College of Management of Technology

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

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Proceedings of EVA-TREN's 1st Experts' Workshop on Transport and Energy Infrastructure Appraisal in Europe :

Theoretical Basis in Perspective
Synthesis, November 7, 2006

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EVA-TREN

IMPROVED DECISION-AID METHODS AND TOOLS TO SUPPORT EVALUATION OF INVESTMENT FOR TRANSPORT AND ENERGY NETWORKS IN EUROPE

Proceedings of EVA-TREN's 1st Experts' Workshop on

Transport and Energy Infrastructure Appraisal in Europe: Theoretical Basis in Perspective

Lausanne, November 7, 2006

SYNTHESIS

Workshop Report – Appendix to Deliverable D4.1

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1 EXECUTIVE SUMMARY

The European Union needs harmonised guidelines to improve the appraisal of large-scale infrastructure dedicated to the Trans-European Networks (TEN); in order to contribute to such guidelines, EU-funded EVA-TREN analyses ex-ante studies and projects outcomes at European level.

EVA-TREN's First Experts' Workshop has gathered experts of large-scale infrastructure planning and operation of the domain of transport and energy. Investigation of their practices highlights the following issues: first, the appraisal frameworks EU countries apply for transport and energy projects differ considerably in scope, sophistication, methodology and parameter values; second, the EU Member States share only a small part of all research results; and third, transnational projects are still problematic within the Union. As a result, cost overruns appear in the majority of projects. Investigation of the EU Cohesion Fund programme reveals that one project in four costs more than 20% above budget, while only one in five stands below + 10%. The main problems are modifications to the project (30%) and delays (25%); inadequate cost estimates and technical reasons are quoted in only 20% of overcosts. Sustainability does not explicitly appear in the appraisal process, even though it is repeatedly quoted as a central aspect of the decision whether an infrastructure should be built or not.

Transport and energy projects essentially differ in finance and elasticity: most infrastructure investments in the transport sector require public funding, whereas those in the energy sector usually do not need any; the situation is similar for operation at regional level. In the transport sector, provision of new road capacities induces additional transport demand, while provision of new electricity lines has very little effect on demand.

In terms of methodology, the quality of evaluations would benefit from increased transparency and from improved feed-back, as would provide for instance peer review of ex-ante assessment and more systematic ex-post evaluations.

Combination of methods may as well contribute to better appraisal. Two approaches based on Cost Benefit Analysis (CBA) look promising: Netherlands' Overview Effects Infrastructure (OEI) and Japan's combination of CBA and Multi-Criteria Analysis (MCA). OEI puts emphasis on the exploration of the problem and on the survey of effects, while Japan's procedure relies on MCA for ranking projects amongst those that score sufficiently well in CBA outcome and it allows other projects to be reassessed considering intangible values, which gives them a second chance. Experts consider macroeconomic models very bad at providing data that are meaningful for CBA; in the case spatial dynamics is tackled at national level only, and therefore produces data that are not detailed enough for assessments at regional or local level, the missing data should be generated through regional/local scenarios.

In practice, the match between evaluation results and project outcomes would be improved if authorities take actions on four topics: to start with, they should use masterplans; then, they should only select mature projects - for which they request measurable and quantified goals, results and impacts; third, they should establish a clear managerial body; and fourth, they should provide assistance on administrative and financial matters as well as methodological support on assessment procedure.

2 OBJECTIVE

The key objective of EVA-TREN project is to improve appraisal methods for large infrastructure projects of the Trans-European networks (TEN).

This document presents a **synthesis of the contributions** given at EVA-TREN's first Experts' Workshop, held on November 6, 2006 at the Swiss Federal Institute of Technology in Lausanne (EPFL, Switzerland). Invited speakers belong to the most relevant experts in the field of transport and energy infrastructure planning and assessment. The experts have expressed their views concerning the state-of-the art in infrastructure appraisal, with a particular focus on existing theoretical basis.

The Workshop has led to **two documents**, which serve two different purposes: the present "*Transport and Energy Infrastructure Appraisal in Europe: Theoretical Basis in Perspective - **Synthesis***" refers to each author's original contribution, whereas "*Transport and Energy Infrastructure Appraisal in Europe: Theoretical Basis in Perspective - **Summary and Conclusion***" (Chevroulet, 2008) is an attempt to regroup the entire material in meaningful answers to transversal questions such as the identification of similarities and discrepancies amongst domains, the advantages and problems that combination of methods may lead to, or the trans-disciplinary lessons that can be drawn from the comparison of transport and energy appraisals.

A selection amongst the suggestions for improvement that are formulated in this document are further developed in EVA-TREN case studies, whereas definitive guidelines and recommendations are provided at EVA-TREN final workshops (end 2008).

EVA-TREN is supported by the European Commission under the 6th Framework Programme. More information on: www.eva-tren.eu.

3 INTRODUCTION

Silvia Maffii (TRT), Project Co-ordinator

The consortium is made up of eight partners with a high level of expertise in the evaluation and assessment of energy and transport sectors. Composition of work packages enables broad scope whereas the definition of tasks ensures accurate delivery.

Objective

EVA-TREN aims at developing tools, indicators and operational parameters for assessing sustainable transport and energy systems. EVA-TREN shall examine various ex ante evaluation approaches used for large infrastructure project, select best practice approach and develop appraisal methods and related decision-aid tools for ex-post evaluation.

Methodology

EVA-TREN proposed methodology is a desk-work to review international approaches and experience as well as a systematic in-depth comparison of ex-ante and ex-post appraisals of 11 case studies concerning large TEN infrastructure projects in the energy and transport sector.

Outcome

The main outcome of the project is to provide a better understanding of the reasons that are critical in a successful implementation of transport and energy schemes. EVA-TREN shall highlight criteria, indicators and "good practice" for the appraisal of complex projects. The outcomes will be gathered in the EVATREN Guidelines.

EVA-TREN Dissemination and workshops

Month	Workshop No.	Workshop contents
Nov. '06	1	What methods are being used in what context ? What are the similarities & discrepancies amongst domains? Do some countries stick to a given appraisal system? Are there any potentially misleading combinations of methods? Does any methodology clearly require decision-makers to tackle the main sustainability issues? What trans-disciplinary lessons can be drawn in comparing energy and transport approaches?
Sep. '08	2 & 3	Share the EVA-TREN findings with a wider audience debate theoretical strengths and weaknesses of existing methodologies; compare lessons learned during demonstration express recommendations for decision-makers and scientists. WS 2 will be devoted to transport and WS 3 to energy; the two workshops will be organized in two following days so that those who are interested might be able to attend both days.

Table 1. Content of EVA-TREN workshops

4 CRITICAL ISSUES OF THE ASSESSMENT PROCESS

Marco Ponti (TRT)

1. Introduction

The “academic” tools are seldom dominant in the political decision process, and often are manipulated in order to pursue a “hidden agenda”. “Measuring” assumes that the “prince” in not always “benevolent and all-knowing”. (Cf. Public Choice approach). Every decision defines implicitly a set of shadow values (Cf. Pareto); therefore it seem better to make these shadow values both explicit and consistent (the numeraire issue)

2. Assessment theory

The basic tool is economic evaluation, i.e. the net welfare gains of a project (the market as an alternative expression of social preferences).

a) **Standard CBA** has a lot of hidden assumptions: perfect markets, willingness to pay as a measurement of social utility, irrelevance of distributive and fiscal impacts. But it has been improved a lot in the years, it has the outstanding advantage of being a “common language”, and it is rather simple to understand (and to improve further).

b) A different approach (**Added Value**) assumes a strict Keynesian setting, and consistently measures as benefits what CBA measures as costs: the remuneration of labour and capital (the factors of production are assumed idle if the public expenditure is not made). The outputs tend to be favourable by definition.

c) A further one (**Multicriteria**) mixes “values” of the prince (“weights”) with measurements. There are a lot of alternative methodologies and innumerable possible outputs (generally favourable, since the prince is generally the promoter of the project).

d) A more sophisticated (and expensive) set of tools is based on **simulation models**. They tend to relax several assumptions of CBA: some upstream and downstream “perfect” markets (labour, land use, fiscal linkages, production costs in the different sectors etc.).

The problems here are mainly consistency (there are different models with different possible outputs for the same projects), and transparency (since the models are complex, a “black box” effect is quite common).

3. Directions for the future

a) Technical improvements

Introducing the marginal opportunity cost of public funds, different from country to country, means filling the gap between financial and economic analysis, a task that cannot be further postponed. Showing that two projects that present identical NPV etc, but have different degrees of reversibility in time, have different values, is another necessary improvement (i.e.

the “option value” of technical flexibility). Income distribution matters, specially to the decision makers (often just because they are short-sighted).

b) The link between models and more simple tools.

Models are telling more, but they are expensive, numerous, and seldom usable in the political arena (*“black box”* problem). A bridge can be built deriving the main shadow prices from sophisticated, regional or national models, and after a political decision, passed over as inputs to specific projects. A contradiction remains: “improved” standard tools tend to become complex themselves….further work is needed on these aspects, even with a closer collaboration with policy-makers of good will

c) Some basic recommendations

The evaluator has to be as independent as possible, and has to “sell” its independency as an added value. The evaluation tools have to be as simple and transparent as possible, taking into account both the dimension of project and decisional context (for example, “local” stakeholders, and the central Ministry of Finance need different approaches). Two types of alternatives have to be always present: *i.* technical alternatives (routes, capacity etc.) and *ii.* modal alternatives. This implies that the evaluation process has to start as early as possible, and, then has to “follow” the subsequent political debate. The general mistake of evaluating “frozen” projects has to be avoided.

5 PRESENTATION OF WP1 RESULTS

Aaron Scholz (IWW)

Introduction

First results of WP1 mainly consist in the description of the state of the art of the appraisal process applied by Member States and by other countries in Europe.

Transport sector

Assessment objective and responsible bodies at national level

Czech Republic	Denmark	France
Transport Policy (medium & long-term direction) General development plan of transport infrastructure (GEDPARDI)	Annual Danish state budget passed by government Banedanmark & Vejdirektoratet (Ministry of Transport and Energy)	Ministry of Transport, National Commission für public debate, local authorities Implementation documents signed by the Ministries
Germany	**Hungary**	**Italy**
Federal Investment Plan (by Ministry of Transport, Buildng and Urban Development)	Hungarian Transport Policy (2003 – 2015) Hungarian national road investment plan (approx. every 10 years)	Nucleo Valutazione e Verifica Investimenti Pubblici (NUVV) – at regional and ministry level Inter-ministerial Committee for Economic Planning (CIPE)
Poland	**Portugal**	**Spain**
Strategy of Transport Infrastructure Development in 2004 – 2006 and the following years (2013)	Assessment is done by the Departments of the Ministry of Public Works	Department of Transport (Ministry of Public Works)
Sweden	**Switzerland**	**United Kingdom**
Ministry of Industry, Employment and Communications (with associated institutions and Swedish federal states) National Transport Plan (2004 – 2015)	Federal Department of the Environment, Transport, Energy and Communications (DETEC) Federal Office for the Environment (FOEN)	Department for Transport („seek good value for money“) HM Treasury (financial planning)

Table 2. Assessment of transport projects in Europe: institutions and legislation

Discount rates

Northern countries tend to apply a discount rate that is lower than Southern countries.

