CURRENT PRACTICE IN PROJECT APPRAISAL IN EUROPE

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1. INTRODUCTION

The work reported in this paper presents the results from the compilation of the national assessment practices in EU25 Member States and Switzerland. The work was completed as part of the current European Union 6th Framework project HEATCO (Developing **H**armonised **E**uropean **A**pproaches for **T**ransport **Co**sting and Project Assessment), which has the objective of developing a set of harmonised guidelines for project assessment and transport costing at an EU level. This paper presents the starting point to this project. Based on the work described in this paper the HEATCO consortium will be developing common definitions and consistent valuation methods for the evaluation of TEN projects.

Previous projects such as EUNET had conducted a similar review to the research presented in this paper. The key reason for repeating the research was the expansion of the EU to 25 countries in May 2004 and the fact that appraisal practices in many countries has evolved since the last survey. A proforma was designed and sent to country representatives to complete. This paper is based predominantly on the results that this data provided. The proforma focused specifically on the use of Cost Benefit Analysis in appraisal with the aim of identifying similarities and differences in country practice. Aside from the national appraisal framework the proforma also considered the individual impacts included in appraisal. The paper describes some of the similarities and differences in how construction costs, time savings, safety and environmental impacts are used across Europe. The paper then concludes with the key differences and similarities as identified by the analysis.

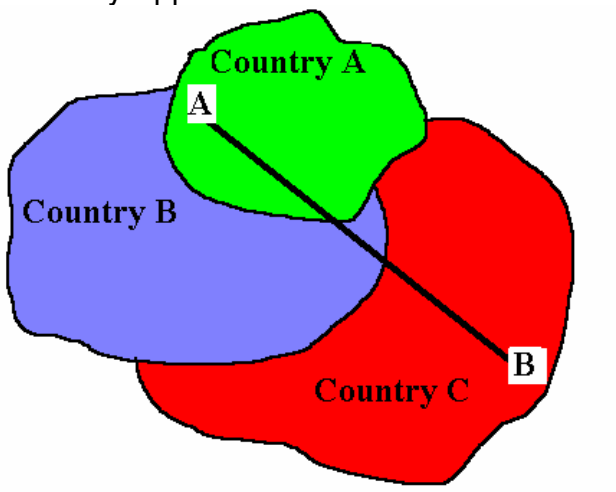
This paper aims at providing an overview of the current appraisal practice and more country specific details are given in Odgaard et al (2005).

2. BACKGROUND

The key reason for reviewing appraisal practice in Europe has arisen from the need to assess the potential impacts from transport investment proposals across the range of EU countries and most critically for investment proposals that transcend country boundaries at a European level. Current TEN-T priority axes and projects (see Van Miert (2003) amongst others) include railway axis between Athina-Sofia-Budapest-Wien-Paraha-Numberg/Dresden and the Nordic Triangle railway / road axis. These priority areas cross multiple country boundaries and any EU appraisal procedure needs to take account of this. Project appraisal in the EU is typically based on national perspectives, where the appraisal frameworks and values placed on individual impacts differ between the countries in question.

Figure 3.1, as an example, shows a potential rail/road link going from A to B through three countries. To conduct an appraisal of this potential link the national values, methodologies used and appraisal frameworks need to be identified in all three countries. Once this information is known then the second stage is to determine the strategy that will be used to account for any differences in the national practices. This second stage is considered in [deliverable 5] a later stage of the HEATCO project.

Figure 3.1 Cross Boundary Appraisal



Previous projects that have considered appraisal practice within Europe are the EC research studies EUNET and UNITE and a PIARC study - PIARC (2003), which considered PIARC user countries. These reviews were completed before the EU expanded in May 2004. The work presented in this paper is important as it indicates the current state of play in national appraisal practice and the differences that exist now that there are 25 countries in the EU.

The EUNET project considered the national appraisal frameworks of 14 EU countries in 1998. The project proposed three key conclusions from analysing these national appraisal frameworks (Grant-Muller et al, 2001). Firstly, all the appraisal frameworks that were considered contained a mixture of monetised

impacts and impacts measured in both physical and qualitative terms. Secondly, it was found that appraisal practice is not standardised across the countries, as there was great variation in terms of the impacts that were monetised, which tended to be the direct transport impacts (e.g. construction costs) and the environmental and social-economic impacts (e.g. economic development), which tended not to be monetised. Finally the framework in which the impacts were considered varied greatly. For example, Greece had a practice of using a MCA framework, with certain monetised impacts included in this. Whereas Sweden uses a CBA framework with additional impacts (e.g. air pollution) included in a qualitative assessment. The conclusions were that "although there is broadly similarity between the appraisals approaches used by different countries in Western Europe there are many points of difference" (Grant- Muller et al, 2001).

PIARC conducted a survey in 2001/02 to consider the methods of evaluation adopted by member countries for road appraisal (PIARC, 2003). The report examines 18 countries including 9 current EU countries (e.g. Czech Republic and France) and 9 non-EU countries (e.g. Australia, USA and South Africa). They found that a wide range of appraisal frameworks were used with almost all countries using CBA in some part of the evaluation. The research showed that most countries include travel time savings, accident costs and vehicle operating costs as monetised impacts in their frameworks however after this point variation between approaches increases along with the values and methods used. For example, the cost of a fatal injury (in euros) varies from 46,500 in South Africa up to 3,641,000 in the USA. They found that where externalities were monetised these tended to be for noise (e.g. New Zealand) and air pollution (e.g. Japan). The broad consensus from the report agreed with the earlier EUNET study in that there were some commonalities between the appraisal practices in different world countries, but that at the same time appraisal practice is not currently standardised.

One of the focuses of the EU project UNITE and presented in Nellthorp et al (2001) was a review of the values that were then used by EU countries in national appraisal practice. This information was then used to identify best practice and produce the valuing conventions subsequently used for the UNITE project. This report identified that there were differences in the methodologies used to determine monetary values for inclusion in an appraisal as well as between the values used.

The previous reviews of current practice have indicated that there remains a common set of impacts that are routinely included as monetised impacts, but across national appraisal frameworks there remain significant differences in how impacts are treated. This paper will now go on to discuss the results of the survey that was conducted to examine the state of the art for the 25 EU countries plus Switzerland. The aim of this review is to identify differences and similarities between the national frameworks.

