-adjusted) cost figures. This decreases their comparability.

Considering the life-time of assets, we advise not to issue standard lifetimes. There are good reasons why lifetimes vary (variance in quality, environmental and climatological circumstances, infrastructure use, et cetera). Therefore, uniform lifetimes would lead to a distorted view on infrastructure costs. We therefore propose to adhere to the lifetime of assets as reported in business accounts (see also table 3.5).

Fixed and variable infrastructure costs

Based on the analysis in the previous chapter, we suggest a matrix structure as provided in the next table. On the horizontal axis, expenditures are categorised between investments, renewal, maintenance and operational expenses.

[51] Furthermore, from a theoretical point of view, it is wrong to calculate costs by using both replacement values and nominal interest payments. Interest is considered to be a reward for lending capital and a compensation for inflation. Replacement values are adjusted for inflation. So, when calculating costs, replacement values should be used in combination with real interest rates. Interest payments that are available from the profit and loss account should be adjusted for inflation. All these adjustments use arbitrary methods and parameters. Therefore, it is better to use historical cost prices and nominal interest rates.

This categorisation should be according to the following definitions. Investments are expenditures aimed at new infrastructure or improving the quality or functionality of existing infrastructure over and above its original functionality. Renewals are expenditures aimed at replacing existing infrastructure that has reached the end of its designated useful life. These prolong the life expectancy. Maintenance expenditures are aimed at infrastructure actually reaching its designed useful lifetime.
Depending on national accounting principles, maintenance and operational expenses together make up running expenses, or part of maintenance is capitalised (Estonia).

On the vertical axis a second cost categorisation is applied, related to the different parts of infrastructure.

Table 4.9 Suggested structure for expenditure categories

	Investment expenditure		Current expenditure		
	Investments	Renewal	Maintenance	Operational	Total
	Capital costs		Capital costs / Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable
Buildings / Railway stations	100% / 0%	a% / b%	c% / d%	e% / f%	
Civil engineering works	100% / 0%				
Superstructure	100% / 0%				
New construction in progress [a)]	100% / 0%				
Transmission lines	100% / 0%				
Signalling equipment	100% / 0%				
Telecommunications equipment	100% / 0%				
Safety installations	100% / 0%				
Vehicles / rolling stock	100% / 0%				
Plant and machinery	100% / 0%				
Other fixed assets	100% / 0%				
Interest	100% / 0%				
Management of traffic, control and safety systems					
Train running diagrams					
Unallocated overhead					
Total	100% / 0%				

a) In accordance with IFRS, new construction in progress in investment properties is reported in business accounts under the category 'new construction in progress' at the cost incurred until the new investment has been completed. At that moment it is reclassified as investment property under one of the other categories.
Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

We expect most infrastructure managers to be able to provide detailed expenditure figures for most of the cells in this matrix, since detailed information for a large number of expenditure categories is available internally. For infrastructure managers that do not have data available up to this level it detail, there is a fall back option to either report for each cost category (e.g. buildings, superstructure etc.), or for each type of cost (i.e. investment, renewal, maintenance, operational expenditures).

Fewer infrastructure managers will be able to provide information on the share of fixed and variable expenditures within each cell. In general we do expect infrastructure managers that already distinguish between fixed and variable expenditures to be able to provide information on a more aggregate level, per row or column. They either have information already available in this format, or should be able to construct the necessary data from the format they currently apply.

For infrastructure managers that do not yet distinguish between fixed and variable expenditures, the proposed matrix structure provides a framework for making progress on this subject.

The first best approach requires information on both the level of expenditure and the share of variable / fixed expenditure for each cell of the matrix. Under a second best approach, this information is only available for the row and / or column totals. Under a third best approach, no information is available on the share of variable expenditures and information on expenditures levels is only available for row or column totals.

The first best approaches combine two categorisations. The reason is that the share of variable expenditures will differ in both dimensions. Investments are fixed, but renewal and maintenance expenditures do depend on infrastructure use. The share of variable renewal expenditures is not the same for signalling as it is for superstructure or electrification. In turn, the share of variable maintenance expenditures for these categories differs from the share of variable renewal expenditures for these categories. By separating these categories, results for different countries can better be compared. Also, we have opted for a classification of (operational) expenses related to functions and not to types of expenditures, e.g. personnel, stock etc. because would not have provided insight into the share of variable expenditures.

If all infrastructure managers would complete the previous matrix, numbers for different countries could be compared and benchmarked. This provides the Commission with an instrument to control potential charges derived from variable expenditure levels.

At present, most infrastructure managers will not be able to fill out the matrix completely, and some will not be able to fill out any cell. Alternatively, they would provide numbers for each expenditure categories (e.g. superstructure, signalling etc.) of each type of expenditures (i.e. investment, renewal, maintenance and running expenditures) only. Combined with the actual expenditure data, infrastructure managers could be benchmarked irrespective of whether they provided information on the variable share for the whole matrix, or only for the expenditure categories or types of expenditures. Information from [BAH, 2000 and 2005] could provide a first check on the submitted data.

The proposed framework thus offers a method for benchmarking expenditures of different infrastructure managers and infrastructure types (e.g. high speed line versus dedicated freight lines). It should be noted that the share of variable expenses may differ between Member States and infrastructure managers. There are several reasons for this. In the first place, infrastructure use determines to a large extent the share of variable expenditures, see for example Figure 12 in [CE Delft / ECORYS / Stratec, 2004[52]]. Secondly, other influences such as the climatic conditions may influence the share of variable expenditures. In the third place, it is very likely that the share of variable expenditures differs with the quality of infrastructure, see [BAH, 2005] and [TRL et al., 2001]. Care should therefore be taken when comparing results for one Member States to other Member States.

Note that for charging purposes it might be beneficial to include categories for infrastructure related exclusively to passenger transport and infrastructure related exclusively to freight transport. Also, alternatively to the proposed categorisation, it can be decided that the expenditures for 'New construction in progress' should be listed under the categories they are related to, e.g. under 'civil engineering works' or 'superstructure'. Clearly, some cells in the matrix will remain empty.

Impact assessment

By using business accounts as the primary source for infrastructure costs, our advise minimises the burden on companies or reporting authorities. However, in order to arrive at a consistent and comparable set of infrastructure costs, we need to advise te use of IAS/IFRS, this may have a considerable impact on the companies that do not currently use IAS/IFRS or have not prepared their bookkeeping systems for IAS/IFRS. This means that for Austria, France, Spain, and Sweden, infrastructure managers may have to change their bookkeeping systems and methods. The Dutch and German infrastructure managers may have to make minor adjustments in their reporting, but not in their bookkeeping.

In order to prepare for a calculation of fixed and variable expenditures, we advise to distinguish between investments, renewals, maintenance and operational expenditures. Furthermore, we advise to use several categories of expenditures (see Table 3.3). As mentioned above, in the business accounts a clear cut distinction between investment, renewal, maintenance and operational expenditures is often not available. Only the distinction between running expenditures that go to the income statements, and capitalised expenditures (often named 'investments' in business accounts), which are capitalized and put on the balance in the form of assets is made.

However, from the interviews with infrastructure managers it is clear that internally these categories are clearly distinguished. The consistency in definitions of these categories is large. Investments are related to enhancement or improvement of current infrastructure or to totally new pieces of infrastructure. Renewals replace existing infrastructure and do not add new functionalities, but prolong the life expectancy. Maintenance is intended to

[52] CE Delft / Ecorys / Stratec, 2004, Marginal costs of infrastructure use – towards a simplified approach, July 2004.

actually reach the life expectancy infrastructure was designed for. Operational expenditures relate to traffic management, train running diagrams, research and such.[53]

Business accounts are not fully consistent in the treatment of maintenance expenditures. The Dutch, German, Spanish, Swedish and British infrastructure manager classify all maintenance expenditures as running expenditures. The Swedish infrastructure manager stands out in taking the full expenditure on renewal in the first year. Renewal expenditures are not capitalised in Sweden. In contrast, the business account of the Estonian infrastructure manager reads that only maintenance with a periodicity shorter than one year is included in the running expenditures and that maintenance and inspections with a longer periodicity are capitalised and depreciated according to the periodicity of inspection. This is in line with IAS/IFRS, and our advice to prescribe the use of IAS/IFRS ensures consistency on this issue.

Although the applied terminology differs between business accounts, we feel confident that most infrastructure managers would in principle be able to adhere to the above categorization without too many problems. The categorization available internally at infrastructure managers is much more detailed than the categorization presented in the business accounts.