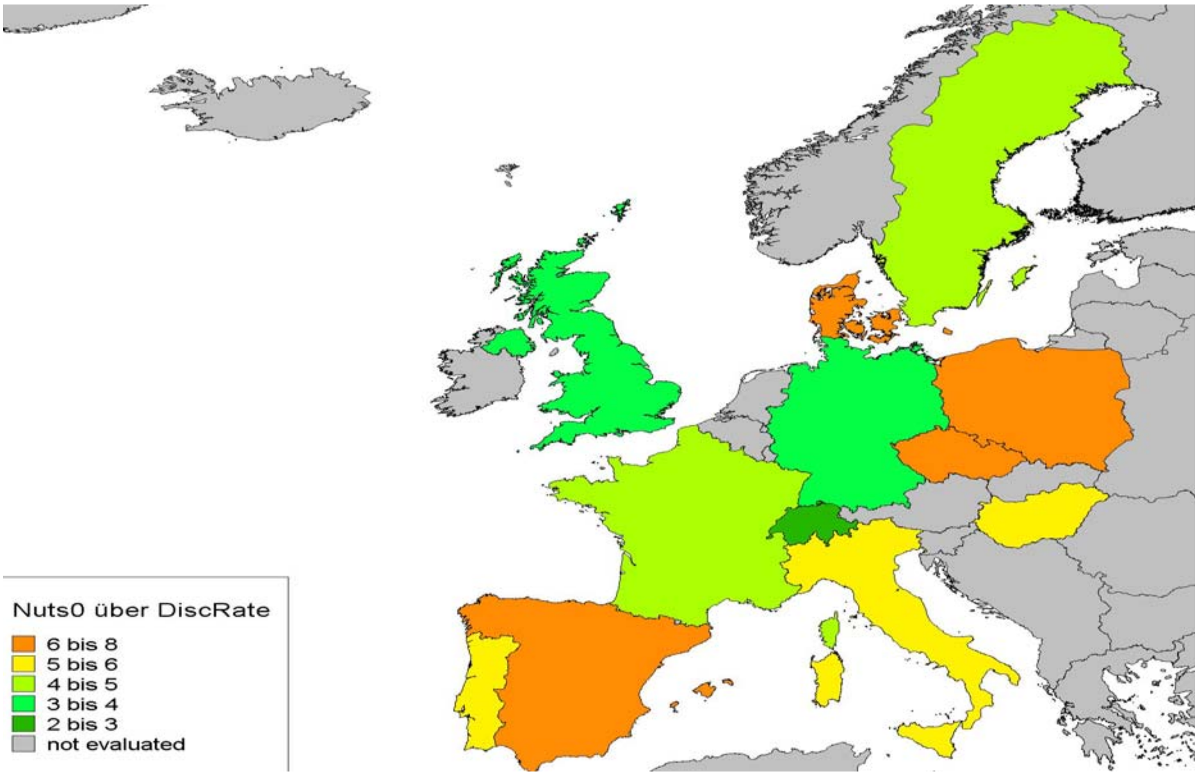


Fig 1. Discount rates used in Cost-Benefit Analysis in Europe

Appraisal period

Northern countries tend to assess costs and benefits over a period that is longer than Southern countries. Nevertheless, the length taken into account varies significantly according to project specifications in Spain, France and Germany.

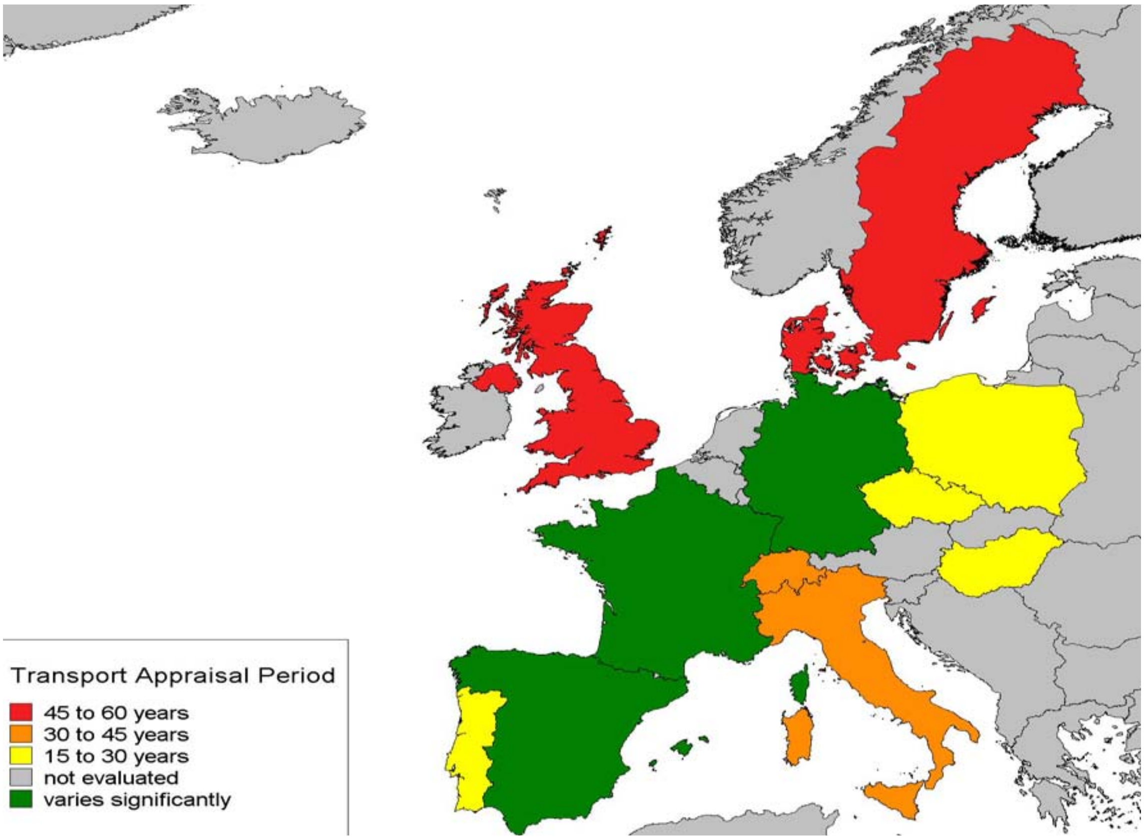


Fig 2. Appraisal period for transport projects in Europe

Ex-post analysis

Ex-post analysis is not compulsory in Europe. Only France, the United Kingdom and Ireland apply some form of ex-post analysis. In those cases, however, the procedure is different from the ex-ante assessment.

Energy

Bodies responsible to provide assessments for energy infrastructure projects

Czech Republic	Denmark	France
Czech Energy Act (2000) – rules for transmission system operating CEPA (Ceska Elektrizacni Prenosova Soustava) - member of UCTE	Energinet.dk (founded in 2005 to guarantee competition) - member of UCTE	Gestionnaire du Réseau de Transport d‘Electricitè (RTE) – owns the infrastructure Transmission system operator (TSO) - operate the transmission grids Energy Regulation Commission (CRE) – sets the prices for transmission
Germany	**Hungary**	**Italy**
Legal framework (Law on electricity and gas supply – 1998) Four private companies – own, maintain and invest into the transmission grids Federal Network Agency (Bundesnetzagentur) – ensures non-discriminatory network access and prices	MVM (public company – power generation and grid company) MAVIR (private company, but ownership rights still by the Ministry of Economics and Transport) MAVIR is responsible for transmission system operation and network infrastructure development	Rete Elettrica Nazionale SpA is in charge of the grid network throughout Italy (1999) Traded on the stock exchange since 2004
Poland	**Portugal**	**Spain**
PSE (Polski Sieci Elektroenergetyczne) - owner of Poland‘s electricity network since 1990 Responsible for grid operation and power dispatching	REN (Rede Eléctrica National) – independent company since 2000 Separation of transmission, distribution and production (EU Directive)	REE (Red Eléctrica de Espana) – first company in the world devoted to transmission (1985) Responsible for management of the transmission grid network (maintenance and development)
Sweden	**Switzerland**	**United Kingdom**
Svenska Kraftnät operates the Swedish national transmission grids (15,000km) Three companies (e.g. Vattenfall, E.ON Sverige, Fortum Power and Heat) mostly own the regional network (36,000km) and the local network is owned by 177 network operators (approx. 400,000km)	ETRANS (independent coordination company) - SwissGrid (2007) The 7 Swiss high voltage companies (e.g. atel, BKW) decide in cooperation with ETRANS about future development of the transmission network	National Grid UK is owner, operator and developer of the transmission network (private company) Ofgem (price and network regulator)

Table 3. Assessment of energy infrastructure projects in Europe

Ownership of electricity transmission companies

Transmission grid companies are private in most countries of Europe. They are public only in France, Poland and Dennmark.

Assessment procedures

Assessment procedures for energy infrastructure projects widely differ amongst European Members States. France requires a feasibility study, while other countries require security, reliability, environmental impact assessment and/or other evaluation, according to project specifications.

Ex-post evaluation is not compulsory in the countries investigated.

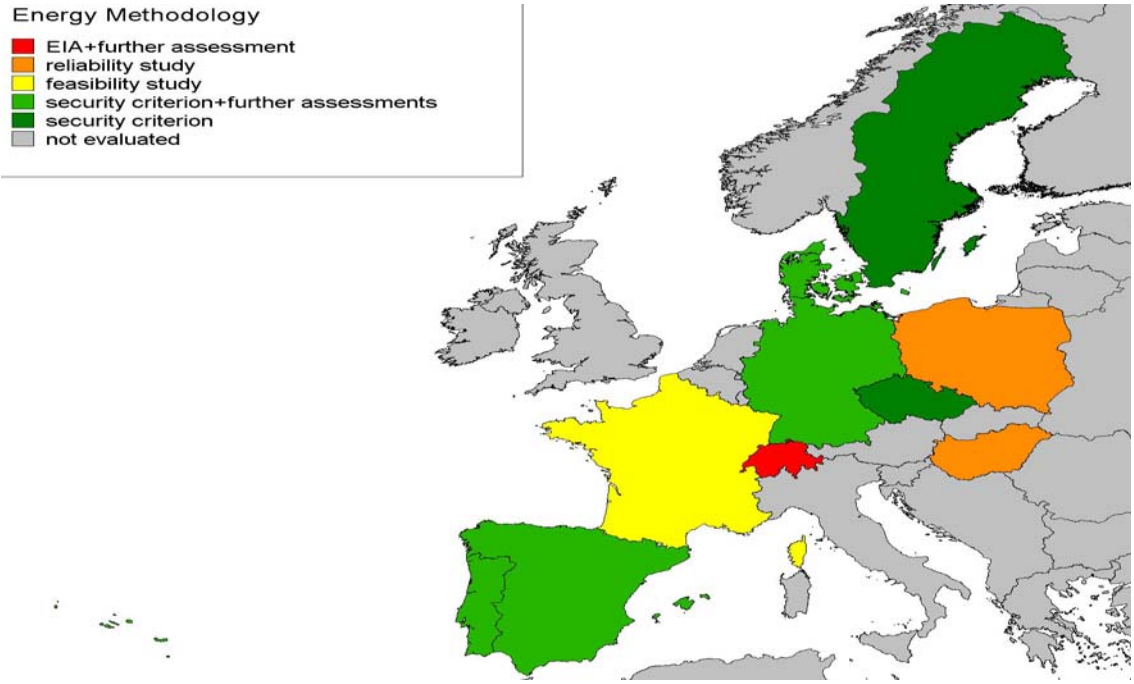


Fig 3. Assessment procedures for energy infrastructure projects (ex-ante)

6 HARMONISED GUIDELINES FOR PROJECTS' ASSESSMENT AT EU LEVEL – HEATCO EXPERIENCE

Peter Mackie, Institute for Transport Studies (ITS) Leeds

Ref: HEATCO Co-ordinators: Rainer Friedrich & Peter Bickel, University of Stuttgart**.**

According to the findings of HEATCO project, all EU countries apply some form of appraisal for transport projects. However, these procedures considerably differ in scope, sophistication, methodology and values. Evaluation results cannot be simply transferred amongst countries while trans-national projects inevitably require special attention. According to HEATCO, harmonised guidelines may help significantly improve the quality of assessment the TEN projects. The most important improvement required for this is a better definition of the role of assessors.