3. APPROACH

The results presented in this paper are based on a review of existing studies, comprehensive collection of new data and analysis of same. The first part of

the work involved reviewing the previous studies (e.g. UNITE, EUNET), state-of-the art recommendations and guidelines from ECMT, EU and other international organisations to provide a benchmark for national practices. On the basis of this review, a delimitation of the project was made and a framework for the analysis developed. The cornerstone of this framework was a proforma for country reports.

The country based proforma was designed to allow the detailed collection of appraisal information on a county by country basis. This process was completed in close cooperation with those national authorities responsible for infrastructure appraisal. The country reports contain information on the national frameworks for project appraisal, with a focus on cost-benefit analysis. One country report was completed for each surveyed country and covers all modes. In some countries there is no standardised methodology for project appraisals. For these countries the country reports reflects the "normal practice". The information that was collected formed the basis for the analysis and comparison of existing practice of project appraisal. This has concentrated on identifying differences in approaches, definitions, valuation methods and gaps of knowledge. It became clear during this process that several countries are in the process of revising their national guidelines for project appraisal and updating money values. Accordingly, the content of this paper should be seen as a snap shot on the existing practice

A key issue when comparing appraisal practice across countries is to secure the use of a consistent set of definitions. In the proforma for country reports several references were made to the definitions used in the EUNET study (Nellthorp et al, 2001). The definitions used are discussed in the relevant sections of this paper. Additionally to allow the comparisons of regional similarities and differences in project appraisal the surveyed countries have been grouped into three regions (North/West European countries, Eastern European countries and South European countries). The country grouping is provided in Table 3.1.

Table 3.1 Country grouping

Region	No. of countries	Countries
North/West	11	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Netherlands, Sweden, Switzerland and UK
East	8	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia
South	6	Cyprus, Greece, Italy, Malta, Portugal and Spain

Information for Luxembourg could not be obtained despite considerable efforts. The result of this is that the analysis presented in this paper covers 25 countries; all EU Member States (excl. Luxembourg) and Switzerland as a non-EU country. The rest of this paper will discuss the findings from the country based proforma.

4. PROJECT ASSESSMENT METHODS USED

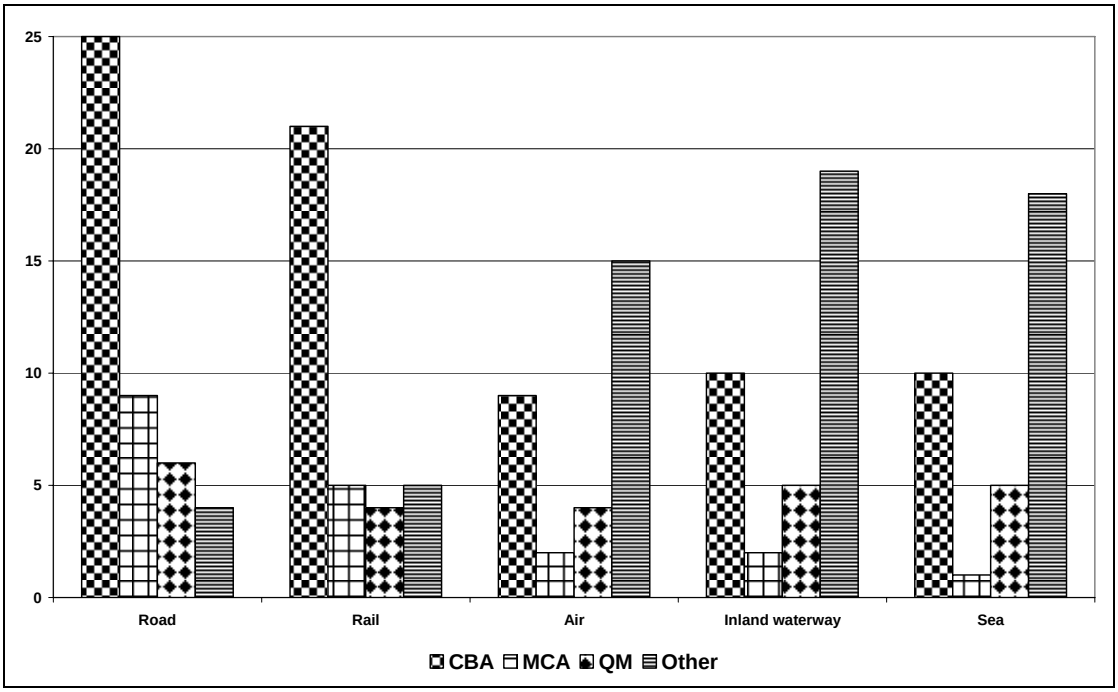
Previous studies have, as mentioned, found that there was great variation in terms of the impacts that were included in the appraisal with a monetary value, and the frameworks that were used for project appraisal.

The first impression when comparing country practice is that the degree of standardisation of principles for project appraisal varies considerably across countries and modes. The national appraisal frameworks are most developed for the appraisal of road projects then less so for rail and for other modes the coverage is very limited. This is reflected in the fact that PC software is only used for the appraisal of road projects. This covers countries in the North/West region that have developed their own software and countries in the East region that use HDM-4. Furthermore, the comparison shows that many of the countries in the East region draw upon international guidelines (EU, EIB, and World Bank) for project appraisal and that several countries have mode specific approaches.

In line with the findings of Grant-Muller et al (2001), this study found that many types of analysis are used for project assessment. Figure 4.1 shows the number of countries which uses the different types of analysis for project assessment by mode. It shows, for example, that all the countries surveyed use cost-benefit analysis (CBA)[1] for the appraisal of road projects. Caution should be applied when interpreting this result as CBA is not a requirement in several countries and as such only is used under certain circumstances. In the East region of the EU, for example, CBA is most commonly or exclusively used for projects, which are promoted for co-funding from the EU. The country reports, however, indicate that CBA is gaining acceptance for use in locally financed projects in several of the countries in the East region of the EU.

It is also clear from the country reports that CBA is only part of the assessment of transport projects, in the sense that CBA most often does not stand alone. For example, in 9 countries the CBA is used together with multi-criteria analysis (MCA)[2] for road project appraisals. Again caution should be applied, as no information is available on how sophisticated the MCAs are. As can be seen, the project appraisal also include other quantitative measures (QM)[3] and/or qualitative assessments (QA)[4].

Figure 4.1 Types of analysis used for project assessment, number of countries[5]



Theoretically, all benefits and costs could be accounted for in the cost-benefit analysis. In practice though, many effects are left out either due to difficulties of estimating a trustworthy monetary value, difficulties of quantifying the effects or because the effects are considered to be of minor importance.