From the interviews with the infrastructure managers we have learned that more information is indeed available. The Dutch infrastructure manager has indicated that it has such information at its disposal. The shares of fixed and variable expenditures for different categories of expenditures have been determined by internal experts. The Dutch Office of Transport Regulation has assessed this methodology as subjective and not robust.

Table 4.10 Summary of impact assessment railways

	Impact							
	A	**D**	**EE**	**ES**	**F**	**NL**	**SE**	**UK**
Infrastructure categorization (superstructure etc)	0	0	0	0	0	0	0	0
Cost categories:								
• Investment	0	0	0	0	0	0	0	0
• Renewal	0	0	0	0	0	0	0	0
• Maintenance	0	0	0	0	0	0	0	0
• Operational	0	0	0	0	0	0	0	0
Expenditures categories :								
• Investment expenditures	0	0	0	0	0	0	0	0
• Running expenditures	0	0	0	0	0	0	0	0
• Fixed expenditures	++	++	++	++	++	0	++	0
• Variable expenditures	++	++	++	++	++	0	++	0
Capital cost drivers:								
• Apply IAS/IFRS	++	+	0	++	++	+	++	0

[53] Note that in some cases, expenditures on low-value assets (e.g. up to € 400 in Austria and 10.000 EEK in Estonia) are expensed as incurred in the reporting period, irrespective of their normal useful life.

	Impact							
	A	D	EE	ES	F	NL	SE	UK
• Life time expectancy	0	0	0	0	0	0	0	0
• Depreciation	0	0	0	0	0	0	0	+
• Interest rate	0	0	0	0	0	0	0	0

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

4.5 Inland waterway infrastructure

Definition of infrastructure

The expenditures on inland waterway infrastructure are split up between inland waterways and inland ports in both Germany and The Netherlands. This is not the case in France: here the costs are not split up. For the new registration methodology it is recommended to define inland waterways as **inland waterways excluding inland ports**. One reason for this is that information regarding inland ports and inland waterways are not registered at the same places in both Germany and The Netherlands. Combining the expenditures of inland ports and waterways would imply that substantially more authorities would have to be contacted. Another reason for not combining the expenditures for ports and inland waterways is the fact that inland shipping already pays for a lot of services of inland ports, contrary to the use of inland waterways itself.

Based on the requirements of the EC infrastructure regulation 1108 a common classification of inland waterways is based on the accessibility by vessels with a dead weight metric tonnage:

- From 250 up to but excluding 400 t (CEMT I)
- From 400 up to but excluding 650 t (CEMT II)
- From 650 up to but excluding 1.000 t (CEMT III)
- From 1.000 up to but excluding 1.500 t (CEMT IV)
- From 1.500 up to but excluding 3.000 t (CEMT Va)
- Equal to or exceeding 3.000 t (CEMT Vb, VI and VII)

This classification has been determined by the Conference Europeenne des Ministres de Transport (CEMT) and all inland waterways in Europe have been classified according to the CEMT criteria.

Collection and processing of data

The relevant data should not be collected from national statistical bureaus but from regional waterway authorities. In France this means the VNF, in Germany the Wasser- und Schifffahrtsdirektionen (7) and in The Netherlands the Provinces (12).

Expenditure categories

In paragraph 3.4 it was concluded that enough detailed infrastructure expenditures are available for the inland waterways. In order to determine the infrastructure costs it is not necessary to collect data on such a detailed scale. Regarding the classification of

expenditures for inland waterways it is advised to use the expenditure categories as mentioned in chapter 2.

As already mentioned in chapter 2 investments are expenditures made for new infrastructure (=new capacity), expansion of existing infrastructure (=enlargement of capacity) or adding new functionalities to existing infrastructure (for example traffic guidance on a waterway). For inland waterways this means that investments comprise for example the expenditures on land purchase (necessary to build for example a canal), the construction costs of new waterways, enlargement / reconstruction of existing waterways/adjustment to bigger vessels, purchase of machines/equipment/boats and the construction of company roads along inland waterways. The investment expenditures all have a life-time expectancy greater than 1 year and therefore have to be capitalized to order to calculate investment costs. With regard to the average life expectancy of inland waterways (when calculating the capital costs) we have seen that different numbers are currently used in the relevant countries[54]. Overall most EU-countries apply a life time in between 40 and 80 years for waterway infrastructure (see table 4.3), which arrives at an average lifetime of 60 years. For the time being it is advised to follow this average lifetime, if more specific information on a certain asset is available in a country and there are good reasons to diverge from the average lifetime of 60 years for this particular asset, these specific figures could be applied. Depreciation is advised to be linear and the interest rate 5%.

Renewal expenditures comprise expenditures on replacing existing infrastructure, prolonging the lifetime without adding new functionalities. Here one can think for example of the replacement expenditures for a lock. These expenditures are also expected to have a lifetime expectancy greater than 1 year. In practice the difference between renewal and investment expenditures can be difficult.

With regard to maintenance expenditures a distinction must be made between maintenance expenditures with a life time over one year (and that have to be capitalized) and expenditures with a life time less than one year: these costs should be recorded in the period incurred (for example yearly dredging costs). Maintenance expenditures comprise maintenance expenditures for locks, bridges, canal banks, radar, traffic guidance, beacons/concrete, service vessels, dredging costs. If the maintenance work is done by 'external' people the salaries of these people have to be included in the maintenance expenditures.

The operational expenditures are characterised as expenditures not related to enhancing or maintaining lifetime and/or functionality of the infrastructure. These expenditures comprise personnel costs, administration costs, overhead costs, housing costs, police costs, insurance. For now it is not advised to include the costs made by the (water)police in the expenditure categories since none of the three countries can provide these data.

[54] With the Netherlands and Finland applying relatively short lifetimes for waterways and ports (35 years) and Germany, Ireland and Italy applying relatively long lifetimes for waterways and ports (80 years). These are average figures, lifetimes may differ a lot depending on the type of investment (e.g. some types of earthworks or drainage have an lifetime expectancy of more than 100 years).

Expenditure categories like 'subsidies' are not to be taken into account, nor taxes paid, reservations made or write-off costs.

Fixed and variable infrastructure costs

In none of the countries a division is made between fixed and variable infrastructure costs.

Based on the cost-allocation approach in a recent study by ECORYS and METTLE, the following figures regarding the splitting into a fixed and variable part of the total infrastructure expenditures on inland waterways, are derived from three Dutch case studies.

Table 4.11 Fixed and variable part of infrastructure expenditures on inland waterways

Cost category	Fixed	Variable
Investment	100%	-
Renewal expenditures	100%	-
Maintenance expenditures	70-85%	15-30%
Operational expenditures	70-85%	15-30%

Source: 'Charging and pricing in the area of inland waterways – practical guideline for realistic transport pricing', ECORYS, METTLE, 2005

There is no common breakdown of expenditures within most countries, let alone across countries. Based on the information available at waterway authorities with some efforts the following categorisation could be used and is therefore recommended.

Table 4.12 Suggested structure for expenditure categories

Category	**Investment expenditure**		**Current expenditure**		
	Investments	**Renewal**	**Maintenance**	**Operating**	**Total**
	Capital costs		Capital costs / Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable	%fixed / %variable	
Locks	100% / 0%	a% / b%	c% / d%	e% / f%	
Bridges	100% / 0%				
Canal Banks	100% / 0%				
Radar, traffic guidance	100% / 0%				
Beacons, buoys	100% / 0%				
Service vessels (e.g. patrol service vessels)	100% / 0%				
Dredging	100% / 0%				
Housing (e.g. at locks)	100% / 0%				
Interest					
Unallocated overhead					
Total	100% / 0%				

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Impact assessment

The proposed infrastructure definition of the new methodology will result in additional work for the VNF in France since they will have to split the costs between inland waterways and inland ports. For the infrastructure managers in Germany and The Netherlands no impacts result from the infrastructure definition used in the new methodology.

The distinguished expenditure categories in the new methodology are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current expenditure categories into the four distinguished categories of the proposed methodology.

The distinction of the proposed expenditure categories into expenditures made for assets with a lifetime expectancy greater than one year or equal/less than one year will result in additional work since this distinction is not made now. These efforts are however not expected to be substantial. With regard to the distinction between fixed and variable expenditures it is advised to use the percentages that were established in a previous study (see previous table). The resulting additional efforts are therefore expected to be small.