European Approaches for Transport Costing

European Approach	General Issues
All EU countries apply an appraisal framework for transport projects, BUT i. The frameworks differ considerably in scope, sophistication, methodology and parameter values ii. Research results are not fully transferred between countries iii. There are problems with transnational projects – harmonised guidelines are needed for the TEN	i. Framework, specification of project alternatives ii. Unit of account – factor costs iii. For international projects, PPP as well as local values iv. Discount rate v. Criteria – NPV and benefit/cost ratio, with incremental analysis vi. Project life and residual value assumptions vii. Risk analysis and optimism bias

Table 4. Issues in transport project appraisal in Europe

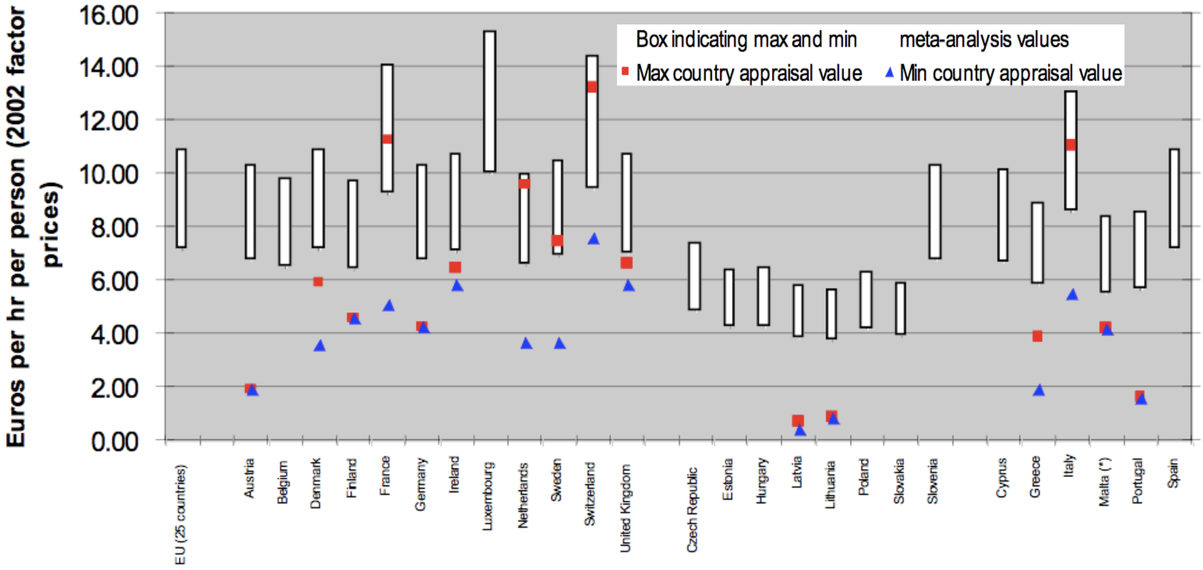
Impacts of projects

Projects generate impacts of very different nature, such as construction, maintenance and operating costs; travel time and congestion; accident risks; air pollution; noise; greenhouse gases. Wider economic impacts are displayed in IASON project. Other decision-making tools consider non-monetary criteria.[1].

Appraisal differences

As an example of problematic issue, Prof. Mackie displays HEATCO findings concerning the values of time. This work is based on a meta-analysis of 77 studies from 30 countries for passenger and 33 studies from 18 countries for freight.

[1] Concerning the variety of project impacts Tristan Chevroulet suggests to consider *non-monetary* decision-making tools, such as "AUDITOR", which provides a set of indicators used in Switzerland: http://lem.epfl.ch/francais/informatique.php.



Source: HEATCO

Fig 4. Passenger Non-Work VTTS – Comprarison of exsting country appraisal valuest and meta-analysis values (car)

HEATCO—Harmonised European Approaches for Transport Costing

The HEATCO Guidelines	**Tricky issues**
i. Flexible – balance of pragmatism and theoretical robustness ii. Take full account of relevant principles (transferable) iii. Recognise data availability and evidence base issues iv. Recommend minimum standards v. Propose values based on benefit transfer methods using best evidence vi. Use local studies and values wherever this evidence is better	i. Inconsistency between national appraisal methods ii. Need for overarching assessment of projects with trans-boundary impacts –who owns the appraisal? iii. Treatment of transit traffic– the values of the origin country, the destination country, the driver or the transit country? iv. And always remember: garbage in, garbage out.

Ref: the guidelines, report on current practice, case study applications and other information are available on HEATCO webpage: http: //heatco.ier.uni-stuttgart.de

Table 5. Guidelines and issues for European transport costing

7 KEY ISSUES FOR GOOD ASSESSMENTS

Claus Doll, Fraunhofer Institute

Traditional transport modelling

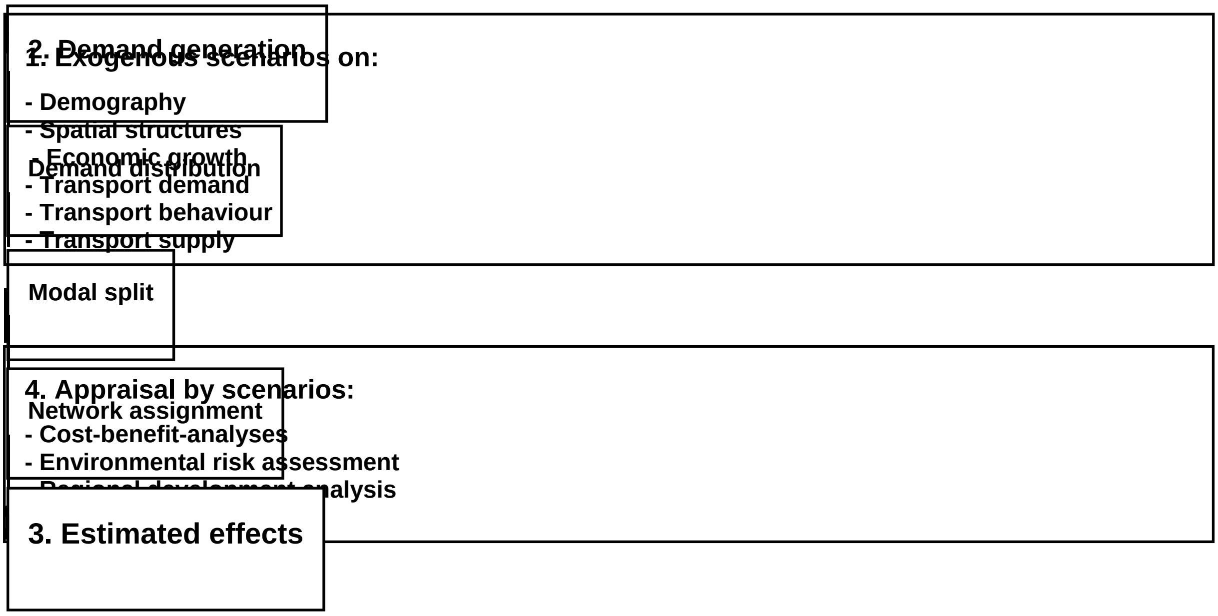


Fig 5. Traditional stages of transport modelling for infrastructure projects

Potential of system dynamics to improve traditional modelling

Adding system dynamics to traditional modelling should help producing more realistic results.

Example: *Tax-financing* of TEN vs. *integrated policy* with infrastructure charging.

Future considered	Benefits
Short run	benefits for *integrated policy*.
Medium run	slight advantage of *tax policy*
Long run	clear advantage of *integrated policy*

Table 6. *Benefits of system dynamics for strategic transport modelling (example: tax-financing vs. integrated policy)*

Interdependency of multiple investment projects

Interdependency of multiple investment projects is a typical issue of decision-making in the European Union. The TEN-STAC project aims at simplifying the complexity of such infrastructure programmes.

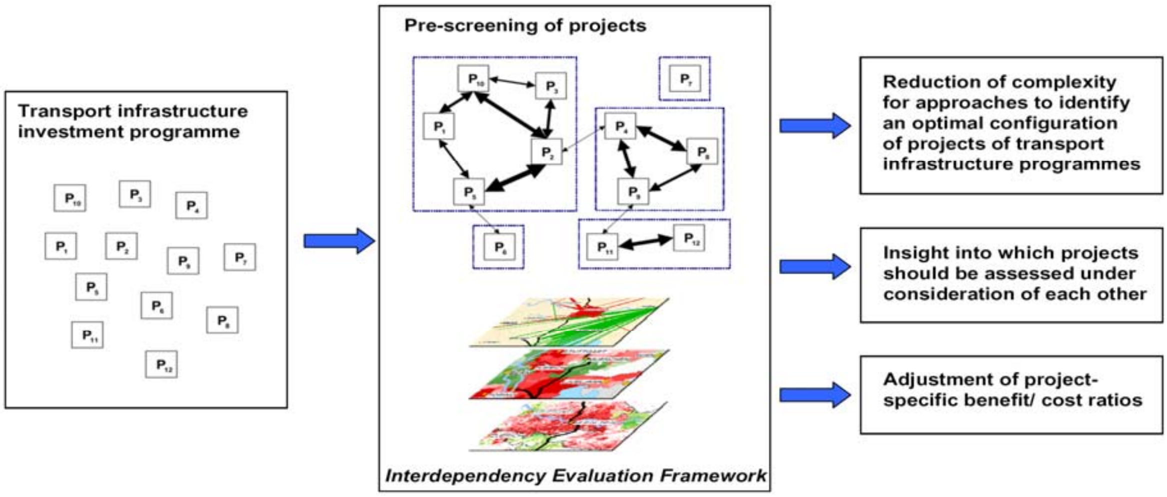


Fig 6. Choice and appraisal of inter-connected transport projects (TEN-STACK)

Integrated European Approach

In Europe, the TRANS-TOOLS model has been designed as a transversal approach to traditional models.

The European Transportation Model system comprises:

- **Regional Economic model** (SCGE-model)
- **Freight models** handle trade (Simultaneous Model), destination choice (Gravity Model), logistics (Nested Logit Model), mode-chain choice (Nested Logit) for freight
- **Passenger models** deal with trip frequency, destination - and mode choice (Nested Logit)
- **Assignment models** consider all modes, they are mixed probit, multi-class, stochastic user equilibrium methods
- **Impact models** (environment, safety, economics,…)
- More sophisticated models include feedback and conversion mechanisms

Poorly treated dimensions in traditional modelling

Innovation is key factor in improving performance of transportation. Nevertheless, if considered in standard models, innovation is merely modelled by means of constant rates of technical progress. In this respect, Multi-Agent-Models could significantly improve the quality of modelling.