For the analysis of how the elements of a CBA are treated in the appraisal framework the effects were grouped into 11 categories which again were grouped into 4 categories of main effects (see table 4.1).

Table 4.1 Elements of a CBA

Category of main effects	Element
Infrastructure costs	Construction costs, costs for maintenance operation and administration
User benefits	Passenger transport time savings, vehicle operating costs, benefits to goods traffic
Externalities	Safety, noise, air pollution - local/regional, climate change
Other	User charges and revenues, disruption from construction.

Figure 4.2 provides a summary on how the 11 elements are covered in each of the countries surveyed in case CBA is used. It is clear that;

- all countries include *construction costs, costs for maintenance operation and administration, passenger transport time savings, benefits to goods traffic* and *safety*;
- the effects which are most often excluded in the CBA are *disruption from construction, noise, air pollution - local/regional* and *climate change;*

- the range of effects covered differs a lot across countries;
- the coverage of effects is most comprehensive in the North/West region; and finally
- only a few countries in the East and South regions of the EU include *noise, air pollution - local/regional, climate change* and indirect socio-economic effects with a money value in their appraisal frameworks.

Figure 4.2 Coverage by country and element in case CBA is used[6]

		Construction costs	Disruption from construction	Costs for maintenance, operation and administration	Passenger transport time savings	User charges and revenues	Vehicle operating costs	Benefits to goods traffic	Safety	Noise	Air pollution - local/regional	Climate Change	Indirect socio-economic effects
North/West	Austria (*)												
	Belgium (*+)												
	Denmark (*)												
	Finland (*)												
	France (*)												
	Germany (*)												
	Ireland (*)												
	Netherlands (*)												
	Sweden (*)												
	Switzerland (*)												
	UK (*)												
East	Czech Republic (*)												
	Estonia (+)												
	Hungary (*)												
	Latvia (+)												
	Lithuania (*)												
	Poland (+)												
	Slovak Republic (*)												
	Slovenia (*)												
South	Cyprus (+)												
	Greece (+)												
	Italy (+)												
	Malta (*)												
	Portugal (+)												
	Spain (*)												

Colour codes:
: Included with a money value
: Measured quantitatively, qualitatively or not included

All countries surveyed do, as mentioned, use cost-benefit analysis under some circumstances in project appraisal. However, the country data shows that there are many points of differences on the technical issues of cost-benefit analysis. For example, the survey shows that;

- around half the countries refer to factor costs and half to market prices;
- there is a significant range in the values used for the discount rate. Four countries use a real discount rate of less than 4%, 17 countries a discount rate of 4-7% and 3 countries a discount rate of more than 7%. The data shows that there are no clear regional differences in the choice of discount rate; and that
- there is large variation in the appraisal period, ranging from 20 years to an infinite time horizon. 8 countries uses a time horizon of less then 30 years,

7 countries a time horizon between 30 and 40 years, and 4 countries a time horizon of more that 40 years (including the Netherlands and Switzerland which sometimes uses an infinite time horizon).

Furthermore, there are differences between countries on whether or not transboundary effects should be included in the project appraisal. Transboundary effects are those which impact on "non-residents" and/or "foreign" areas[7]. This issue is therefore often highly relevant for the appraisal of Trans-European Network-projects. The majority of countries do not include transboundary effects in the project appraisal, but six countries (Austria[8], Belgium, Sweden, Switzerland, the UK[9] and Spain[10]) - of which five are countries in the North/West region - include transboundary effects in some form in their project appraisals[11]. In Austria, Sweden, Switzerland and Spain transboundary and national effects are treated equally. In the UK, it is not made explicit in the guidelines how to treat transboundary effects.

Among the countries surveyed the majority do not include distortion effects from tax financing. Distortion effects refer to the fact that infrastructure projects (especially road and rail) are mostly financed through taxation and that taxation reduces output in the economy and causes a deadweight loss to society. Four (Denmark, Sweden, Slovenia and Greece) of the 21 countries for which the information is available take distortion effects from tax financing into account.

5. CONSTRUCTION RELATED COSTS

The costs of building and maintaining the infrastructure are key components of project appraisals and often comprise the most important cost element in transport project appraisals. This study indicates that all surveyed countries include the direct costs of building the infrastructure in project appraisal. Differences, however do, exist across countries regarding which *elements* to include in investment costs, how to handle the *residual value* and which *lifetimes/depreciation profile* to use for various components.

This study used the EUNET definition of elements of investment costs. The definition was (Nellthorp et al, 1998);

- *construction costs*, including materials, labour, energy, preparation, professional fees and contingencies;
- *planning costs*, including design cost, planning authority resources and other costs incurred after the decision to go ahead;
- *land and property costs*, including the cost of acquiring land needed for the scheme (and any associated properties), compensation payment necessary under national laws and the related transactions and legal costs; and
- *disruption costs*, i.e. the disruption to existing users to be estimated using the same values of time as are used for travel time savings arising from the scheme.

All countries include *construction costs* and costs for *land and property purchase.* All countries except two (Finland and Hungary) include *planning costs*. However, the data did not provide sufficient information to understand fully the approaches taken in all countries, e.g. whether Finland and Hungary exclude all planning costs or only planning costs incurred prior to the decision to go ahead with the project or not. *Disruption from construction* is included in 11 of 25 countries.

In theory, the time horizon of the infrastructure appraisal should equal the lifetime of the infrastructure. The appraisal period is, however, often shorter than the lifetime of the infrastructure due to uncertainty. This introduces the issue of residual value. For three (Germany, Netherlands and Sweden) of the 25 countries surveyed the issue of residual value is not relevant because they use an appraisal period which is infinite or equal to the lifetime of the infrastructure. For the other 21 countries the issue of residual value is relevant. Of these countries 18 include the terminal/residual value, whereas three (Ireland, Malta and Portugal) do not. The assessment of residual value consists of two components;

- the lifetime of the infrastructure (or its components); and
- the depreciation profile.

There is a significant range in the lifetimes used in the surveyed countries. For example, a lifetime of 30 years is used for bridges in Spain and Portugal, whereas Denmark and Estonia refer to a lifetime of 100 years for bridges. However, the data shows that the range narrows considerably when excluding the few most extreme cases. For those countries which include the terminal/residual value straight line depreciation[12] is the most commonly used method.