Table 4.13 Impact assessment on the efforts countries/infrastructure managers will have to make as a result of the proposed methodology for the registration of expenditures on inland waterway infrastructure

Impact of	F	D	NL
Infrastructure definition	+/++	0	0
Expenditure categories:			
• Investment and renewal	0/+	0/+	0/+
• Maintenance	0/+	0/+	0/+
• Operational	0/+	0/+	0/+
Distinction of the expenditure categories in:			
• Life-time expectancy > 1 year/<= 1 year	+	+	+
• Fixed/ variable expenditures	0/+	0/+	0/+
Capital cost calculation of:			
• Previous investments (30-40 year)	++	++	++
• Current expenditures	+	+	+

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

The capital cost calculation of previous investments is expected to result in substantial additional efforts to be made by the infrastructure managers. Long time investment series will have to be constructed and this will be a time consuming effort. In a next step the capital costs of these investments will have to be calculated which is also time consuming. One remark has to be made however: the construction of a long time investment series will only have to be done once. When the investments in previous years are known and the expenditure registration in the following years takes place according to the new methodology, no/small additional efforts in the subsequent years are needed regarding the collection of data.

The calculation of capital costs of current expenditures will also result in additional efforts since this is not done at the moment by the infrastructure managers.

4.6 Air transport infrastructure

Definition of infrastructure

Only flight related infrastructure should be included in the analysis: infrastructure serving aviation including ground handling and air traffic control. This means that airport operators must make a split in their expenditures regarding flight and non-flight related activities. As discussed in section 3, we can assume that in the near future the majority of operators will be able to make such distinction.

Collection and processing of data

The preferred sources of information are the individual business accounts of airport operators as these accounts provide much detailed information and are published on an annual basis. In our view these accounts provide the best available information to establish overviews of air transport infrastructure expenditures and costs in EU-countries.

Currently the published accounts do not present all relevant details or segments for the purpose of this study. Non-published cost accounting matters must be collected from financial staff of individual operators, which is not always an easy task for reasons of business strategy (non public information) and/or staff availability.

In most business accounts, air traffic control expenditures are not included. This activity is often being performed by separate (public) air traffic control organisations. In order to include these expenditures relevant data should additionally be collected from these organisations.

Expenditure categories

As the accounting system of all (major) airport operators will shortly comply to IAS/IFRS standards, any recommendation from our side regarding cost categories and the calculation of costs should in principle not conflict with IAS/IFRS.

In sections 4.1 and 4.2 we have already dealt with the issues of depreciation method, interest rate and the notion that all non-yearly expenditures (including maintenance) should be capitalized. That leaves us with the matter of the average asset lifetime expectancy and the corresponding depreciation costs. Under IAS/IFRS no preset categories of assets exist. The rule is that assets with different lifetime expectancies should be clustered together in order to calculate adequate depreciation costs.

Based on our analysis in section 3, we suggest a matrix structure as in table 4.14. Included here are the main categories of assets with different lifetime expectancies.[55] In practice it may be necessary to define more subcategories, corresponding with specific lifetime expectancies.

[55] We refrain from prescribing specific lifetime expectancies for specific assets as these are also influenced by the drivers for difference in infrastructure expenditures (please refer to table 2.1 in section 2.2).

Table 4.14 Suggested flight-related air transport expenditure categories

Category		Investment expenditure		Current expenditure			
		Investments	Renewal	Maintenance		Operational	Total
		Capital costs		Capital costs	Running costs	Running costs	
		%fixed / %variable	%fixed / %variable	%fixed / %variable		%fixed / %variable	%fixed / %variable
Land		100% / 0%	a% / b%	c% / d%		e% / f%	
Terminal building and pier		100% / 0%					
Other buildings, plants		100% / 0%					
Airfield	Runway surface	100% / 0%					
	Runway bases	100% / 0%					
	Taxiways and aprons	100% / 0%					
New construction in progress[a)]		100% / 0%					
Roads		100% / 0%					
Installations, equipment		100% / 0%					
Other fixed assets		100% / 0%					
Airport police		100% / 0%					
Interest		100% / 0%					
Management of traffic control and safety systems							
Unallocated overhead							
Total expenditures		100% / 0%					

a) In accordance with IFRS, new construction in progress in investment properties is reported in business accounts under the category 'new construction in progress' at the cost incurred until the new investment has been completed. At that moment it is reclassified as investment property under one of the other categories.
Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Capitalised expenditures into investments, renewal and (partly) maintenance form capital costs. Running costs consists of the operational expenditures and the part of maintenance expenditures that are not capitalised.

Fixed and variable costs

In principle the suggested format for registration of expenditures and costs in table 4.14 can be extended towards differentiation between fixed and variable components. For each cell this split should then be filled in.

As mentioned previously however, currently no split between fixed and variable expenditures or costs exists in the business accounts. Also under IAS/IFRS standards such a split is not intended. In this respect it can be expected that airport operators will not change their accounting system voluntarily (having complied to IAS/IFRS already),

but only if a legal obligation would require such change. Please refer also to the impact assessment in the next section.

Impact assessment

The proposed infrastructure definition will not result in additional work for airport operators as most of them have already shifted or are expected to shift towards differentiating between flight-related and non flight-related infrastructure (and related activities).

The suggested asset based expenditure categories (investments, renewals, maintenance and operations) are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current different expenditure categories into the three distinguished categories of the proposed methodology.

A split of expenditures in fixed and variable components however will result in major efforts for airport operators as this is no common practice nor prescribed under IAS/IFRS rules.

Concerning the calculation of capital costs, in addition to the general IAS/IFRS-rule concerning the classification of assets with different life time expectancies, some effort may be required for establishing the required (comparable) classifications. Furthermore the required split between yearly and non-yearly maintenance expenditures in order to capitalize part of these expenditures will take some effort. Finally a split between fixed and variable costs will be difficult for the same reasons as the split between fixed and variable expenditures.

Table.4.15 Impact assessment for airport operators / infrastructure managers of the proposed methodology (base case = IAS/IFRS)

Impact of	IFRS-based accounting
Infrastructure definition	0
Expenditure categories (A):	
• Investment and renewal	0/+
• Maintenance	0/+
• Operational	0/+
Expenditure categories (B):	
• Fixed/ variable expenditures	++
Capital cost calculation:	
• Differentiation of asset life time expectancy	0/+
• Capitalization of maintenance > 1 year life-time expectancy	+
• Fixed/variable costs	++

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

4.7 Maritime infrastructure

Definition of infrastructure

Based on the current information available the expenditures can be limited to seaports only. It is recommended that expenditures for light, buoys and navigational aids and other maritime infrastructure at sea are not included at this time. We can assume that the majority of infrastructure managers (mainly port authorities) will be able to make such a distinction.

Collection and processing of data

Data availability and data reliability are the main bottlenecks for a harmonized approach based on expenditures. Data available at national level is mainly based on the business accounts, therefore an approach based on cost information from business accounts is recommended. Business accounts concerning maritime (seaports) infrastructure are fairly well available. The business accounts provide the best available information to create an overview on seaport infrastructure expenditures. Clearly, the consistency and comparability between countries would depend strongly on potential differences in national accounting principles.

Furthermore, some more detailed non-published costs or other accounting matters will have to be collected from individual ports. This information will take relatively much effort to collect and is currently difficult to obtain for reasons of business strategy (non public information).

Infrastructure costs

There is no common breakdown of cost available within most countries, let alone across countries. Based on the public available information, mostly from business accounts, expenditure categories at the most aggregated level are obtainable:

- Investments & renewal
- Maintenance costs
- Other operational expenditures

This categorisation can be implemented with limited effort by all countries.

However, with some extra effort and more detailed information from the individual ports, the following categorisation could be used and is therefore recommended. Based on our analysis in section 3, we suggest a matrix structure as in table 4.16. Included here are the main categories of assets with different lifetime expectancies. In practice it may be necessary to define more subcategories, corresponding with specific lifetime expectancies.

Table 4.16 Suggested seaport expenditure categories

Category	Investment expenditure		Current expenditure			
	Investments	Renewal	Maintenance		Operational	Total
	Capital costs		Capital costs	Running costs	Running costs	
	%fixed / %variable	%fixed / %variable	%fixed / %variable		%fixed / %variable	
Quays & berthing	100% / 0%	a% / b%	c% / d%		e% / f%	
Maritime access (fairway, dredging, signals)	100% / 0%					
Land	100% / 0%					
Superstructure (cranes, terminals, etc.)	100% / 0%					
Land access	100% / 0%					
Other civil engineering works (piping, etc)	100% / 0%					
Equipment (e.g. ice breakers, service vessels, etc.)	100% / 0%					
Interest	100% / 0%					
Unallocated overhead						
Total	100% / 0%					

Note: Grey cells indicate non-existent combinations (e.g. interest is always capital costs)

Capitalised expenditures into investments, renewal and (partly) maintenance form capital costs. Running costs consists of the operational expenditures and the part of maintenance expenditures that are not capitalised.