Systematic bias and Reference Class Forecasting

Large-scale investment in transport infrastructure is regularly characterized (Flyvbjerg, 2006) three types of bias:

i. Technical (data and models)

ii. Psychological

iii. Political-economic (optimism and strategic misinterpretation)

Flyvbjerg's studies show that no improvements have been achieved over the past 70 years. The main issue is a clear optimism-driven bias.

Issues	Rail	Road
Average inaccuracy (%)	-51.4 (sd=28.1)	9.5 (sd=44.3)
Percentage of projects with inaccuracies larger than ±20%	84	50
Percentage of projects with inaccuracies larger than ±40%	72	25
Percentage of projects with inaccuracies larger than ±60%	40	13

Source: Flyvbjerg, 2006

Table 7. Systematic errors in transport project assessment in Europe

Flyvbjerg (2006) proposes to take an "*outside view*" by analysing similar projects of the past (which he calls „*Reference Class Forecasting*“).

8 TRANSPORT INFRASTRUCTURE EVALUATION – THE OECD/ECMT VIEW

Andreas Kopp, ECMT and Joint OECD/ECMT Transport Research Centre

CBA is broadly used for transport policy evaluation. CBA produces results in monetary value, which decision-makers are keen to use. Nevertheless, this methodology also has limits (aggregation, small-scale) and its underlying hypotheses are not always clear. Computer models, such as Meso-Evaluation Models (Computable Equilibrium Models –CEM- and Disequilibrium Simulation Models –DSM-) and Macro models may help understanding the stakes at larger scale.

Limits of Evaluation Methods for transport policy evaluation

CBA	Meso-Evaluation Models	Macro Models
Changes of interregional specialisation Impact on agglomeration economies i. Static: firm size economies ii. Dynamic: knowledge dissemination by face-to-face communication Impacts on relative goods prices Repercussions in the logistics sector	Computable Equilibrium Models i. "Iceberg" type transport costs: transport policy evaluation without the transport sector ii. "Imperfect competition": limited to "Dixit-Stiglitz", neglect of transport cost effects on competition intensity Disequilibrium Simulation Models i. Ad hoc adaptive behaviour of agents ii. Lack of explicit expectation formation and learning	Transport policy effects are identified as a residual Little analytical content: residual remains a "black box" Identification problem

Table 8. Limits of transport policy evaluation methods: CBA – Meso - Macro

Normative Basis for Evaluation

Which role for policy judgments?	Context of Policy Reform
Policymaker-planner interaction on distributional weights Stakeholder involvement: conflict with welfare economics? i. Informational asymmetries ii. Differences in organisability of interest Planners' perceptions of the organic state: do meritoric goods count more than consumer welfare?	i. Contribution of transport policy to reform of other portfolios ii. First-, second- or x-th best solution? **"Transaction Costs" of Evaluation. Static: firm size economies** i. "*Ad hocery*" is less costly than sound method. ii. Avoidance of political interference in selection of method is costly.

Table 9. Actors' roles and evaluation practice

Improving Evaluation Processes

Evaluation method	Coordination	Reputation building
i. Emphasis on transparent, formal methods ii. Complementarity of approaches iii. Increase attention to secondary effects	i. Coordination failures arise from interregional spillovers ii. Coordination by centralisation might have costs in terms of political accountability iii. Strengthen mechanisms for self-coordination on the regional or national level	i. Increase transparency of determination of objectives ii. Increase transparency of selection of evaluation and forecasting methods iii. Peer review ex ante plans iv. Increase the importance of ex post evaluation

Table 10. Suggestions for improving infrastructure evaluation process

Conclusion

The quality of evaluations would benefit from increased transparency and from improved feed-back, as would provide, for instance peer review of ex ante assessment and more systematic ex post evaluations.

9 POLITICS AND FEASIBILITY STUDIES – EIB VIEW

Claus Eberhard, Projects Directorate Rail & Road Division, European Investment Bank (EIB)

Introduction

The European Investment Bank (EIB) was created by the Treaty of Rome in 1958. EIB's shareholders are the 25 Member States of the European Union. The subscribed capital is EUR 164 billion, with lending EUR 47 billion (42 in EU25), 14 bn of which for transport (2005) and total outstanding loans of EUR 294 billion (24 bn for PPP) (end 2005). Lending ceiling is EUR 409 billion. EIB, as a bank, considers that financial issue is of very high importance and sets this aspect in a long-term and wide perspective. Therefore, it has developed a multidisciplinary approach and monitors projects closely after they have been implemented. Information: www.eib.org

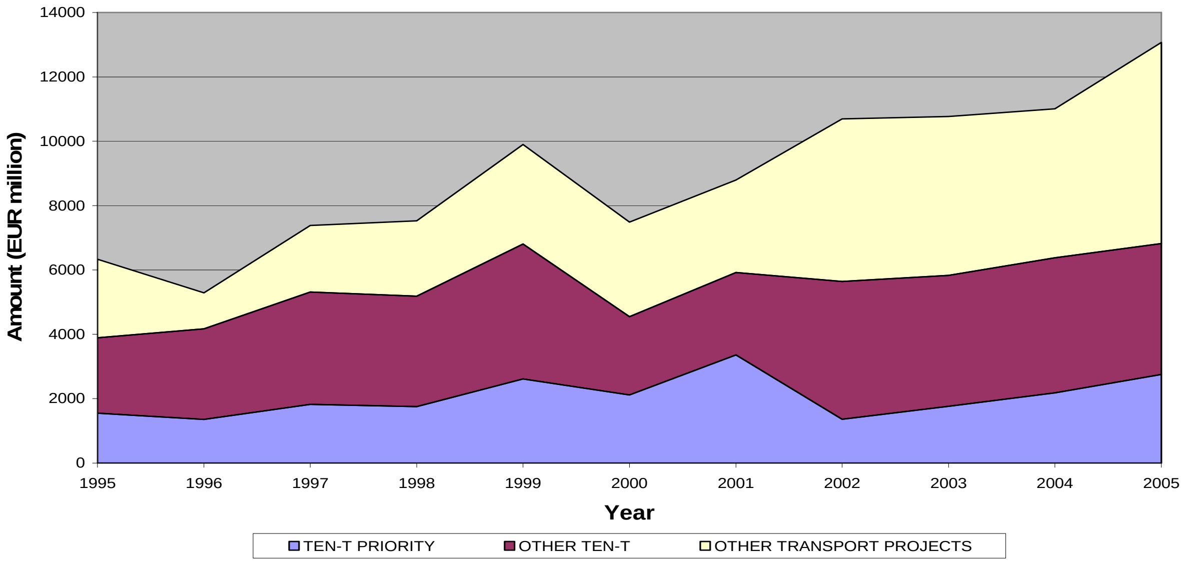


Fig 7. Evolution of EIB transport lending in EU 25 between 1995 and 2005

EIB Project Cycle

EIB Project Cycle consists of three main steps: Identification, Appraisal and Evaluation. Identification happens when a State or a promoter notifies EIB of his intent to launch a project. The following steps progress as follows:

Project Appraisal

Appraisal Methodology	Appraisal Purpose
In-house team of engineers and economists Starting point: Review of project promoter information Screening of proposed projects, dialogue with promoters In-house "toolboxes" for CBA, financial analysis, risk analysis	"Product": Structured appraisal report, recommendation to Management Committee/ Board of Directors Not: ranking of projects; rather ensure the project eligibility, quality and (economic) profitability PPP projects: risk assessment, results determine loan conditions

Table 11. European Investment Bank appraisal procedure for transport projects

Project Evaluation

Project evaluation is made out of three steps: 1. Project Appraisal (ex ante); 2. Project Progress and Project Completion; 3. Spot checks by Internal Audit.

Ex-post evaluation is conducted for 15% of projects. Project performance criteria are: Effectiveness, Efficiency, Sustainability.

Broader EIB Tasks

EIB undertakes Upstream Work, Feasibility Studies and Technical Assistance.

Upstream Work

EIB engages in dialogue with stakeholders, bringing in its technical and financial experts. In the case of large-scale projects (e.g .TEN Priority Projects), EIB participates in steering groups etc. aiming to advance the project.

In order to assist beneficiary countries to absorb EU Structural and Cohesion Funds (2007-2013), EIB provides JASPERS[2] (Joint Assistance to Support Projects in European RegionS).

Feasibility Studies

The EIB is "user" of feasibility studies. On request the EIB analyses feasibility studies/project proposals/funding applications for DG Regio. In its role as "policy-driven Bank", EIB

i. finances studies and Technical Assistance (normally outside EU15), or

ii. prepares TOR and/or finances and supervises feasibility studies (for FEMIP etc.)

Conclusions

Annual EIB loans reach 50 bn, 25% of loans for transport sector, 50% thereof for TEN.

Projects must meet strict eligibility and quality criteria, and be economically viable.

The EIB screens, appraises, monitors and evaluates the projects it finances.

The EIB engages in dialogue with "Brussels" and other stakeholders to actively advance projects and gives neutral expert advise; e.g. active involvement in TEN-T Priority Projects from early on.

Additional roles include provision/financing of Technical Assistance and Feasibility Studies in order to improve project preparation (JASPERS, FEMIP).

[2] A joint policy initiative of the EIB, DG REGIO the EBRD.

10 INSTITUTIONAL DECISION MAKING DEVELOPMENTS IN THE NETHERLANDS

Pauline Woertelboer, AVV Transport Research Centre, Netherlands

The Dutch framework for infrastructure evaluation is entitled "Overview Effects Infrastructure" (OEI) approach. OEI is based on a 9-steps CBA.

Overview Effects Infrastructure -OEI- Steps

1. Problem analysis: what do we want to solve?
2. Project definition: design and alternatives, base case
3. Identifying project effects
4. Forecast relevant exogenous developments
5. Estimate and value project effects
6. Estimate investment and development costs
7. Producing a cost-benefit set-up
8. Alternatives and risk analysis
9. Additional tasks (PPP, ex post evaluation)

OEI Evaluation process in the Netherlands

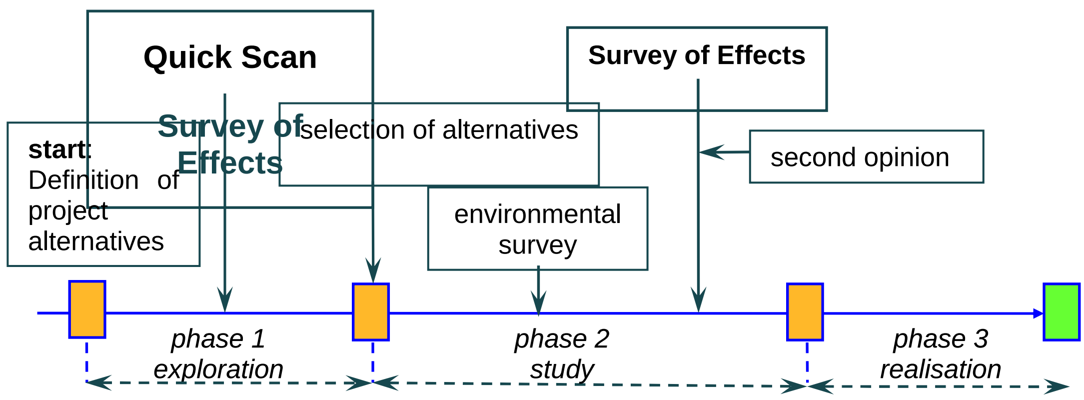


Fig 8. Overview Effects Infrastructure –OEI- procedure used in the Netherlands

Support for project developers

The Steunpunt Economische Evaluatie - SEE - **(**Support desk for Economic Evaluation) helps project developers who have questions about economic evaluation of infrastructure. This approach is increasingly used for projects smaller than national scale.