It is a well-known fact that many transport infrastructure projects experience budget overruns, whereas few end up less costly than originally estimated. Recent evidence (Flyvbjerg et al, 2003) shows that cost escalation occurs in almost nine out of ten projects and that actual cost on average are 28% higher than estimated/forecast cost. This relates to issues of uncertainty, additional project requirements during the planning and implementation period and/or optimism bias. The majority of the surveyed countries have systematic methods to tackle uncertainty/bias in the construction cost estimate. However, most often this comprises a form of standard mark-up on construction costs, which can vary with the stage of the process. Denmark and the UK are two of the countries, which are using more advanced methods for handling uncertainty/optimism-bias. The UK uses a "top-down approach" where information from a class of similar or comparable (finalised) projects is used to estimate the average budget overrun. Contrary, the Danish approach is a "bottom-up approach", which focuses on project specific risks. Furthermore, the Netherlands is currently considering using an approach similar to the method of the UK.

Costs for maintenance, operation and administration are the costs accrued during the operating life of transport infrastructure by the infrastructure owner

for the parts of the network which are changed by the project. More specifically, the EUNET study (Nellthorp et al, 1998) defined the related *System operating costs and maintenance* as; *"costs consisting of the costs of infrastructure operation (e.g. signalling/traffic control), the costs of maintenance (e.g. cleaning, minor repairs, winter servicing) and the costs of renewal (e.g. road surfacing)"*[13]. This study showed that the definition used in 20 of the surveyed countries are consistent with that suggested in EUNET. In addition Switzerland uses a definition which is almost identical to that of EUNET.

All countries[13] include costs for maintenance, operation and administration in their appraisals of road and rail projects. For air, inland waterway and sea the vast majority of countries include costs for maintenance, operation and administration. Around half the countries surveyed have standard figures for these costs for road. A few countries have standard figures for rail. Many countries often use project specific cost estimates even where national standard figures are available. Furthermore, other studies (e.g. DIW et al, 1998 and Link and Maibach, 1999) have documented that approaches to cost allocation between fixed/variable costs are heterogonous among EU Member States and that country practice to cost allocation to vehicle types is quite different among countries.

6. TIME SAVINGS

Traditionally the most important source of monetary benefit in transport appraisal practice are travel time savings. While all EU countries surveyed used time savings in their appraisal there remain differences in the methods used to determine the values, the way in which those values are differentiated and ultimately in the values themselves.. This section will consider passenger time savings, then commercial goods traffic.

6.1 Passenger travel time savings

The research indicates that there is a high degree of consensus on what constitutes a passenger travel time saving. Whilst not all national appraisal guidelines include a definition of passenger travel time savings the approach adopted across the EU typically takes any change in the door to door journey time to constitute a change in passenger travel time. The majority of countries differentiate between the values that are used for working trips and non-working trips. The majority of countries that have guideline values for work trips use the costs saving approach as the valuation methodology. Two countries, Sweden and the Netherlands use the Hensher approach (Hensher, 1977). Austria, Lithuania, Italy and Portugal use some relationship to GDP/capita whilst Switzerland uses a relationship to non-working time. A variety of methods are also used to value non-work VTTS. For the seventeen countries that have guideline values for non-work VTTS, six base their valuations on willingness to pay surveys, whilst seven use some form of fixed relationship with the wage rate or the value of work VTTS. The remaining four countries use methods based on the international comparisons, literature surveys and analysis of macro economic data such as national income. Those countries that do not differentiate between work and non work VTTS

either use an average value (Belgium, Slovak Republic, Czech Republic, Spain, Hungary,) or do not have any guideline values (Luxembourg, Poland, Estonia, Cyprus, Italy, Portugal).

Trip purpose is only one of the categories of VTTS that differ by country across the EU. The next two most common differentiations are mode of transport (16 countries) and multiple non work categories (9 countries). Two countries differentiate by income group (Netherlands and Switzerland) and both the Netherlands and the UK use different values for drivers and passengers. The other methods for differentiating values include urban/ interurban differences (France), length of Journey (France, Switzerland and Sweden), delays (Denmark and Sweden) and different days of the week (Hungary). Figure 6.1 shows the range of values used for work trips across the countries. This ranges from Austria who applies a maximum value of €57.40 (2002, PPP, €, factor prices) for work trips down to Hungary who apply a value of €2.81 (2002, PPP, €, factor prices) for private road vehicles travelling for work purposes. This table shows that there is also a large variation both between EU countries and then within the countries in the values that they apply to different variations of work trips. The same is the case for non work trips, which is presented in figure 6.2. Here the values range from a maximum of €21.4 (2002, PPP, €, factor prices) in Switzerland to a minimum values for non work trips of €1.4 (2002, PPP, €, factor prices) in the Netherlands. The principal reasons for the variation in VTTS values within a country are disaggregated by income, distance and mode.

There is some variation in the treatment of growth in real VTTS over time. With respect to passenger time savings 8 countries have no guidelines, 6 assume there will be no change and the remaining 12 use some form of real growth mechanism.

Figure 6.1 VTTS for passenger work trips (all modes), per person hour (2002 € at PPP and factor prices)[14]