Expenditures for superstructure are made sometimes made by port authorities, sometimes by private operators and sometimes by both, depending on the country and situation. In order to obtain comparable information across ports and countries, it is recommended not to include these expenditures. Expenditures from private operators are very difficult to obtain, because of the effort needed and sensitivity of this mostly very strategic information.

It is recommended not to include costs for harbour master tasks. In some ports these tasks are performed by the port authority, in others by a separate entity. The tasks of the harbour master can best be compared to police tasks for other modes.

Information on the split between the different purposes of expenditures (investment, renewal, etc.) can often be obtained directly from business accounts. In the cases where already a clear distinction has been made, the rule is that all those expenditures are capitalized that lead to increased capacity, productivity or to lengthening of useful lives

of assets. All other maintenance expenditures are considered as running expenditures. Multi-annual maintenance expenditures should be booked as operational expenditures or capital costs (depreciation) according to their nature, as discussed above.

As a best practice, all cells would be filled in. Under less optimal conditions, only the row and column totals (including the share of variable expenses for each row and column) are available. As worst case, only the row or the column totals are provided. We expect most port authorities to be able to fill in the larger part of this matrix. The share of fixed and variable expenditures may be difficult as this is not common practice.

Fixed and variable costs

In none of the countries a division is made between fixed and variable costs. Since data availability forms a bottleneck, the cost-allocation approach is realistically the only method available to divide fixed and variable costs. From the survey it is also clear that the available data will not allow a distinction either following the econometric approach or the engineering approach. The division into a fixed and variable part of the total infrastructure expenditures for maritime transport could be derived from case studies, and project the results of the case studies on to the infrastructure expenditure statistics. This would be a feasible approach in each country, but it would require the performance of consistent representative case studies in all member states[56].

The business accounts have to comply with their respective national accounting principles. Although these principles have not been compared in detail in this study, there are certain discrepancies between the individual countries. In a general way the IAS/IFRS accounting principles will in future act as a common denominator thus reducing such discrepancies.

Impact assessment

The proposed infrastructure definition will not result in additional work for port authorities, as most of them are not responsible for maritime infrastructure at sea.

The suggested asset based expenditure categories (investments, renewals, maintenance and operations) are expected to result in only minor additional efforts for the infrastructure managers since there is enough detailed information available. The only effort needed is the combining of current different expenditure categories into the three distinguished categories of the proposed methodology.

A split of expenditures in fixed and variable components however will result in major efforts for port authorities as this is no common practice nor prescribed under IAS/IFRS rules.

Concerning the calculation of capital costs some effort may be required for establishing the required (comparable) classifications of assets with different lifetime expectancies.

[56] This is in contrast to inland waterways where only a sample of case studies in the most important inland waterway countries (e.g. Belgium, France, Germany, Netherlands, Austria) will do to arrive at a representative distinction of fixed and variable costs. Maritime port infrastructure however is being represented in most of the EU countries however, so more case studies should be performed here in order to arrive at a representative distinction of fixed and variable costs.

Furthermore the required split between yearly and non-yearly maintenance expenditures in order to capitalize part of these expenditures will take some effort. Finally a split between fixed and variable costs will be difficult for the same reasons as the split between fixed and variable expenditures.

Table 4.17 Impact assessment on the efforts countries/infrastructure managers will have to make as a result of the proposed methodology for the registration of expenditures on maritime infrastructure

Impact of	EE	F	D	NL	E	S	UK
Infrastructure definition	0/+	0	0	0	0	0	0
Expenditure categories (A):							
• Investment and renewal	+	0	0/+	0/+	0	0/+	0/+
• Maintenance	+	0	0/+	0/+	0	0/+	0/+
• Operational	+	0	0/+	0/+	0	0/+	0/+
Expenditure categories (B):							
• Fixed/ variable expenditures	++	++	++	++	++	++	++
Capital cost calculation:							
• Differentiation life time expectancy	+	0/+	0/+	0/+	0/+	0/+	0/+
• Capitalization of maintenance	++	+	+	+	+	+	+
• Fixed/variable costs	++	++	++	++	++	++	++

0 = no extra efforts are expected to apply the proposed framework

+ = additional efforts are expected to apply the proposed framework

++ = substantial additional efforts are expected to apply the proposed framework

Annex 1 Questionnaire

In this annex the questionnaire as set up by ECORYS/CE and send by EUROSTAT regarding national practices on infrastructure accounting is presented.

Introduction

The aim of this questionnaire is to get a clear understanding of the data availability and methods used by statistical institutes and national authorities to compile data on expenditures for road, rail, inland waterways, air and maritime transport infrastructure. This questionnaire deals with **road** transport infrastructure.

One of the underlying aims of the project, under which this questionnaire is set out, is to form an idea about if and how expenditures on road infrastructure are transformed in annual cost estimates. For this, we need to now if such transformations are made at national level, for example at the statistical institute, and if so, how.

Also of interest is the level of detail at which statistics are available.

The questionnaire is divided in 3 sections:

Section 1: Data characteristics and definitions.

Section 2: Methodology of data collection.

Section 3: Level of detail.

Before filling in the questionnaire, please complete the following table.

Date	
Organisation	
Function	
Name	
Telephone/Fax	
E-mail	

Section 1: Data characteristics and definitions

*1.1 Please indicate what kind of information on infrastructure expenditures is being compiled separately by your organisation for **road** transport infrastructure?*

- o Total budgets only
- o Total expenditures only
- o Total costs of infrastructure only
- o A subdivision of expenditures into investments and running expenditures
- o A subdivision of infrastructure expenditures into fixed and variable expenditures

1.2 If applicable, could you indicate the exact definitions used to distinguish between the aforementioned expenditure categories?

Investment expenditures	
Running expenditures	
Other expenditures	

From "Glossary for transport statistics (3rd edition)":

Types of costs
The main categories of costs being considered are:
-- Labour costs
Including wages and salaries of active staff, pensions, various social charges, etc.
-- Material and service costs
Including purchase of other material and services provided by third parties, but excludes energy
consumption costs.
-- Energy consumption costs
-- Taxes
-- Financial charges
-- Other costs
Including amounts allocated to depreciation and provisions etc.
Investment expenditure
Expenditure on new construction and extension of existing infrastructure, including reconstruction, renewal and major repairs.
Maintenance expenditure
Expenditure for keeping roads in working order.
This includes surface maintenance, patching and running repairs (work relating to roughness of carriageway's wearing course, roadsides, etc.).

Some questions of the present questionnaire aim at finding out how (cash based) "investment expenditure" is converted to annual "costs" (e.g. depreciation and interests).

Section 2: Methodology of data collection.

*2.1 What is the basis for the data that are collected for **road** transport infrastructure? (more than one answer possible)*

	Financial accounting	Mgt accounting
o Accounts systems of public organisations	---	---
o Account systems of private organisations	---	---
o Both through public and private systems	---	---
o account systems of public private partnerships	---	---
o Other systems, namely ……	---	---

(Financial accounting is carried out to establish annual accounts required by law and often used for tax purposes; management accounting aims at assessing the profitability of projects and operations.)

2.2 From what type of organisations or data source is this information being collected (i.e. ministry of transport, regional authorities, private companies)? (more than one answer possible)

- o Ministry of transport
- o Ministry of finance
- o Local/regional authorities
- o Private companies
- o Public companies
- o Public administrations
- o Public private partnerships
- o Other, namely ……

2.3 From how many different organisations or data sources is this information being collected?

1	2-5	6-10	10-20	20-50	>50

2.4 Has there been any change in data providers or data sources in the past 25 years?

No Yes (please specify year(s), and describe reason of changes that occurred (privatisations, political changes), and assess the impact on the continuity of the data series)

…….
…….
…….

The following questions deal with more specific data treatment activities.

Infrastructure expenditures do not have to reflect yearly costs. Major road maintenance is necessary each 5-10 years for instance, and these expenditures will therefore show up each 5-10 years in the balance sheets.

2.5 Are **road** transport infrastructure expenditures being distinguished in annual and multi-annual expenditures, and if so, is the distinction made in the primary data sources, or is it superimposed at national level?

No (if the distinction is not made, please describe how multi-annual expenditures are categorised)

…….
…….
…….
…….

Yes (please describe whether the distinction is made in the primary data sources or are superimposed at national level and which methodology or corrections are made)

…….
…….
…….
…….

There is a difference between maintenance expenditures that are related to the existence of the infrastructure (fixed expenditures) and maintenance expenditures that are related to the use of the infrastructure (variable expenditures).

*2.6 Are **road** infrastructure expenditures being distinguished in variable and fixed expenditures, and if so, how?*

No Yes (please describe methodology or corrections made, or provide glossary)

…….
…….
…….