SEE mission:

- Support for small questions about economic evaluation (max. 8 hours)
- Information exchange, also on international level

Contact: www.rws-avv.nl/SEE

11 EX POST VS. EX ANTE, OVERLOOKED ISSUES, ECOTRANS EXPERIENCE

Bas Scholten, ECORYS Transport, Rotterdam, The Netherlands

Background

Ecorys has carried out an ex post evaluation of a series of projects financed by Cohesion Funds.

The Cohesion Fund (CF) has been established in 1993 by DG Regional Policy. It aims at strengthening economic & social cohesion within Member States (MS). The eligibility criterion is that MS should have a GNP smaller than 90% GNP EU avg.

Period 1993-2002: Ireland, Portugal, Spain and Greece eligible

Period 1 May 2004-2006: New Member States, Portugal, Spain, Greece

An ex-post evaluation has been undertaken on a sample of 200 transport and environment projects in the period 1993-2002. The evaluation was based on 6 aspects:

1. Appropriateness
2. Effectiveness
3. Efficiency
4. Impact
5. Management and implementation system
6. Community value added

Appropriateness

National needs	Community policies
Three periods: i. Interim facility: lack of project pipeline ii. First period 1994-99: projects increasingly available iii. Second period 2000-06: improved planning of projects	The projects reviewed are generally in line with Community policies
Majority of projects fulfil national needs in general terms. Usually not made explicit and contribution of projects not always quantified	Remarks: Some projects do not have a clear relation with Community Policies (only in early period!) Some (road) project are part of TEN, but their national impact is far more important Shift towards high speed passenger rail neglects the rail freight sector, which deserves attention from sustainable transport point of view

Table 12. Ex-post evaluation of transport projects financed by Cohesion Funds

Integration in strategies	National procedures & criteria
In early years projects came from an existing or hastily prepared 'pipeline' -> less programming was carried out	In beginning "maturity" and "eligibility" of projects were most important criteria
Over time programming has increased and projects have been derived from national needs assessments, national infrastructure plans and/or sector plans	Over time these criteria have remained important, but others have been added Still projects have been selected that were not ready in terms of technical feasibility, or did not have highest priority
Projects were found appropriate from the point of view of national/regional strategies	What is missing: problem descriptions, analysis of alternative options! CBA not always elaborate (or not carried out) Long delays in approval are result (up to > 1 year, average 6-10 months)

Table 13. Evolution of projects submitted to Cohesion Funding – a critical view

Use of PPP	Complementarities
Only few CF projects use PPP constructions, due to lack of legal framework in country, lack of experience, lack of useful projects Also CF regulation (e.g. assessment of Co-financing rate) works against it But also some good examples: • Tagus bridge (Portugal) • New Athens Airport (Greece, not in sample)	In many cases both CF and Structural Fund funding possible for the proposed projects Co-financing of different stages is taking place (SF one phase, CF other phase) Division of projects between CF and SF is pragmatic: • Larger projects -> CF • TEN – T and EU Directives -> CF • Projects in larger communities -> CF • Eligibility rules: more complex, multi staged projects -> SF • Other: availability of funds, maturity, co financing rates

Table 14. Private-Public partnerships and complementarities of transport projects supported by Cohesion Funds

Effectiveness

Outputs and Results
i. Generally only outputs are quantified ex-ante. Results and goals are mainly treated qualitatively (no quantified indicators or targets).
ii. Also final reports lack quantified information on goals and results indicators and targets.
iii. For more than 70% of the reviewed projects (for which sufficient data were available) outputs were fully realized
iv. In 60-70% of the reviewed projects goals and results are deemed to have been or are expected to be fully realized

Table 15. Quality of appraisal in projects supported by Cohesion Funds

Utilization, External factors	
For many sample projects not sufficient information on utilization available Of those for which information is available, 65% of projects are fully utilized External factors usually not identified ex ante Ex post there seems to be strong impact from external factors in 17% of the cases (32% no data), in 41% of the cases no or only small impact of external factors	Main 'external' factors identified (not all are external): i. Public protest ii. Archaeological factors / habitats iii. Weather conditions iv. Economic growth faster/slower v. Land purchase

Table 16. Estimation of utilization and influence of external factors

Effectiveness

Beneficiary population
i. In most cases (70% of total) the project benefits the envisaged population fully (or mainly)
ii. In case of transport projects, quantification is difficult; quantification of indirect benefiting population is particularly difficult

Table 17. Estimation of benefits generated by transport projects

Efficiency

Time scale
Only 20% of projects more or less stick to original time schedule, 30% show delay of more than 2 years. The reasons are:
i. Insufficient preparation of projects/technical reasons
ii. External factors (sometimes foreseeable)
iii. Opposition from local population
iv. Lack of management capability

Table 18. Temporal deviation of transport projects

Cost deviations	Co-financing rate
Cost overruns appear on > 50% of projects In 20% of projects cost overruns < 10% In 25% of cases overruns are > 20% Average cost overrun 15-20% Generally time delays are more frequent than cost overruns (co-financing budget is constraining) Main causes of cost overruns: i. Modifications (30% of overruns) ii. Delays (25% of overruns) iii. Technical reasons (20% of overruns) iv. Inadequate costs estimates (20%)	No clear criteria for setting co-financing rate (i.e. 80 or 85%), except for Spain: national level 85%, regional level 80% Generally net revenues from projects have been taken into account (user charges), but mostly maximum level of co-financing used since fees are set/assumed at level of operating and maintenance costs Ex post much more variation in co-financing due to cost overruns

Table 19. Cost deviations of transport projects and co-financing arrangements

Common reasons for error in infrastructure project assessment

General	Ex post CBA
Project documentation weak No standard methodology applied No clear problem description and with/without comparison Different treatment of VAT, shadow prices, wider economic impacts Guidance needed on externalities for environment projects RERR generally lower than ERR RERR for transport generally higher than for environmental projects	Many difficulties in establishing ex post ERR (RERR) Lack of data (e.g. on output) Ex ante CBA weak or no existing (or only financial) Ex ante CBA's not always clear in methodology Changes carried out in ex post CBA: Project parameters (investments, output, timing, etc) Project period (according to CBA guide) Methodological changes (shadow rates, inclusion of externalities)

Table 20. General issues in transport project assessment and findings of ex-post studies

Employment	Regional level
At project level only info available on temporary employment (direct and indirect), structural effect usually not known At regional level impact can be substantial as seen from model runs LSE. Long run additional employment from larger projects can be up to 10,000 jobs (exception: 16,500 jobs in case of Tagus crossing!)	Model runs from LSE give different impacts from transport projects. Indirect effect estimated at 0-55% of direct effect on transport costs, typical effect 10-25% of direct effect Impact on regional growth differs considerably between regions. Usually effect less than 1% of the national or regional income.

Table 21. Assessment of effects on employment and regional impact

Management and implementation

Management and implementation
Management and implementation systems similar between countries: National managing authority with MA at sector level; More centralization over time in implementation bodies Monitoring system is similar with monitoring committees and monitoring on the basis of physical and financial progress indicators Administrative costs: difference between CF and SF does not seem to be significant. However, different timing of input, with more elaborate time needed at programming stage in SF, during implementation in CF

Table 22. Issues in transport project management and implementation

Community added value

Community added value
i. CF played key role in improving transport infrastructure, drinking water supply, wastewater treatment, solid waste management in the CF4 ii. CF stimulated development of sector strategy and focus in sector policies iii. CF stimulated introduction of and improvement of techniques during project cycle management, from identification up to monitoring

Table 23. Contribution of Cohesion Funds to so-called “Community added value”

Recommendations

Recommendations
i. Select only mature projects!
• Adopt multi-annual planning approach
• Create pipeline of projects
• Request active public consultation
• Request fully developed technical studies
• Apply technical quality assurance
ii. Offer methodological support to beneficiaries!
• CBA methodology, indicators
iii. Treat water supply, sewerage construction and waste water treatment in an integrated way!
• Use masterplans
iv. Request measurable and quantified goals, results and impacts!
v. Discuss projects with Commission before submission, check information needs!
vi. Ensure adequate, professional management of projects
• Establishment of clear managerial body
• Establish one managing body for groups of smaller municipalities
• Give central assistance on administrative and financial matters
vii. Central pre-funding system can greatly facilitate start of projects!

Table 24. Recommendations for improving European infrastructure funding

12 EXAMINING ENERGY INFRASTRUCTURE PROJECTS EX POST – THE OPERATOR VIEW

Barry Murray, Electricity Market Services Limited, UK

Use of System Management & Charging Principles

There are charges for use of the assets and for the losses incurred in spot and bilateral transactions that involve wheeling through the network. The internal use of system charges may be geographically differentiated so as to provide appropriate price signals to system users. The concept is to encourage generation and load location so as to minimise or reduce long distance network flows and congestion. The calculation of the costs incurred is complex but the market requires simple charging arrangements to facilitate trade so separate revenue collection from allocation. Arrangements are required to manage congestion and to enable participants to hedge against the risks. This is why a methodology has been developed to calculate “Use of System Charges” for suppliers and generators.

Typical Methodology to calculate Use of System Charges for suppliers and generators

The approach aims to identify the proportion of the network utilised by injections or extractions at each node of the system.

The marginal costs of transmission investment can be derived using a DC load flow model (DCLF). The model is used to assess the changes in flow on all lines resulting from an injection of 1 MW at each node. The results are expressed as the increment of MW km required to accommodate the injection. The studies are usually based on winter peak loading conditions. Added factors are used to take account of the higher costs of cables.

Zonal values are calculated from the capacity weighted average nodal prices. The zonal marginal MWkm figures are converted to costs by multiplying by the standard cost for transmission equipment (e.g. 400 kv £9.8/MWkM). This is multiplied by a factor to take account of security requirements e.g 1.8. A constant is added to distribute the costs between generation and demand (50% 50% or in UK generators pay 27% and demand 73%). Nodes with a similar price and impact on the network are grouped into defined areas or zones.

The network losses may be embodied in the trading arrangements or managed by the TSO

Managing and charging for transmission International Practice

PJM internal costs based on postage stamp approach $/kW/yr. RTO manages interconnection with LMP (Location Market Prices) based on local generation and loss costs; FTRs (Financial Transmission Rights) used for hedging.

EU calculates compensation fund ITC for Inter TSO transfers. Identify horizontal network (RAV) and apportion costs using transit key that compares wheeling to total asset utilisation; costs recovered through charge on import/export and entry charge at perimeter of €1/MWh

UK – establishes nodal use of system charges using DCLF model to establish asset utilisation and then groups nodes into zones; losses managed using loss adjustment through market; interconnection managed by auction.

Nordpool – internal constraints are managed by counter trade and incur a cost whereas inter-connector congestion is managed by market splitting and generates a bottleneck income. Internal charges are not differentiated by location.

Merchant transmission – exploits short term price differentials between separate markets with all revenue accruing to owners.