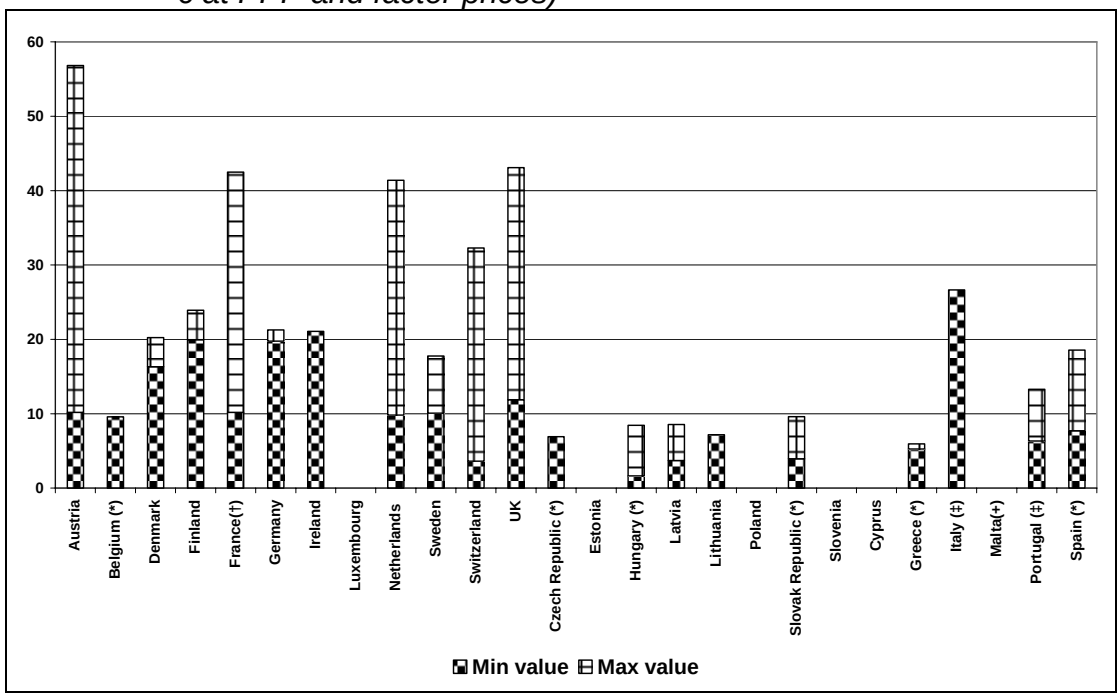
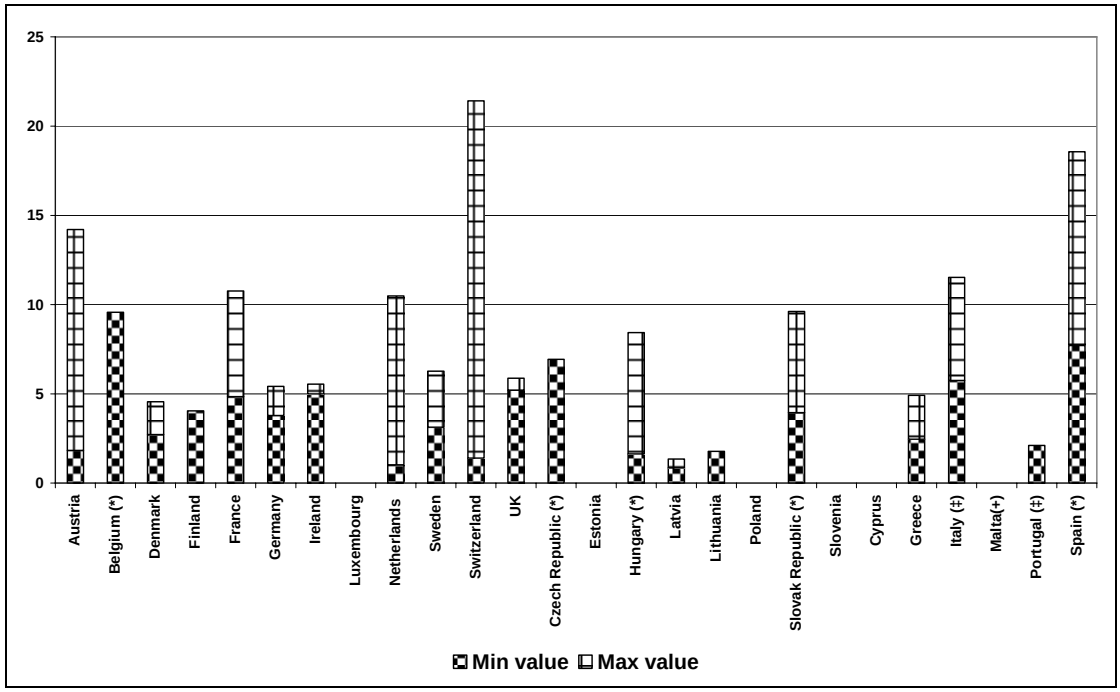


Figure 6.2 VTTS for passenger non work trips (all modes) per person hour (2002 € at PPP and factor prices)[14]



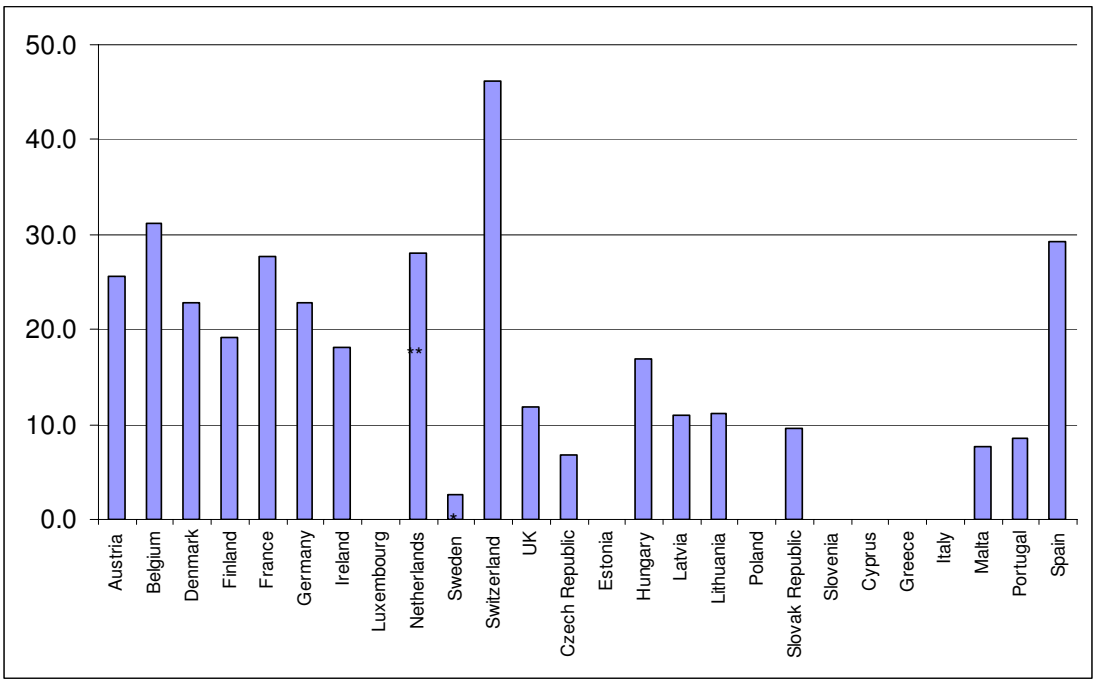
6.2 Commercial goods traffic

All countries include the VTTS for commercial goods traffic in their appraisal, but four have no guideline values (Luxembourg, Estonia, Poland and Cyprus). The VTTS for commercial goods traffic is the marginal benefit arising from a unit reduction in travel time. These 'values of freight time savings' usually include savings in the time variant costs of vehicle operation, whereas for

passenger transport the value of time savings (VTTS) and vehicle operating costs (VOC) are usually treated separately. The survey showed that almost all countries use the cost savings approach to calculate the VTTS for commercial goods vehicles. The Netherlands however has a different approach to the rest of the EU, as they use a willingness to pay survey in conjunction with fctor cost estimates to determine a value for all freight costs together. Figure 6.3 provides a comparison of the VTTS used for commercial goods vehicles across the EU countries surveyed. It shows that there is a significant range in the values used. They range from €46.2 in Switzerland down to €6.8 in the Czech Republic.