The following questions deal with the calculation of capital costs (including depreciation of infrastructure investment expenditures) of transport infrastructure. If capital costs are not being calculated either in the primary data sources or at the national level please continue with questions in section 3.

*2.7 Is information on annual capital costs (investment expenditure divided between years of the investment life) for **road** infrastructure available in the primary data sources?*

Yes *No*

2.8 If information on capital costs for **road** infrastructure is available, how are these calculated?

Please specify as clearly as possible or provide function with parameters (method of depreciation for different types of investments and estimated useful life, interest rate applied):

This question can be answered by a colleague dealing with national accounts (at statistical office or in the ministry):

*2.9 Whether or not information on annual capital costs for **road** infrastructure is available in the primary data sources, are annual capital costs calculated at national level?*

Yes *No*

*2.10 If capital costs for **road** infrastructure are calculated at national level, what methodology is applied to calculate capital costs from information on infrastructure expenditures?*

- Perpetual Inventory Method
- Cost Replacement Method
- Business accounts
- Other, namely ……

Section 3: Level of detail

Infrastructure expenditures can be categorized in several ways, i.e. by type of expenditure (new construction, extension of existing infrastructure, reconstruction or renewal, maintenance, operations, traffic police, personnel, other general expenditures, etcetera) or by type of construction (locks, bridges, tunnels, pavement, dredging).

3.1 *Can you specify as clearly as possible on what level of detail information on **road** infrastructure expenditures is being collected by your organisation? Please indicate both the breakdown of (investment and running) expenditures as well at the infrastructure levels (i.e. motor ways, national roads, municipal roads, etcetera**). Instead of filling in the box you can also add a copy of an example as annex to this questionnaire.***

Thank you for answering this questionnaire. We kindly ask you to resend the completed questionnaires not later than 30 April 2005. You can send your completed form by e-mail to:

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Eurostat, D-4 Energy and Transport
Tel. +352 4301 32035

E-mail: simo.pasi@cec.eu.int

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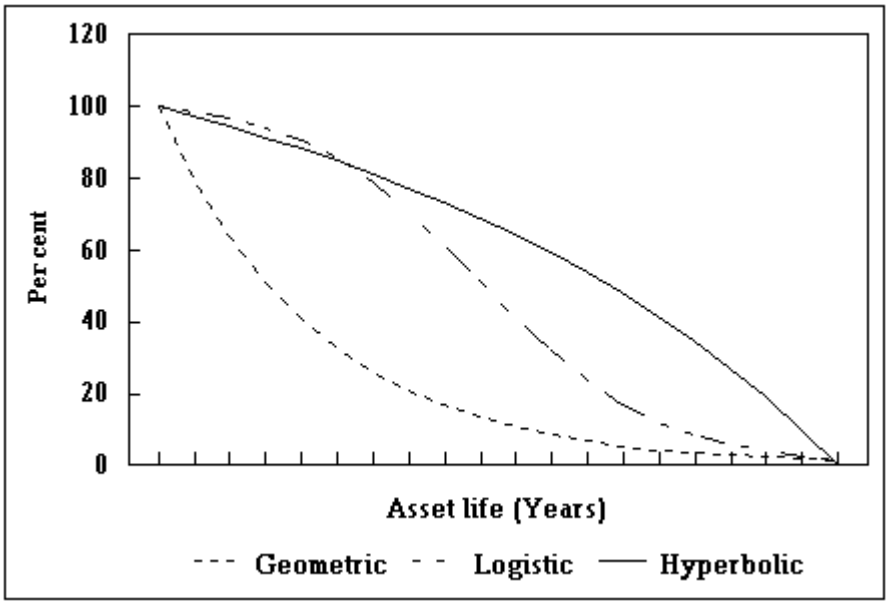
Annex 2 Depreciation functions

When using historical costs for valuation of assets, depreciation costs can be calculated by different types of depreciation functions (linear or non-linear), resulting in different depreciation costs estimates.

Refer to figure A2.1. A non linear, geometric depreciation function implies a high loss of value in the early life years. Assuming an acceptable level of maintenance for public infrastructure, depreciation should typically be rather strong hyperbolic, suggesting linear rather than geometric depreciation functions. However when the PIM does not distinguish individual components of infrastructure assets, geometric depreciation may have more validity.

Eurostat[57] considered that the available evidence did not justify recommending that countries using geometric depreciation should change their system. However countries using different functions for different asset classes or countries considering to change their system may want to retain or introduce linear depreciation functions for infrastructure assets.

Figure A2.1 Types of depreciation functions



[57] Source: 'Conclusions and recommendations of the GNI Committee's Task Force on the consumption of fixed capital on roads, bridges, etc', Eurostat, November 2003.

Annex 3 Glossary of terms

Asset valuation	This is the process by which the economic value of the infrastructure is calculated. There are two basic methods of asset valuation: 'replacement cost' and 'historic cost'. In broad terms, there should be a certain degree of equivalence (and comparability) between them and the choice between methods should be largely determined by practical data availability considerations. The 'replacement cost' method combines an inventory of asset quantities by asset type with corresponding unit costs for replacing them in their current condition. In contrast, the 'historic cost' method relies on data on year-by-year investment figures for a long period of time, taking account of depreciation in value and adjusting to changes of prices over time. While the replacement cost method is also sometimes referred to as the 'synthetic method', the 'historic costs' method is applied by using the Perpetual Inventory Model.
Capital costs	The capital costs comprise the consumption of fixed capital (depreciation costs) and interest. Capital costs represent a high share of total infrastructure costs and are different to the annual capital expenditures.
Costs	Periodic value for use of resources. Whenever resources are used and paid by the same agent, we talk of internal (resource) costs, otherwise of external costs. One can distinguish current costs which are equal to current expenditures and opportunity costs for the resource depletion of investments.
Depreciation (economic)	Depreciation refers to the annual loss in value of assets over time due to their physical deterioration. The economic definition of this term relates to the expected life span of the asset, and depreciation may be calculated on the basis of an equal loss in value in each year (linear depreciation) or as a percentage of the asset value at the start of each year (declining balance depreciation). Note that the economic definition of this term seeks to distinguish it from that used in accountancy or taxation practice – where, for example, the depreciation period may differ from the likely life span of the asset.
Expenditures	The expenditures comprise the current costs: the amount of money that actually has been spend.

Fixed costs	Fixed costs are those costs which do not change with traffic volume. It is necessary to distinguish short and long rum perspectives. Important elements of fixed costs in the short run are capital costs for traffic infrastructure or of the vehicle stock of a collective transport operator. In the long run however, all costs are variable.
GFCF	Gross Fixed Capital Formation (definition SNA93): Total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non-produced assets by the productive activity of institutional units. Fixed assets are tangible or intangible assets that are produced as outputs from processes of production and that are themselves used repeatedly or continuously in other processes of production for more than one year.
Historic cost accounting	Historic cost accounting is a valuation method for goods and assets used in production. They are valued against the expenditure actually incurred to acquire those goods or assets, however far back in the past those expenditures took place. An alternative valuation method makes use of replacement cost.
Interest costs	A part of capital costs; it denotes the opportunity costs of capital.
Investment expenditures	Expenditures made for new infrastructure (=new capacity), expansion of existing infrastructure (=enlargement of capacity) or adding new functionalities to existing infrastructure (for example DRIPS on roads).
Maintenance expenditures	Expenditures for keeping the infrastructure in working order and to reach the life expectancy infrastructure was designed for Road: This includes surface maintenance, patching and running repairs (work relating to roughness of carriageway's wearing course, roadsides, etc.). Inland waterway: Expenditure on locks is included.
Major renovations/reconstruction	Major renovations significantly extend the previously expected service live of a fixed asset and so are classified as part of gross fixed capital formation; the decision to renovate a fixed asset is a deliberate investment decision which may be undertaken at any time and is not dictated by the condition of the asset.
Obsolescence	Obsolescence occurs when an asset is retired before its physical capability is exhausted.
Operational expenditures	Operational expenditures do not relate to enhancing or maintaining lifetime and/or functionality of infrastructure. For instance traffic management, train running diagrams, research and such.
Renewals	Renewals replace existing infrastructure and do not add new functionalities, but prolong the life expectancy.