Australia – manages congestion by splitting regions allowing different marginal prices but there is a common marginal price within each region; the surplus revenue is auctioned to enable risk to be managed

Different arrangements to minimise the impact of the constraints in a given market situation

Market constraints	Conflicting objectives
i. Split market and let zonal prices separate until transfers match capacity available (Nordpool)	i. Establish optimal unconstrained flow (equal Lambda) for supplier
ii. Ignore constraints in market operation – let TSO resolve constraints in real time and share costs through uplift – ex-post	ii. Establish constrained optimal solution to maintain security for TSO
iii. Explicitly charge for use of inter-connector to manage transfer – bilateral or auction (Europe).	iii. Establish optimal use of system charge for inter-connector owner

Table 25. Market constraints and conflicting objectives in operating arrangement in the energy sector

Methodologies for forecasting and for revenues evaluation

Forecasting future inter-connector flows	Evaluating revenues from exports
i. Establish a model of the network (an equivalent admittance matrix) ii. Develop pseudo voltage as a function of market price iii. Predict future market prices/new voltages iv. Substitute pseudo voltages to calculate new interconnection flows v. Check for constraint violation and add cost vi. Iterate year on year	i. Identify future export across interconnection and revenues; ii. Establish periods of price differentials; iii. Establish slope of system price function; iv. Estimate use of system charge; v. Estimate level of economic transfer

Table 26. Forecasting techniques used in the energy sector

Issues in calculation of "use of system charges"

i. How to predict future inter-connector flows, taking account of market developments?
ii. How to manage the impact of variable sources like wind and exporting generation?
iii. How to manage constraints so as to minimise impact?
iv. hould private interconnection development be encouraged?
v. How to establish equitable wheeling charges through systems?
vi.. How to compare the efficiency of network design and operation?

13 RISK ASSESSMENT IN ENERGY INFRASTRUCTURES

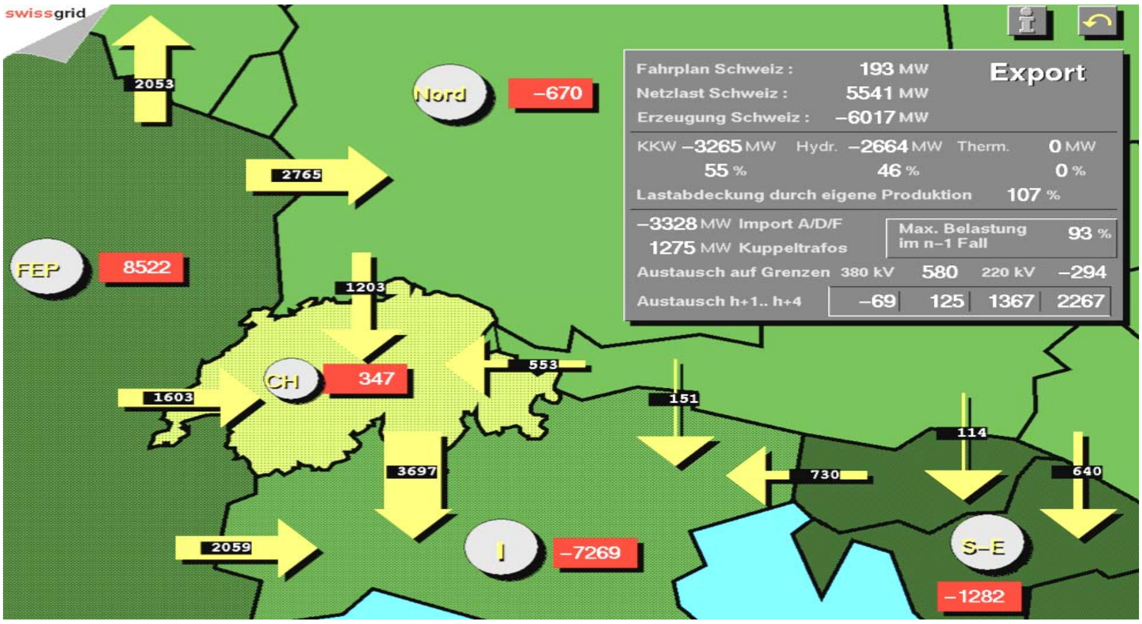
Philippe Huber, Grid Planning and Studies, ETRANS AG, Switzerland

Introduction

On the Swiss electricity transport grid, risk assessment concerning distribution failures is undertaken by means of a so-called "*n-1 security check*" procedure.

1. Situation of the Swiss transmission Grid

Switzerland is situated in the centre of the UCTE interconnected transmission grid. Therefore, the Swiss transmission Grid is very strongly interconnected with the neighbouring countries.



Source: Swissgrid, 2007.

Fig 9. Typical traffic over the France-Germany-Switzerland-Italy-Austria interconnection (note the "n-1 situation" in the display)

In import situation, load flows in the Swiss transmission grid are strongly influenced by UCTE generation pattern: Windmills in Germany depend on meteorology, while French nuclear power is constant. Italy is an importer at daytime and Austria's hydro is seasonal.

2. Risk assessment for the Swiss transmission Grid

Risk assessment is based on the so called "*n-1 security check*" procedure, based on the best available load flow forecast or an actual load flow situation a network. Contingency analysis consists of a simulation where every line and transformer of the 380 kV and 220 kV transmission grid (Swiss grid including tie lines and relevant foreign elements) is successively switched off. The remaining part of the network is then checked for violation of the limits.

The limits are defined as the maximum permissible currents for lines and the apparent power for transformers, i.e. 100 %, per definition.

Operational planning security

In the operational planning phase, the network is defined as "*n-1 secure*", if for every element no violation of the limits occurs after the outage of any single other element. Exceptions can be agreed on for elements where the overall security is not affected, e.g. for connecting lines to small power plants.

Operations security

In actual operation phase the network is defined as n-1 secure, if the element loadings after the outage of any single element are within limits. In case some element loadings reach up to 120 % predefined remedial actions must be known which bring all element loadings below the limits within 20 minutes.

Additional criteria are monitored (e.g. voltage level and angle difference) which could affect the security or the return to secure conditions after an outage.

Swiss transmission Grid	Neighbouring transmission grids
Online measurement and topology from SCADA of Swiss Utilities	i. **Online** measurements and topology from SCADA of neighbouring TSOs ii. **Offline** model of complete UCTE system

Table 27. Models and measurement techniques used in the Swiss energy sector

3. Typical situations and congestions

Two extreme situations in the operation of the Swiss transmission Grid

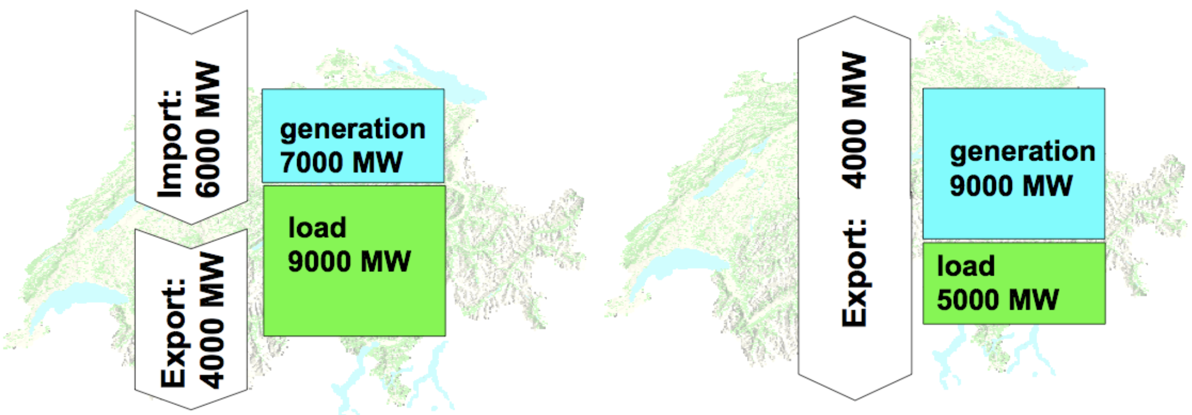


Fig 10. Left: High import from North and high transits (near capacity limits, on winter nights)
Right: High CH-Export (high marginal benefits, during summer working days)

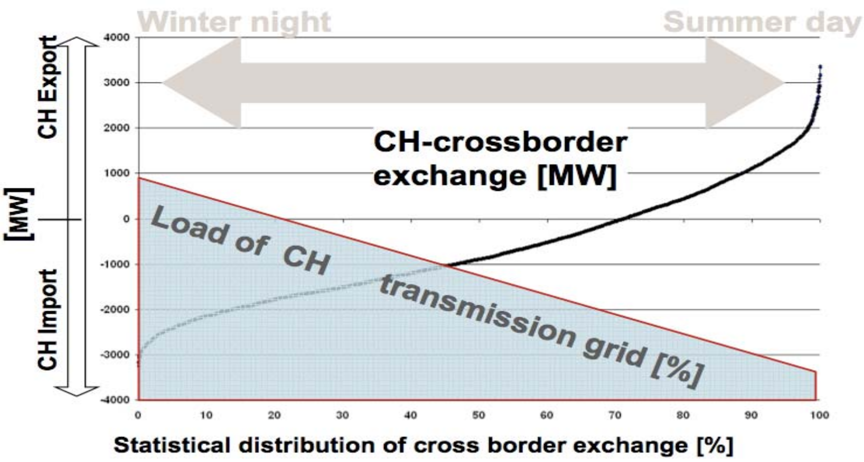


Fig 11. Swiss grid contribution to typical import-export situations

There are two types of congestion in the Swiss transmission grid: 1. through the Alps, on the North-South link, when Swiss producers generate high power; 2. at three spots (France- CH, France-Germany-CH near Basel, Austrian Border near Graubunden) when France, Germany and/or Austria generate high power, which is bought by Swiss operators.

4. Drivers for planned infrastructure reinforcement

There are three drivers for transmission grid reinforcement; these are technical, financial and commercial.

Technical drivers	Financial drivers	Commercial drivers (Market)
Allow n-1 secure operation •Guarantee security of supply of the distribution networks (cover Swiss consumption increase of about 2% yearly) •Allow maintenance of transmission Grid infrastructure with enough flexibility for grid owners •Allow transmission of electric power generated or pumped by hydro power plants in almost all conditions	Maintain value of assets under consideration of legislative obligations •Increase income for grid usage (e.g. fee on import or export flow) •Reduce redispatch costs •Reduce cost of losses	•Allow for the producers the use of the high flexibility of the existing and planned hydro power plants •Allow import of cheap energy for suppliers (internal consumption) and for producers (pumping for storage power plants) •Allow export of high value energy for producers i.e. permit a high level of import or export opportunities for commercial activities

Table 28. Drivers of infrastructure reinforcement in the energy sector

5. Co-ordination of grid reinforcement

According to M. Huber, three important projects will reinforce the Swiss transmission grid and they shall solve congestions problems by 2015:

1. North: Schaltanlage mit Transformatoren (Switch with transformers)

Leitung mit 220kV in Betrieb

Leitung mit 380kV in Betrieb

Schaltanlage "Gösgen-Mettlen1": IBS Commissioned in summer 2003, existing 220 kV line shall be upgraded in a 380 kV line with double circuit. => (n-1)-security in central Switzerland substantially shall be increased.

2. Transalpine transport (North-South) "Nufenenpass": Project has been commissioned in autumn 2005; existing 220 kV has been line upgraded in a 380 kV line with double circuit. This project is part of the West- East 380 kV connection programme.

3. East: "Bernina": Commissioned in December 2005 Existing 220 kV line will be upgraded in a 380kV line with double circuit, which will reduce the load on existing 380 kV tie-lines. This work will increase export capacity to Italy.