Only 9 countries provide guidelines recommending that the VTTS of commercial goods traffic grows over time.

Figure 6.3 VTTS for Commercial Goods (€ 2002 at PPP and factor prices)



6.3 Treatment of congestion, unexpected delays and reliability

Congestion can affect the performance and quality of the transport system in a number of ways: increased travel times; overcrowding on public transport; deterioration in the 'driving experience' with stop-start conditions; and reliability problems. The number of countries that include the impacts of congestion, beyond that of just increased travel time, within the monetised element of the cost benefit analysis procedures is limited. With respect to passenger traffic, only the UK, Netherlands and Sweden specifically include reliability as a monetised input, whilst Sweden, Denmark and the UK (rail only) have guideline monetary values for public transport delay (travel time in excess of expected). In terms of passenger overcrowding on public transport only France and the UK (rail only) have guideline values. With respect to

commercial goods traffic (freight) only the Netherlands and Sweden provide recommended values for reliability.

7. SAFETY

The costs of accidents are a dominant socio- economic cost of transport. Savings in accidents are included in the appraisal framework for all EU countries. However there are variations in how they are included. For example, in Poland safety is only part of a CBA approach for those projects which are co-financed using EU funds. The main three elements of accident savings are; material damage, personal loss for casualties and costs to society. All countries in the North /West region include all three elements. However, countries including Latvia, Slovenia and Spain do not include costs to society in the calculation and Hungary does not include personal loss for casualties.

This study used the EUNET definition (Nellthorp et al, 1998) for categories of casualties to determine whether there were any differences between the EU countries. These definitions were:

- *Fatality : Death within 30 days for causes arising out of the accident*
- *Serious Injury: Causalities who require hospital treatment and have lasting injuries, but who do not die within the recording period for a fatality; and*
- *Slight injury: Casualties whose injuries do not require hospital treatment or if they do, the effects of the injuries quickly subside.*

16 of the 25 countries surveyed were found to use a definition that was consistent with this classification. In addition to this only three countries (Denmark, Sweden and Switzerland) currently correct for non reported accidents. The values applied in the national frameworks vary by country with Finland having the highest value of 1,941,503 per fatality (2002, €, factor prices) compared to at the lower end of the values the Slovak Republic with 197,810 per fatality (2002, €, factor prices).

8. ENVIRONMENTAL IMPACTS

There are a number of different environmental impacts considered in project appraisal. These will be considered in turn starting with noise, then considering air pollution, climate change and other environmental impacts.

8.1 Noise

The survey showed that all countries, except three (Estonia, Italy and Malta), take noise effects into account in some form in the project appraisal. 13 of these countries include noise levels in a CBA as a monetised impact (see Figure 4.1). There is a clear regional tendency in the treatment of noise. None of the countries in the South region include *noise* in a CBA, whereas all but three countries in the North/West region (Belgium, Ireland and UK) do this. Around half of the countries in the East region have monetary values for noise.

Noise effects are normally considered to consist of two elements;noise annoyance; and health related costs. Of those countries that use monetary values for noise all include the effect of *noise annoyance* and around half of these countries (France, Germany, Lithuania, Slovenia, Sweden and Switzerland) also include the annoyance at *other locations.* Only five countries (Denmark, France, Lithuania, Poland and Switzerland) include *health related costs* related to noise with a money value. The money value of noise annoyance is based on *hedonic pricing* in all countries except for Germany, where the money value is based on *stated preference/contingent valuation* analysis. In Austria both hedonic pricing and *stated preference/contingent valuation* is used. The money value for *health related costs* is derived from different sources in the five countries where included. The HEATCO country reports show that a wide range of values are used for noise effects, though the values used are difficult to compare due to the different approaches for including noise effects.

8.2 Air pollution - Local/Regional

This study found that the vast majority of the surveyed countries take into account the effect on local and regional air pollution in national project appraisals. 14 countries use monetary values to include the effects from air pollution in a CBA, whereas eight countries use some form of qualitative description, quantitative description and/or multi-criteria analysis for air pollution. Only three countries (Belgium, Ireland and UK) of the 11 countries in the North/West region do not include the effect with a money value. Only three of the eight countries in the East region (Czech Republic, Hungary and Lithuania) do include it in a CBA. For the countries in the South region, three out of six countries use monetary values for air pollution (see Figure 4.1).

The majority of countries, which include the effect with a monetary value have values for particulate matter (PM), nitrogen oxides (NO_x), sulphur dioxide (SO_2), Hydrocarbons/volatile organic compounds (HC) and carbon monoxide (CO). Only lead (*Pb*) is not included in the appraisal in the majority of countries.
The majority of the surveyed countries who value air pollution base their money value on the *impact pathway approach*. However, many different approaches are used including other damage cost approaches and avoidance cost approaches (cost of avoiding emission or cost of avoiding damage). Some countries use more than one approach for estimating the money value. There are differences between countries on which effects to include in the money value. All countries, which include the effect on air pollution with a money value and for which the information is available, include *Human health - production loss from sickness and increased mortality.* In addition six countries include; human health - willingness-to-pay to avoid sickness and reduce risks of death; agricultural and forestry production loss; and blackening and corrosion of buildings.

The HEATCO country reports show that there is a significant range in the values used for local and regional air pollution. Finland for example use a figure of €9730/ton (2002 EUR, factor prices, PPP) for SO_2 compared to a

figure of €1584/ton in Austria (HEATCO deliverable 2, 2005). The values for air pollution are only modified over time in three countries, namely France, Lithuania and Switzerland.