Replacement cost accounting (or current cost accounting)	Replacement cost accounting or Current cost accounting is a valuation method whereby assets and goods used in production are valued at their actual or estimated current market prices at the time the production takes place.
Synthetic method	One of the two main methods to value an existing infrastructure network (see also PIM method). The synthetic method values the infrastructure network by estimating what it would cost to replace the infrastructure network with assets of equivalent quality. The method therefore involves measuring the existing physical assets. In the case of road infrastructure this would mean measurement in terms of road length of particular types, bridges, etc. and then multiplying these measures of physical assets by unit replacement costs, such as the cost of constructing a motorway with the same physical characteristics as the existing one.
Perpetual-inventory method (PIM)	This is a method to estimate the asset value from a time series of annual investment expenditures. Annual new investments are cumulated and –according to their remaining life time – a depreciation will be calculated. The sum of these annual remaining asset values is equal to the total amount of the asset value.
Variable costs	Variable costs depend on the amount of users and the traffic volume performed by then.

Annex 4 Literature and contacted persons

Literature

EC, 'Introducing an accounting system for expenditure on infrastructure in respect of transport by rail, road and inland waterway', Regulation (EEC) no 1108/70 of the council, 4 June 1970.

BAH (1999), Booz, Allen & Hamilton, 1999, Railway infrastructure cost causation, Report to Office of the Rail Regulator, November, 1999

BAH (2000), Booz, Allen & Hamilton, 2000, Usage Costs: Issues raised in the regulator's consultation, Report to Office of the Rail Regulator, London, October, 2000

BAH (2005), Booz, Allen & Hamilton, 2005, Revision of variable usage and electrification asset usage charges: initial report, Submitted to Office of Rail Regulation, London, January 2005

Calculation Transport Infrastructure Costs, Final report of the expert advisors to the High level group on infrastructure charging (working group 1), April 28 1999

Charging and pricing in the area of inland waterways – Practical guideline for realistic transport pricing, Final report, ECORYS/Mettle, Rotterdam, June 2005

CE Delft, ECORYS, Stratec (2004), Marginal costs of infrastructure use – towards a simplified approach, Final report, Delft, July 2004

CEMT/CM (2005)6, European Conference of Ministers of Transport, Council of Ministers, Rail Transport, Railway reform and charges for the use of infrastructure , Conclusions and recommendations, 28 April 2005

Eurostat, 2003, 'Summary result of second Eurostat questionnaire on CFC on public infrastructure, DOC.CFC 15.

Finnish Rail Administration, Marginal Rail Infrastructure Costs in Finland, 1997 – 2002, Juha Tervonen and Tiina Idström, Helsinki, 2004

NERA (2004), Study of the financing of and public budget contributions to railways; A final report for the European Commission, DG TREN, January 2004.

TRL et al (2001), A study on the costs of transport in the Euripean Union in order to estimate and assess the marginal costs of the use of transport, Final Report – Volume 1: Literature survey. Rhys-Tyler G, Dettmeyer V, Mackenzie-Williams P, Ramdas V, Higginson M, Rothengatter W, Doll C, Gringmuth C, Van de Voorde E, Meersman H, Van Elslander T, Walther C, Sieber N, Puschner F, Visser HA, Vrenken H (2001). For the European Commission DG TREN. TRL Limited, Crowthorne, October 2001

UIC, International Benchmarking of Track Cost, Oskar Stalder, SBB AG Bern

UNITE
Nääs, O. Lindberg, G. 'The pilot accounts of Sweden – Annex 8b (Statistical annex)

The Pilot Accounts for Austria – Annex Report, Deliverable 8, Annex 2
Herry M, Sedlacek N, Tomschy R (HERRY) and Peter Bickel, Stephan Schmid (IER). The Pilot Accounts of Austria - Annex Report (UNIfication of accounts and marginal costs for Transport Efficiency) Deliverable 5. Funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, October 2001.

Pilot Accounts – Results for France, Deliverable 8, Annex 4
J.F. Jeger, Quinet E, A. Rémy Schwartz D, Taroux J.-P, Link H, Stewart L and Bickel P (2001), "Pilot Accounts - Results for France", Annex to Deliverable D8 Pilot Accounts - Results for Tranche B Countries, UNITE Project (UNIfication of accounts and marginal costs for Transport Efficiency) Funded by the European Commission 5th Framework RTD Programme. ENPC-CERAS,

Pilot Accounts – Results for the Netherlands, Deliverable 8, Annex 6
Corina Certan, Marten van den Bossche, Eline Devillers, Hellen Boersma (NEI), UNITE (UNIfication of accounts and marginal costs for Transport Efficiency) Working Funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, July 2002.

Pilot Accounts – Results for Germany, Deliverable 5, Annex 1
Heike Link, Louise Helen Stewart (DIW), Claus Doll (IWW), Peter Bickel, Stephan Schmid, Rainder Friedrich, Roland Krüger, Bert Drost-Franke, Wolfgang Krewitz (IER), UNITE (UNIfication of accounts and marginal costs for Transport Efficiency) Working Funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, April 2001.

Pilot Accounts – Results for Spain, Deliverable 8, Annex 3
Ofelia Betancor and Gustavo Nombela (EIET), UNITE (UNIfication of accounts and marginal costs for Transport Efficiency) Working Funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, April 2001.

Pilot Accounts – Results for Estionia, Deliverable 14, Annex 3
Tarmo Loog, Kaur Lass (Entec Ltd), Mall Villemi (Tallinn Technical University), Veli Himanen, Tiina Idstrom, (JP-Transplan Ltd). UNITE (UNIfication of accounts and marginal costs for Transport Efficiency) Deliverable 14. Working Funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, September 2002.

Pilot Accounts – Results for the United Kingdom, Deliverable 8, Annex 7

Tweddle G, Nellthorp J, Sansom T, Link H, Stewart L and Bickel P (2002), "Pilot Accounts - Results for the United Kingdom", Annex to Deliverable D8 Pilot Accounts - Results for Tranche B Countries, UNITE Project (UNIfication of accounts and marginal costs for Transport Efficiency) Funded by the European Commission 5th Framework RTD Programme. ITS, University of Leeds.

Regulation (EC) No 1602/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards

Regulation (EEC) No 1108/70 of the Council of 4 June 1970 introducing an accounting system for expenditure on infrastructure in respect of transport by rail, road and inland waterway

Directive 2001/14/EC of the European Parliament and of the Council of 26 February 2001 on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification

Annual reports Rail

The Netherlands: ProRail aan het werk in 2003; Financieel jaarverslag 2003: http://www.prorail.nl/ProRail/Over+ProRail/Jaarverslagen.htm

UK: Network Rail Infrastructure Limited, Annual Report and Accounts 2005: http://www.networkrail.co.uk/companyinformation/AnnualReports/AnnualReports.htm
Sweden: Annual report 2004 Banverket: http://www.banverket.se/upload/pdf_English/About_Banverket/Arsredovisning_04_ENG_Low_x.pdf

Germany: Annual report 2003 Deutsche Bahn Group: http://www.db.de/site/bahn/en/db__group/investor__relations/financial__reports/annual_reports/annual__report__2003.html

Estonia: Annual report 2003 Eesti Raudtee, Estonian railways: http://www.evr.ee/?id=1312

Austria: OBB, Bahn wirkt, Annual report 2003: http://www.railcargo.at/vip8/rca/english/Company/Annual_Report_2003/Annual_Report_2003.pdf

Spain: RENFE, Informe annual 2003: http://www.renfe.es/empresa/memoria.html

France: Annual report 2003 RFF: http://www.rff.fr/biblio_pdf/pages_en_connaitre_connaitre.pdf and Financial statements 2003 RFF: http://www.rff.fr/biblio_pdf/en_financial_statements.pdf

Annual reports air

Austria: Annual report 2004, Flughafen Wien AG: http://english.viennaairport.com/ir/airport.cfm
2003 Annual report, Flughafen Graz: http://www.flughafen-graz.at/home/unternehmen_flughafen/annual_report.php

The Netherlands: Schiphol Groep Jaarverslag 2004: Available through www.schiphol.nl
Germany: Hub to the future, Annual report 2004, Fraport: http://www1.cargocity-frankfurt.com/cms/service_point/dokbin/37/37654.annual_report_2004.pdf

United Kingdom: Success through innovation, Annual report 2004/05, BAA: Available through www.baa.co.uk

Estonia: Annual report 2003, Tallinn Airport: http://www.tallinn-airport.ee/index.php?page=591&PHPSESSID=de9b99b395c6e6d8b8d77b8d2f761edc

Spain: Legal information, Annual Accounts, Memoria, Annual report 2003 AENA: http://www.aena.es/csee/Satellite?pagename=Aena/Page/Aena&lang=EN_GB (in Spanish)

(Annual) reports maritime transport

Sweden: Annual report 2004, Port of Göteborg
http://www.portgot.se/prod/hamnen/ghab/dalis2.nsf/vyPublicerade/017BEF585EA8F1D6C1256CFD00259E08?OpenDocument