Power plant projects

Seven new power plants shall run by the year 2014. Altogether they shall be able to produce 3'927 MW (mainly by turbine) and to pump up to 2'875 MW in total.

Power Plant	Increase in turbine generation	Increase in pumping power
Sambuco	960 MW	720 MW
KWO+	470 MW	340 MW
Linth-Limmern	1'000 MW	760 MW
Chavalon	350 MW (nat. gas)	-
Nant de Drance	612 MW	585 MW
Verzasca	400 MW	400 MW
Val d'Ambra	135 MW	70 MW

Table 29. Power plant projects in Switzerland (2007-2015)

National Co-ordination	International Co-ordination
i. Working group Transmission Grid development (AG VNE) - TSO (Swissgrid) - Swiss Utilities (Grid owners) ii. Working group Security of Supply and of Transmission (AG LVS) - Periodical actualization of „Reinforcement projects in the Swiss transmission system“ - Co-ordination with Swiss Federal Office of Energy iii. Planning and Authorization - SUL –Plan for transmission lines -> Authorities, representatives of organizations - PGV –Procedure for plan authorization - ESTI –Federal inspection of high voltage infrastructures	i. UCTE –TSOs-technical and operational issues - Working groups: System „Coordinated Planning“und „System Strategy“ - UCTE System Adequacy Forecast 2006-2015 ii. ETSO –TSOs–market and commercial issues - Market mechanism, auctions - Inter TSO compensation models, - Congestion management, (PTDF, Redispatch) iii. Eurelectric(EU) –suppliers, producers & TSOs - Lobbying - Exchange of experience

Table 30. Co-ordination of energy infrastructure investment in Switzerland and in neighbouring countries

In Switzerland, construction of electricity transport lines is undertaken under the responsibility of an integrated company. The investments are decided on a commercial basis, taking into account the expected revenues, which depend on energy prices in the different regions.

14 INTERNATIONAL OVERVIEW: USA, CANADA AND JAPAN

Massimo Florio (CSIL)

European Union: DG Regio

DG Regio can finance programmes or single projects to achieve its objectives of regional policy. For the new programming period 2007-2013, DG’s objectives are:

i. Convergence;

ii. Regional competitiveness and employment;

iii. European territorial cooperation.

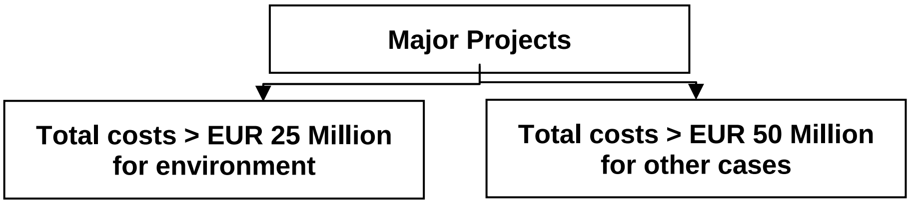


Fig 12. Definition of "major project" in the European Union (DG Regio)

Major projects should follow the same procedure (Reg. 1083/2006) for the co-financing decision regardless their specific sector.

DG Regio Evaluation process

a. Ex-ante evaluation

Major projects applications should be submitted to the European Commission (EC) by a Member State or a managing authority, together with a specific set of information**:**

- Results of the feasibility study;
- Timetable for project implementation;
- Financial plan showing planned total resources and financing needs;
- CBA including a risk assessment of impacts;
- Analysis of the environmental impact;
- Justification for the public contribution.

b. Ex-post evaluation

"The Commission should carry out an ex-post evaluation of all the operational programmes implemented" (Reg. 1083/2006). Focus should be on efficiency and effectiveness of funding and on the socio-economic impact.

Transport project appraisal

Specific elements to be included in the appraisal are:

Transport project appraisal	Important points
i. Demand analysis	Generated and diverted traffic
ii. Optimal pricing of services	Efficient pricing based on long-term marginal social costs and Polluter Pays Principle
iii. The quantification of time savings and safety enhancement	a. Calculated using national estimates. Different values by reasons, by transport modes and users b. Calculated referring to the average dangerousness levels by transport mode.
iv. Evaluation of environmental impact.	Externalities should be monetized using local values or applying “shadow prices”.

Table 31. DG Regio requirements for transport infrastructure assessment

Energy project appraisal

There is a distinction between: Energy transport and Energy production/distribution. Specific elements to be included in the appraisal are:

Energy project appraisal	Important points
i. Demand analysis	Demand should be calculated for all tariff levels considered
ii. Optimal pricing of services	(idem)
iii. Evaluation of external effects	External effects should be monetized through a “willingness-to-pay” approach or the cost sufficient to neutralise possible negative effects

Table 32. DG Regio requirements for energy infrastructure assessment

DG Regio: new programming period

i. **Time reference period** should be equal to the economic useful life of the project and long enough to encompass longer term impacts. The commission provides directly average time horizon by sector: railways 30, ports and airport 25, roads 25-30. Energy reference period is 15-25 years.

ii. **The discount rate for the financial analysis** should tend to reflect the opportunity cost of capital to the investor. It is set at 5% in real terms, however values differing from 5% should be accepted only in duly justified cases. The discount rate can be higher for PPP projects.

iii. **Environmental externalities** should be monetized using local values or, in their absence, it is possible to apply “shadow prices”.

iv. **The discount rate for the economic analysis** is based on long–term growth and pure time-preferences rates. Benchmarks should be 5,5% for the Cohesion countries and 3,5% for the others. Reflecting Member State specific conditions, different values may be justified.

v. Special attention is devoted to **projects generating revenues** and to those cases when private partners are involved in the projects. In these cases, the contribution from the Funds should be determined prudently so that no undue profit is reaped by the private investor.

vi. Determination of the **eligible expenditure**. The determination of the level of Community assistance is based on the **“funding gap” rate of the project**.

Rule:**EU grant = DA*Max CRpa**

Assessment of CBA quality

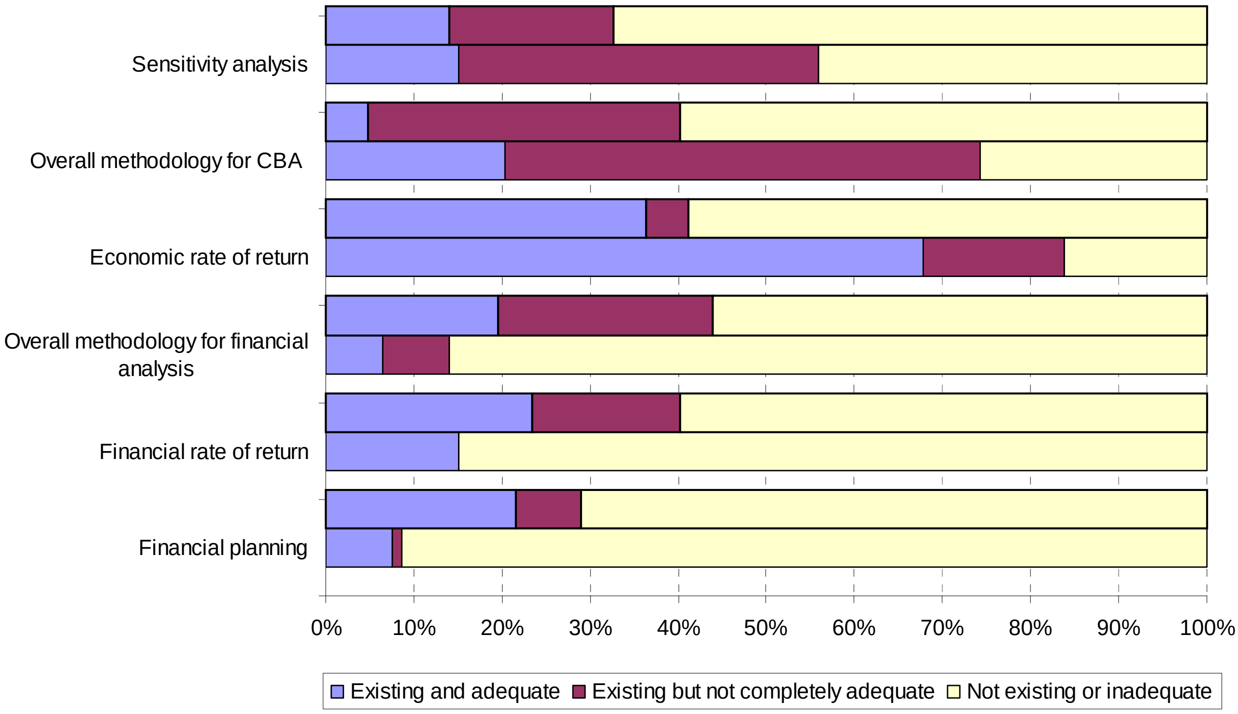


Fig 13. Quality of CBA related to European funding

The state of the art of the evaluation of the projects submitted to the DG Regio for funding is very poor; there is a need for improvements.

World Bank: general issues

The World Bank systematically evaluates investment projects before and after their implementation. Country desks provide Ex-ante evaluations, while the Operation evaluation department makes Ex-post evaluation. To appraise its operations, the WB uses the same approach sector wide, which is strongly based on **CBA**.

World Bank Evaluation process

Economic evaluation ensures that projects promote the development goals of the borrower country as well as the Bank’s poverty reduction strategy.

Ex-ante evaluation

- Compulsory analysis;
- Alternatives analysis;
- Financial analysis;
- Economic analysis:
- Risk analysis;
- CEA.

Ex-post evaluation

Instruments:

- Implementation Completion Report;
- Project Performance Assessment Reports;
- Impact Evaluation Reports
- ARDE.

These instruments evaluate, respectively, the accomplishments and lessons learned, the projects outcomes and, the projects' economic worth and long-term effects.

Two example are provided:

i. for energy, the **Azerbaijan – Power Transmission** Project, which aim was to improve the efficiency of the power transmission operation in the country (proposed loan: 48 million USD)

ii. for tranport, **Turkey – Railways Restructuring** Project**.** The aims were: to support the Borrower's implementation of the Program over the four year period 2005-2009, to improve productivity and effectiveness of railway operation, to assist General Directorate of State Railways Administration (TCDD) in reaching a financially sustainable situation and reduce the fiscal burden TCDD represents for the Borrower. (Proposed loan: 143,7 million EUR).

USA

Roles and responsibilities:

The Congressional Budget Office (CBO)	The General Accounting Office (GAO)	The Office of Management and Budget (OMB)
It advises Congress on the approval of the Budget.	It evaluates the financial congruity and the formal correctness of the evaluations vis-à-vis the legal regulations.	It prepares the budget on the behalf the Federal President It is the main decisional instrument in the allocation of capital spending, concerning federal investments and capital grants It has specific guidelines for the for the CBA to use to assess projects.

Table 33. *Roles and responsibilities in US infrastructure investments*

Discount rates in the USA

Each Office evaluates projects through a CBA that differs only in the methodologies to determine discount rates:

The OMB nominal rate is supposed to be the market interest rate; the real one is calculated roughly by subtracting the expected rate of inflation from the nominal rate. However usually 7% real rate is used for "public investments". The CBO applies a real rate equal to the real rate on the Treasury debt, which one assumes around the 2%. The GAO fixes the discount rate equal to the average nominal return on the Treasury debt placed on the market which falls due between one year and the length of the project under evaluation.