8.3 Climate change

The survey shows that climate change effects (global warming and ozone depletion) are only included with a monetary value in nine of the countries surveyed and that there are also clear regional differences on the treatment of *climate change.* Only four of the countries in the North/West region do not include climate change effects in a CBA (Belgium, Ireland, France and UK), whereas only one of the countries in the East region (Czech Republic) and one country in the South region include the effect of climate change in a cost-benefit analysis (see Figure 4.1). All countries which include *climate change* in the appraisal include *carbon dioxide (CO_2) with* less than half of the surveyed countries which include *climate change* including *ozone (O_3)* and *methane (CH_4).*

The country data shows that there is no single common approach for assessing the money value of *climate change* effects. Three countries (Finland, Netherlands and Italy) use the *damage cost approach* and four countries (Austria, Germany, Sweden and Switzerland) the avoidance cost approach. In Denmark the value is decided politically. All countries which use the avoidance cost approach, and for which the information is available refer to the costs of avoiding emission. The country data shows that there is a significant range in the values used. For example, Sweden uses a cost of CO_2 of €108.9/ton (2002, factor prices,PPP) whereas its neighbouring country Finland uses a figure of €23.2/ton. In most countries the values for *climate change* are kept constant over time. Only France changes the values used over time. In France the carbon price is reported to be increased yearly at a rate of 3% after 2010.

8.4 Other environmental impacts

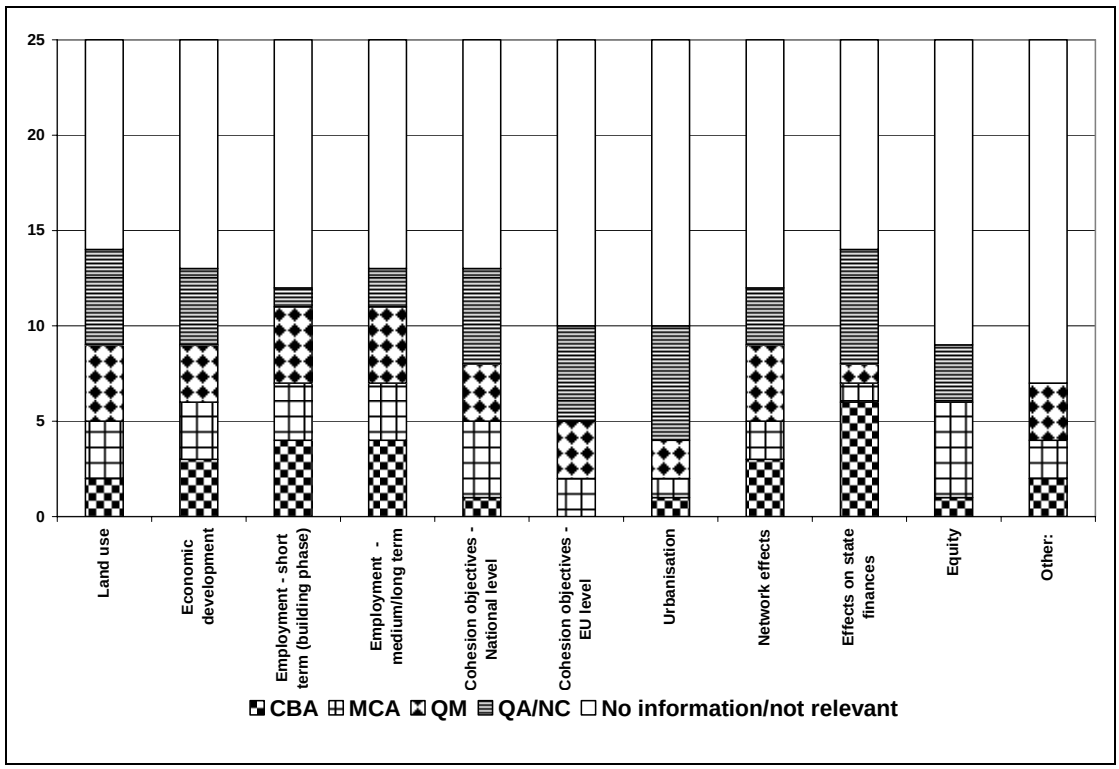
Only a few countries include environmental impacts other than those mentioned above as a monetised impact in their projects appraisals. *Other environmental impacts* include vibration, severance, visual intrusion, loss of important sites, resource consumption, landscape, ground/water pollution etc. In the Netherlands, it is stated that all the effects are (potentially) included in a cost-benefit analysis. Apart from the Netherlands, only Denmark, France, Germany and Switzerland include some of these effects in a cost-benefit analysis. *Other environmental effects* are generally covered by a qualitative assessment - if covered at all. Some countries (for example the UK) are, however, considering how monetised values could be employed to value some of these impacts.

9. INDIRECT SOCIO-ECONOMIC EFFECTS

The focus in the survey was on direct effects. However, the survey also contained a small section on the coverage of indirect socio-economic effects. The results of this part of the survey are summarised in Figure 9.1.

16 countries include one or more indirect socio-economic effects. However, as can be seen, only a few countries include the effects with a monetary value, especially taking into account that in the Netherlands, all mentioned effects are potentially included in CBA except for EU level cohesion objectives.

Figure 9.1 Coverage, indirect socio-economic effects, number of countries



10. ISSUES OF HARMONISATION

Clearly there are significant differences in the values used for transport appraisal across the EU. This raises a policy question for the EC as to the values that should be used for the appraisal of TEN-T priority projects. Consistency is required for the objective comparison of different projects across the EC, as well as to ensure an appropriate treatment of the impacts of cross-border projects or projects with trans-boundary impacts. The policy choice facing the EC in this context can be rationalised to a choice between using country-specific values (based on a common valuation methodology) or EU-averaged values[15].

The main advantage of using country-specific values is that such an approach is more 'satisfactory' in relation to the neo-classical basis for cost-benefit, i.e. that economic values should be derived from the expression of individuals' preferences in the form of their willingness to pay in monetary terms. In addition, a practical advantage might be that a project CBA will be more acceptable and easier to understand for domestic stakeholders when the values used derive directly from the national context. Possible disadvantages of using country-specific values include that specific unit values may not exist or be of poor quality for individual countries within the EU and that the

valuation of identical impacts using different local values may be considered to be morally indefensible. For example, differences in values of statistical life (VSL) between countries may not be acceptable to project decision-makers. Given that country specific values reflect local willingness-to-pay - and therefore income levels - a distributional analysis will also need to be undertaken, otherwise investment may be targeted to those countries with the higher incomes.

The advantages of using EU-averaged values include that a set of common EU values for individual impacts might simplify the appraisal process and increase transparency. Furthermore, it may be more politically acceptable on the basis of perceived equity. The main disadvantages is that this approach does not fully reflect differing preferences and resource costs and that it implies the use of project appraisal as a means of achieving distributional objectives, which may not be the most cost-efficient way of achieving these ends. In addition, the use of EU-averaged values will conflict with values supplied by national level ministries, which may make a practical difference as to which (types of) projects are pursued by the ministries and so distort project selection.