UK: 2004 Annual Report and Accounts, Associated British Ports
http://www.abports.co.uk/investor/reports/ann04.htm

The Netherlands: Annual report 2004, Port of Rotterdam
http://www.portofrotterdam.com/organizations/UK/CompanyInformation/Publications/AnnualReport/Index.asp

France: Annual report and statistics 2003, Port Autonome de Marseille
http://www.marseille-port.fr/site2005/v_anglaise/index.htm

Spain: 2002-2006 Investment Programme, Puertos del Estado
http://www.puertos.es/pageServlet?pageID-1043855891936

Spain: Annual report 2002, Valencia port
http://www.valenciaport.com/NR/rdonlyres/FF1C471E-9B6B-4F07-923F-EDAB6BEC01C0/0/Memoria02en.pdf

Contacted persons

Road

Country	Contact person	Company and Department
Austria	Thomas Spiegel, Wolfgang Hanko	Austrian Federal Road Administration
Estonia	Urve Ahtloo	Estonian Road Administration
France	Mr. Lechanteur, Martine Vertet, Mr. Huerre, Mr. Foatelli	Direction des Routes
	Jean Leveque	Ministère des Transports, de l'Equipement, du Tourisme en de la Mer
Germany	Mr. P. Haardt, Mrs. Künkel-Henker, Mr. Holst	BAST
	Gregor Schröder	Minsitry of Transport, Building and Housing
Netherlands	Co van der Vusse, Roel van der Horst	Dutch Road Administration
Spain	Jesus Rubio	Ministerio de Fomento
	Jacinte Vaelle	Consultrans
Sweden	Lars Bergfalk, Lena Erixon	Swedish National Road Administration
UK	John Robinson, Peter Bevis	Highways Agency

Rail

Country	Contact person	Company and Department
Netherlands	Peter Krumm, Gert Joosten and Evert Hetebrij	ProRail
Germany	Herr Nagel	Deutsche Bahn
Sweden	Anders Svensson, Mikael Alriksson	Banverket
UK	Tom Smethers	Networkrail

Inland waterways

Country	Contact person	Company and Department
Netherlands	Mr. Hielke Wijnstra	Province of Friesland
Germany	Mrs. Claudia Oberheim, Mr. Seus	Bundesministerium für Verkehr, Bau- und Wohnungswesen
France	Mr. Jean-Louis Julien, Mr. Frederic Maes	Voies Navigables de France (VNF)

Air

Country	Contact person	Company and Department
Austria	Mr. Imlinger	Vienna Airport
Netherlands	Mr. Koppedraaijer	Schiphol Airport
Germany	Mr. Krieg	Frankfurt Airport

Maritime transport

Country	Contact person	Company and Department
Sweden	Ms. Charlotta Hök	Ports of Sweden
	Mr. Kjell Svensson	Port of Göteborg
UK		Associated British Ports, public relations department
Netherlands	Mr. W. Remmerswaal	Port of Rotterdam
France	Ms. Veronique Grignon	Ministere de l'equipement, DTMPL
Germany	Ms. Heike Link (UNITE consortium partner)	DIW

Annex 5 Optional step to adjust operational and maintenance expenditures

In previous studies it was found that for a number of reasons operating and maintenance expenditures being registered by administrators do not always reflect the **necessary** yearly infrastructure expenditures. Due to for example budget restrictions actual operating and maintenance expenditures might be too low compared to the amount of money which is really needed, resulting in backlogging.

Infrastructure administrators can perform the following data checks, and if necessary adapt figures accordingly, in order to translate actual expenditures into annualised expenditures (the examples given are all based on a previous study done for the European Commission regarding transport pricing for inland waterways)[58]. The aim of this study is however to stay as close to the actual expenditure based information as possible. The possible adjustments in this step must therefore be seen as additional information, it is not advised (for the moment) to actually transform registered expenditures into annualised expenditures.

Has the infrastructure been upgraded/broadened during the years for which the cost figures are available?
If the infrastructure has been upgraded/broadened, maintenance expenditures in the years before upgrading/broadening or in the years in which the upgrading/broadening takes place must probably be increased since upgrading/broadening of infrastructure will in most cases result in lower regular maintenance expenditures in the preceding year(s) or in the year(s) the upgrading/broadening takes place.

Example
The Prinses Margriet Channel (PMC) was upgraded in the period 1991-2001. In this period the canal banks were broadened and the canal was deepened. There was a separate budget regarding the costs involved with the upgrading. The upgrading budget covered also the elimination of (part of) existing outstanding maintenance. The fact that the PMC channel was upgraded resulted in the fact that for example the dredging expenditures fluctuated strongly between years in the period 1991-2001: dredging did took place in those years but was part of the upgrading plan so the costs involved had not been registered as maintenance expenditures. As a result the dredging expenditures were increased to the level they would have been had the channel not been upgraded. This new 'maintenance and operating expenditure level' was determined by the province Friesland.

Have there been tight budgetary restrictions resulting in backlogging of maintenance?

[58] 'Charging and pricing in the area of inland waterways, a practical guideline for realistic transport pricing', ECORYS Transport, METTLE, 2005.

Budget restrictions are expected to result in relative low actual maintenance expenditures. It should be determined, with what factor the expenditures should be upgraded to arrive at the annualized expenditures, which are necessary to prevent backlogging.

Example
In the case of the Amsterdam-Rhine channel, the maintenance expenditures had been raised with 20%. This percentage was estimated by the Province Utrecht. According to the Province Utrecht these should have been the necessary maintenance expenditures if no budget restrictions would have existed.

Are infrastructure expenditures always been registered in the 'right' year?
Sometimes bills are not being paid in the (fiscal) year the costs were actually made, however these costs show up in the next year. Therefore expenditures figures collected should be checked on yearly fluctuations.

Example
In the case of the Prinses Margriet Channel cost were analysed for the period 1996-2003. It showed that the cost category 'other expenditures' was only registered for the period 1999-2003. Before 1999 these type of expenditures were made for the channel but registered in another way. It was therefore decided (in accordance with the Province Friesland) to increase the cost category 'other expenditures' with € 2,5 million each year for the period 1996-1998.

Has there been a change in the expenditure registration method as a whole or in the expenditure registration of certain cost units?
If this is the case it must be determined whether expenditure fluctuations between years are caused by these methodological modifications, and if so a correction must be made.

Example
In the case of the Prinses Margriet Channel it was found out that the expenditures on personnel are based on a registration of hours worked. During the last years however several different registration methods of hours were used resulting in costs fluctuations from year to year. In accordance with the province Friesland it was decided that only the most recent figures could be seen as representative.

Has there been a shortage of personnel?
If this has occurred in certain years, expenditures for personnel should be increased with the amount that is necessary to employ these people in order to arrive at the necessary expenditures.

Example
In the case of the Van Starkenborgh Channel it was found that during the period 1994-2002 the personnel costs related to shipping inspection were stable except for the year 2002. Enquiry showed that in the year 2002 the inspection crew needed was finally complete resulting in higher expenditures on personnel in that year. As a result, and in consultation with the Province Groningen, the expenditures on personnel for the period 1994-2001 were increased to compensate for the fact that in this period there was a shortage of personnel.

In order to be able to answer all these questions a contact person within the cost registration organization that has full knowledge regarding the relevant infrastructure and its characteristics is necessary. The 'translation' of infrastructure expenditures into annualised figures should at least be made once every 5 to 8 years.

It must be decided whether the expenditures are ‘translated’ into annualised expenditures (in all countries) or if it is preferred (for the moment) to work with the registered expenditures only.