Special issues arise in relation to the valuation of external and indirect effects. It seems obvious that values for global warming effects would be common to all EU countries, since climate change effects are felt globally, independent of which country generated the emissions. For pragmatic reasons it may also be necessary to settle on a common value of trans-boundary air pollution. However, it should be remembered that in reality the effects are strongest on neighbouring states, and different states have different willingness to pay.

11.CONCLUSIONS

This paper has presented the results of a survey that was conducted to examine national practices for transport costing and project appraisal in all EU Member States (excl. Luxembourg) and Switzerland. The work reported here updates and expands on work undertaken in previous projects including EUNET, UNITE and in PIARC (2003). It is the first time such an analysis includes the new countries which joined the EU in May 2004.

The analysis has shown that the degree of standardisation of principles for project assessment, the frameworks for project appraisal and the impacts that are included in the appraisal with a monetary value varies considerably across countries and modes. In general national appraisal frameworks are most developed and are most comprehensive for the appraisal of road projects and less so for rail. For other modes the frameworks are little developed and the coverage limited. In addition the analysis has shown that the vast majority of countries in the North/West region of the EU have comprehensive guidelines for project appraisal, whereas the guidelines in the East and South regions of the EU seem less developed.

All the countries surveyed use cost-benefit analysis under some circumstances. In the East region of the EU, CBA is most commonly or

exclusively used for projects, which are promoted for co-funding from the EU. However, it is clear that cost-benefit analysis is gaining acceptance also for locally financed projects in many countries in the East region of the EU.

While all countries use cost-benefit analysis, there are many points of differences on the technical issues of cost-benefit analysis. There are large differences in relation to the unit of account of appraisals, the values used for the discount rate, the appraisal period (the time span in which costs and benefits are included) and whether or not transboundary effects should be included in the project appraisal.

There is more convergence on how to treat *construction costs*, though there are still some differences on which elements to include, how to treat the residual value and which lifetimes to use for various components. The majority of countries have systematic methods to tackle uncertainty/optimism-bias in the construction cost estimate. Most often this comprises a form of standard mark-up on the construction cost estimate. Only a few countries use more advanced methods.

Time savings, which are most often the most important monetary benefit, are included in the appraisal in all countries. The majority of countries differentiate between the values that are used for working trips and non-working trips. The next two most common differentiations are mode of transport and multiple non-work categories. The most popular valuation method for work trips are the cost saving approach. However, other approaches (e.g. Hensher approach and relationship to GDP/capita) are also used. For non-work trips willingness-to-pay approaches and a relationship to the wage rate are the most used valuation approaches. The country data shows that there is large variations in the values used, ranging from €2.81 to €57.40 for work trips and €1.4 to €21.4 for non-work trips (All 2002, factor prices, EU-25 PPP). All countries include time savings for commercial goods traffic in their appraisal. Most countries use the cost saving approach to value such savings. Like for passenger time savings, there is a significant range in the values used. They range from €6.8 to €46.2.

Safety impacts are also included in the appraisal in all countries surveyed. Here there also large variations in the values used differentiating by a factor ten from €197,810 per fatality to €1,941,593.

The majority of the countries in the North/West region of the EU include environmental impacts with a monetary value in their appraisals, whereas only a few countries in the East and South regions of the EU include these effects with a monetary value. There also appear to be a significant range in the values used for environmental impacts. For example, the cost of CO_2 varies by a factor five between two neighbouring countries.

In addition, the survey showed that many countries include one or more indirect socio-economic effects. However, only a few countries include the effects with a monetary value.

Finally, advantages and disadvantages of different approaches to harmonisation of the values used for transport appraisal across the EU were set out.

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12. NOTES

[1] Definition of *Cost Benefit Analysis (CBA)*: The effects are assigned a monetary value, and included in an overall economic appraisal of the total value of the project in monetary terms.

[2] Definition of *Multi-Criteria Analysis (MCA)*: The effects are not assigned a monetary value, but are included in an overall project appraisal by assigning non-monetary weights to the individual effects.

[3] Definition of *Quantitative Measurements (QM)*: The effects are estimated in physical units or numbers (cardinal scale), but in contrast to the multi-criteria analysis (MCA) no specific weights are assigned to allow an aggregation of the effects to a single criterion.

[4] Definition of *Qualitative Assessment (QA)*: The effects are classified into one of several ranked categories (ordinal scale) based on well-defined standard criteria for each of the categories, which are invariant from project to project.

[5] It appears that all countries use CBA. Caution should be applied when interpreting this results as it only reflects that all countries use CBA under some circumstances, e.g. only for projects which are promoted for co-funding from the EU. In several countries it is not a normal requirement. Furthermore, caution should be applied when looking at the number of countries using MCA, as no information is available on how sophisticated the MCA is, e.g. whether the countries have weights for all the impacts or they are just scored and then the decision-maker just uses judgement when making the decision.

[6] It appears that all countries include some effects with a money value for inclusion in CBA. Caution should be applied when interpreting this result, as CBA is not a requirement in all countries and as such is only used under some special circumstances. Furthermore, it should be noted that the figure provides a summary for all modes, i.e. it might be that some effects are not included for some modes. (*) - reflects recommended/required approach; (+) - reflects typical approach when CBA is used.

[7] More specifically the issue on how to treat transboundary effects arises for (See Nellthorp et al (1998), page 31); projects for which part of the impact is felt by international traffic using the network sections improved by the project; projects for which impacts may occur beyond the boundaries of the country containing the project, e.g. air pollution; and/or projects which span more than one country.

[8] In Austria transboundary effects are only included for inland waterways.

[9] The UK includes transboundary effects within the UK territory.

[10] In Spain transboundary effects are only included for EU co-financed projects.

[11] There might be some inconsistency as climate change is a transboundary effect.

[12] Fixed % of original value per year.

[13] In Odgaard et al (2005), Cyprus and Poland were categorised as "Qualitative assessment/Not covered" and "Quantitative assessment", respectively. However, both countries include costs for maintenance, operation and administration in case a project is promoted for EU co-funding.

[14] (*) - all journey purposes; (+) not available per person; (†) max value derived from all journey purposes; (‡) Typical not guideline values

[15] Variations on these include the use of country – specific values subsequently adjusted on the basis of distributional weights determined at the EU level or the use of values averaged over the individual countries impacted by the specific project being appraised. Furthermore, a form of sensitivity analysis might result in a further interpretation, namely the use of the highest and lowest country-specific values to bound the range of values used in sensitivity analysis.

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