Annex 6 Detailed tables on air transport expenditures

Table B6.1 Availability of air transport infrastructure expenditures and / or costs at national level (national authorities)

Source	Country	Data characteristics	Data collection / data source	Change in data provision last 25 years	Distinction annual / multi-annual expenditures	Distinction fixed / variable expenditures	Annual capital cost available in primary source	Annual capital cost available at national level	Breakdown of expenditures	Breakdown of infrastructure level
Questionnaires 2005	Estonia	Total budget only	Account system of private organisation	Yes	NA (a)	NA	NA	NA	NA	Only at project basis
	France	Total investment expenditures	Account system of public and private organisations	Yes	Yes	No	Yes	No	Only total investments	National and regional airports
	Sweden	Subdivision into investments and running expenditures	Account systems of public and private organisations	No	No	No	No	Yes (PIM)	Investments breakdown: construction and machinery	NA
	UK	Public expenditures: subdivision into investments and running costs (b)	Account system of public and private organisations	Yes	No	NA	NA	NA	Public versus private expenditures	ATC (c) expenditures not included

Source	Country	Data characteristics	Data collection / data source	Change in data provision last 25 years	Distinction annual / multi-annual expenditures	Distinction fixed / variable expenditures	Annual capital cost available in primary source	Annual capital cost available at national level	Breakdown of expenditures	Breakdown of infrastructure level
		Private expenditures: investments only								
UNITE, 2000	Austria	Subdivision into investments and running expenditures	Airport operators	NA	NA	No	NA	No	Material, taxes, personnel, depreciation, interest rate losses	National airports only. No distinction flight / non-flight related infrastructure
	Germany	Subdivision into investments and running expenditures	Airport operators	NA	NA	Yes	NA	Possible (PIM)	Capital costs include new investments and replacements. Running costs include maintenance, operation and administration	17 international airports. No distinction flight / non-flight related infrastructure
	Netherlands	Investments are estimated. Running costs	Airport operators	NA	NA	No	NA	Possible (PIM)	Investments only.	Not clear

Source	Country	Data characteristics	Data collection / data source	Change in data provision last 25 years	Distinction annual / multi-annual expenditures	Distinction fixed / variable expenditures	Annual capital cost available in primary source	Annual capital cost available at national level	Breakdown of expenditures	Breakdown of infrastructure level
		NA.								
	Estonia	Subdivision into investments and running expenditures	Consultancy report	Yes	Yes	No	NA	NA	Running costs: ATC, administration, education, 10% runway repairing expenditures. Other 90% of repairing expenditures is capitalized.	NA
	Spain	Subdivision into investments and running expenditures	Airport operator	NA	NA	No	NA	Possible (PIM)	NA	39 AENA operated airports

a) NA = not available.

b) public expenditures only minor share of total air transport infrastructure expenditures.

c) ATC = air traffic control

Table B6.2 Comparison of Unite Cost Categorization with available information from published business accounts

Business Accounts **Costs**	**Business Accounts** **Expenditures**			**Schiphol Netherlands 2004**	**Fraport Germany 2004**	**Wien Austria 2004**	**Aena (a) Spain 2003**	**Tallin Estonia 2003**	**BAA UK 2004/5**
Depreciation	Investment expenditures		Total	Yes	Yes	Yes	Yes	Yes	Yes
			By type of business area	Yes	Yes	Yes	No ©	Yes	No **(c)**
			By type of asset	Yes	Yes	Yes	Yes	Yes	yes
			Including (capitalized) expenditures for renewal, improvements or expansion **(b)**	Not clear	Not clear	Not clear	Yes	Yes	Not clear
Interest	Interest			Yes	Yes	Yes	Yes	Yes	Yes
	Operational (running) expenditures								
		Maintenance **(d)**	Total	Yes	Not explicitly	Not explicitly	Yes	Yes	Yes
			By type of business area	No	Yes	Yes	No	Yes	No
		Other operational expenditures **(e)**	Total	Yes	Yes	Yes	Yes	Yes	Yes
			By type of business area	No	Yes	Yes	No	Yes	No

a) Total of 39 Spanish airports.
b) Leading to increased capacity, productivity or to lengthening of useful lives of assets.
c) Business areas currently only assigned to revenues.
d) Repair and upkeep, not leading to increased capacity, productivity or to lengthening of useful lives of assets.
e) Excluding air traffic control expenditures.

Table B6.3 Separation of flight / non-flight business areas by airport operators

Schiphol Netherlands		Fraport Germany		Wien Austria		Aena Spain (a)		Tallin Estonia		BAA UK (a)	
Aviation	Planning, coordination, capacity management	**Aviation**	Flight and terminal operations; airport and aviation security	**Airport**	Flight and terminal operations; airport and aviation security	**Air traffic**	Landing, parking, use of infrastructure, security	**Airport**	Aircraft take-offs and landings, parking, terminal services	**Airport and other traffic**	Aircraft take-offs, landing, parking, terminal services, ground handling
Consumers	Retail, parking, floor space rental in terminal building	**Retail and property**	Renting of shops and offices, parking facility management	**Non-aviation**	Renting of shops and offices, parking facility management, real estate management	**Non- air traffic**	Fuel, catering etc.	**Non-aviation**	Parking, restaurants, lease of premises etc.	**Retail**	Parking, restaurants etc.
Real estate	Development, operation and management of real estate					**Commercial**	Parking, restaurants etc.			**Property and operational facilities**	Property letting sales, usage charges
		Ground handling	Ground handling services	**Handling**	Ground handling services			**Handling**	Ground handling services		
						Air traffic control	Navigation aids				

NB: segmentation in business areas only concerns revenues. Currently not used for (published) allocation of expenditures.

Table B6.4 Life time expectancies (depreciation periods) by type of fixed asset (years of useful life)

Schiphol Netherlands		Fraport Germany		Wien Austria		Aena Spain		Tallin Estonia		BAA UK		
Land	Infinite (no depreciation)	**Land**	Not clear	**Land**	Not clear	**Land**	Not clear	**Land**	Infinite (no depreciation)	**Land**		Infinite (no depreciation)
Runways, taxiways and aprons	30-40	**Buildings etc.**	5-40	**Operational Buildings**	33.3	**Structures**	20-32	**Buildings and structures**	5-33	**Terminal building, pier**		20-60
										Airfield	Runway surface	10-15
											Runway bases	100
				Other buildings	10-50						Taxiways and aprons	50
Roads (incl. car parks)	10-30											
Buildings	20-40					**Plant**	12-15	**Plant and equipment**	3-10	**Airport plant and equipment**		5-20
Installations	5-30	**Technical equipment and machinery**	3-33	**Technical equipment and machinery**	5-20	**Machinery**	6-12					
Other fixed assets	3-20	**Operational and office equipment**	4-25	**Operational and office equipment**	4-15	**Other**	4-18	**Other**	2-10	**Other**		Diverse

Annex 7 Background on IAS/IFRS standards

International Financial Reporting Standards are standards and interpretations adopted by the International Accounting Standards Board (IASB). They comprise:

- International Financial Reporting Standards (IFRSs);
- International Accounting Standards (IASs) and
- Interpretations developed by the International Financial Reporting Interpretations Committee (IFRIC) or the former Standing Interpretations Committee (SIC) and approved by the IASB.

The purpose of introducing IFRS as a standard is to provide a 'fair presentation' in the financial statements of the financial position, financial performance and cash flows of an entity, thus increasing transparency and comparability. Fair presentation requires the faithful representation of the effects of transactions, other events, and conditions in accordance with the definitions and recognition criteria for assets, liabilities, income and expenses set out in the Framework. [IAS 1.13]

As of January 2005, all EU companies with a stock market listing are obliged to comply with the International Financial Reporting Standards (IFRS) by EC Regulations 1606/2002 and 1725/2003. Non-listed companies can comply on a voluntarily basis. This holds especially if these companies seek to borrow on the international capital market.

Hence all EU (principal) infrastructure operators (rail, airports, maritime) are now preparing consolidated accounts in conformity with International Accounting Standards (IAS) or International Financial Reporting Standards (IFRS). Until 2005 business accounts of infrastructure operators have to comply with their respective national accounting principles. This will change as a result of the introduction of IFRS.

For a full overview of the standards and regulations please refer to IASB (http://www.iasb.org/standards/summaries.asp).

Concerning this report on *infrastructure expenditures and costs*, IAS 16 contain the most essential guidelines. The objective of IAS 16 is to prescribe the accounting treatment for property, plant, and equipment. The principal issues are the timing of recognition of assets, the determination of their carrying amounts, and the depreciation charges to be recognised in relation to them.

The most important issues with respect to the capitalization of infrastructure expenditures following IFRS (viz. IAS 16) concern:

- Capitalization of 'major maintenance' expenditures. Currently maintenance expenditures are not capitalised by most infrastructure operators. However under

IFRS differences in interpretation may arise concerning to what exactly 'major maintenance' is as no strict definitions have been set.

- IAS 16 expresses a *preference* for the valuation of assets based on historical costs, although also valuation based on replacement costs is allowed. Currently most infrastructure operators already apply valuation based on historical costs, hence no major differences are expected in this respect.
- Assets with different lifetimes to be valued accordingly. IAS 16 does not prescribe pre-determined asset categories nor respective lifetimes. IAS 16 merely states that assets with different lifetimes should be placed in different categories and be valued accordingly. This means that there is room for variations, especially regarding specific lifetimes of assets.

In summary IFRS concerning capitalization of infrastructure expenditures entail a certain degree of standardization (viz. *preferred* methods). However also under IFRS for infrastructure operators it will remain possible to apply different valuation methods, lifetimes and definitions as long as they provide clear and solid arguments. Applying IFRS does not necessarily guarantee that all operators will report on exactly the same basis.