Project appraisal by sector in the USA

Transport projects	Energy projects
i. The Department of Transportation (DOT) includes one department for each mode of transport, but it provides a single guidebook for the CBA analysis of transportation projects. ii. Two departments have delivered specific guidelines for Highways and Air Transport.	In USA there are no specific guidelines for the ex-ante or the ex-post evaluation of projects.

Table 34. *US transport and energy appraisal guidelines*

<u>Transport project assessment</u>

The DOT methodology for **ex-ante evaluation** follows a two steps approach: Firstly the project proponent should evaluate the consistency of the project with the strategic plan for transport infrastructural development in the USA; secondly the effects of the project should be evaluated quantitatively through a CBA.

In the USA there are no official requirements or guidelines that specify how to carry out an **ex post evaluation** of transportation projects.

Canada

The Canadian Treasury Board delivered in 1994 its guidelines for project appraisal. This guidelines are not sector-specific and are based on CBA. The core elements of the appraisal process are: **Identification** and **Options analysis**. CBA is considered as the most appropriate tool to identify the option that best conforms to the economic goal of maximizing net benefits for society at large.

The Canadian Department of **Transport** delivered a specific manual on CBA of transportation in compliance with the Treasury Board guidelines.

Transport projects	**Energy projects**
The Canadian Department of **Transport** delivered a specific manual on CBA of transportation in compliance with the Treasury Board guidelines.	No specific guidelines for the ex ante analysis nor the ex post evaluation, were issued yet

Table 35. Canadian transport and energy appraisal guidelines

<u>Transport project assessment</u>

Transport project assessment is composed of three main steps: Identification of the problem and formulation of the base case and of other options; application of CBA to compare alternatives; the choice of the best option.

Japan

<u>Transport project assessment</u>

Starting by the end of the Nineties the Ministry of Construction developed four specific guidelines for the evaluation of investment projects in the road, railway, airport and seaport sectors.

The **ex-ante evaluation** of transport projects in Japan is carried out following an approach based on a mix of CBA and MCA. Each methodology serves a specific purpose: The CBA serves to judge which project should be chosen among the available options; the MCA is used for projects ranking. An **ex-post evaluation** of transport projects had to be conducted formally. However no specific guidelines to date have been written.

Road and seaport project should follow a specific procedure which differs from the one adopted for other sectors projects

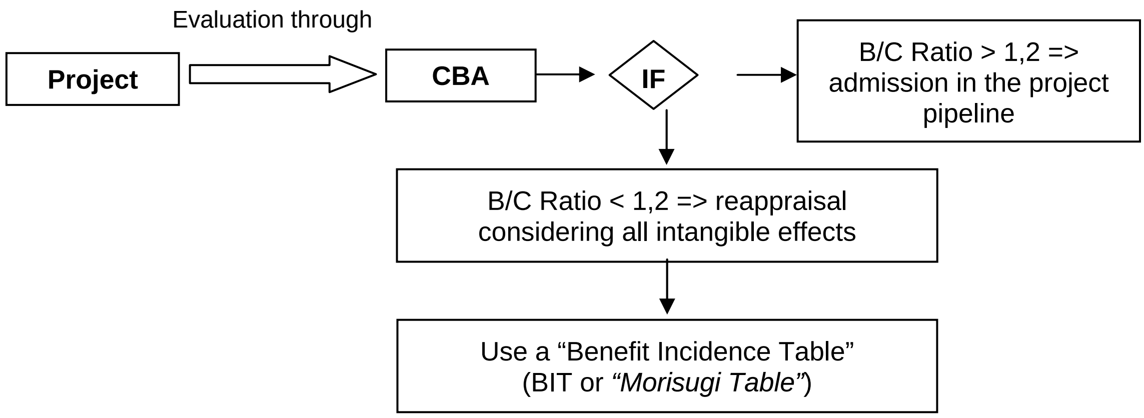


Fig 14. Ex-ante evaluation process for transport projects in Japan

15 TRENDS IN EVALUATION OF ENERGY INFRASTRUCTURE PROJECTS IN USA AND EUROPE

Teddy Püttgen, Energy Center of EPFL

Several types of energy utilities co-exist in the United States

Utilities may belong to investors, they can be cooperatives, they can be owned by the municipalities, or they can belong to the federal authorities.

Energy utilities in the United States
i. **Investor owned utilities** – IOUs.
- Holding companies, such as American Electric Power and Southern Company
- Individual corporations such as Duke Power
ii. **Cooperatives** – co-owned by all customers. There are several thousand of these utilities, especially in rural areas.
iii. **Municipal utilities** – owned and operated by local municipalities. LADWP, in Los Angeles is one of the biggest ones.
iv. **Federally owned utilities**, operated by the US Department of Interior. Bonneville Power Administration, in the Northwest, and Tennessee Valley Authority, are two examples

Table 36. Financial arrangements in US energy utilities investments

Energy utilities structures

Energy utilities may or may not deal in multiple services	Composition of the electricity arena
i. Electricity alone. ii. Natural gas alone. iii. Electricity and water. iv. Electricity and Gas. v. Combination with information distribution	i. Vertically integrated utilities, from generation to the retail customer. ii. GenCo. Only producing electricity. CalPine. iii. TransCo and DiscCo. Only a « wire company » iv. ISO. Independent Systems Operator. Examples are CalISO, PJM, etc… v. Energy services. Only provides services centred around energy.

Table 37. Services supplied by energy utilities in the United States

Regulatory environment

Most states have a local regulatory body, generally called Utilities Commission. The members of the Commission may be elected or appointed by the Governor. The Utilities Commission generally has authority over the rates the utility may charge for its products – electricity, gas, water, telephone, cable, etc…

The typical rate setting process is centred around a decision regarding a reasonable rate of return on the capital included in the Rate Base. When new installations are completed, the local utility requests that the related investment be included in the Rate Base and that, as a result, it may earn revenues from that investment.

Cooperatives and Municipal utilities are not subjected to the regulations of the local Utilities.

Federal utilities are self-regulated by the Department of Interior. The Federal Energy Regulatory Commission (FERC) has the regulatory authority over any interstate energy commerce. As a result, it is charged with the setting of electric power transmission rates. FERC also has regulatory authority over any new construction of transmission lines, pipelines, etc, across State boundaries.

The Nuclear Regulatory Commission (NRC) has the regulatory authority over the site selection, construction and operation of all nuclear power plants in the United States.

The North American Electric Reliability Council (NERC) coordinates the reliability aspects of the electric power grid in the United States and Canada, to a lesser degree.

16 MARKET AND ELECTRICITY INTERCONNECTION – PROBLEMS AND CURES

Jacques Rossat, formerly Commerce and Trading director, EOS

Introduction

Switzerland plays an important role as electricity importer and exporter. The main import business is from France (nuclear), while the main export targets Italy. German windmills produce highly unpredictable energy variations, which may become problematic if they happen while the network is saturated.

European diversity: potential complementarities

In Europe, various primary energies should allow –in theory- global economic optimisation

Primary energies in Europe	
i.	France: Nuclear
ii.	Germany: Coal, gas, wind
iii.	Italy: fuel -> gas
iv.	United Kingdom: Coal, gas, nuclear
v.	Norway: Hydro
vi.	Sweden: Hydro, nuclear
vii.	Switzerland: Hydro, nuclear
viii.	Denmark: Coal, gas, wind
ix.	Poland: Coal

Table 38. Energy supply in Europe

European potential is limited by interconnection capacities

Efficiency, legal and technical competences of regulatory bodies very different from one country to another. In addition to that, partial and incomplete unbundling between producers/marketers and transmission operators impedes fair access to networks. Finally, cooperation between TSOs sketchy at best; improving various *"international blackouts"*.

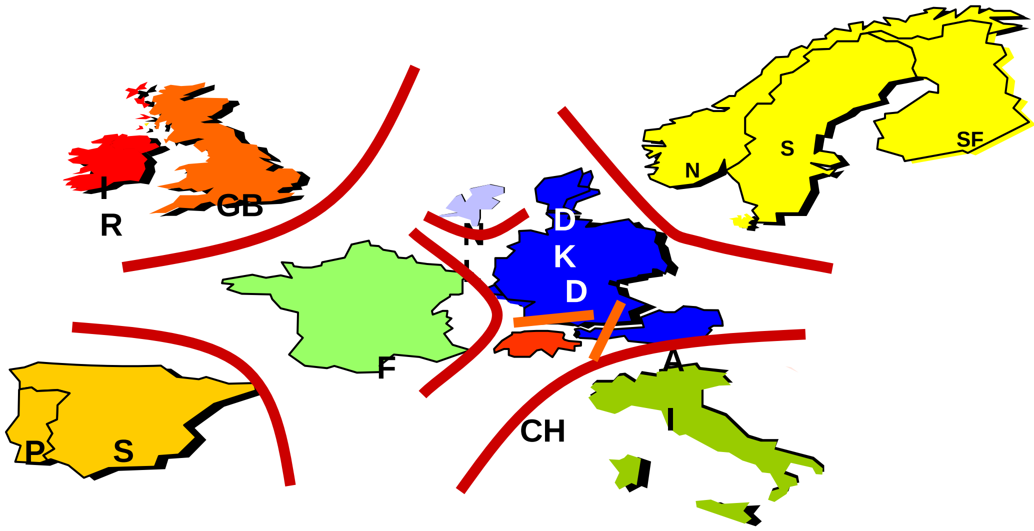


Fig 15. Limited interconnection capacities split the European market

Trends	Bottlenecks and auctions: consequences on Swiss market
i. Boost in national and international traffics, changes in production mix (wind), stricter adherence to n-1 rules (post Italian Blackout !) tend to decrease available NTC at borders	Swiss prices were traditionally similar to German ones. However, the development of a separate Swiss market, more expensive along level of auctions, implied:
ii. The measured NTC are images of internal bottlenecks: e.g. Switzerland. Thus, unimproved networks show moderate increase in physical transfers…	i. changes in the optimization process: rearrangement of commercial flows between D, CH and I:
iii. but increase of commercial contracts, EU and traders' pressure have led to implementation of explicit auctions at 3 borders (D, I, F).	II. changes in the trading pump-storage economics: off-peak hours from D more expensive => e.g. occasional imports of off-peak from Italy !
	Impossibility to import "cheap" electricity from D led to "desoptimization" of CH peak-producing plant. This caused Swiss prices coming closer to Italian ones.

Table 39. Trends and issues in the Swiss-EU electricity market

Globalisation of electricity market, at European scale, is limited weak cross-border connections as well as by the abundance of regulatory bodies, which have produce a huge variety of laws and technical standards.

Security of supply – trading – transmission : a love-hate affair

With Swiss production capacity stuck or diminishing, LTC with France to be terminated in the medium term, demand increasing, safe supply of country demands improvement in international transmission network (e.g. opening of regional bottlenecks to improve internal and international flows). On the other hand, price differences and volatility are good drivers for trade: traders can make good use of every critical situation, especially with European capacity reserve dwindling.

Trading needs transparency and fair access to networks: there is a need for pushes for fair implementation of European directives and recommendations.

Forecast: unclear future

More than 30 projects have been identified to improve Swiss VHT network; some of them to have decisive impact on interconnector capacity. However, these projects may take year before they are realised: The Swiss decision process is hyper-sophisticated and slow; the regulatory and economic frameworks are uncertain while the "Big 6" community nurtures very diverging interests.

More mature and transparent allocation processes in international trading are needed to optimize use of available capacity.

Incentive is needed to push TSOs to build new lines instead of cashing the revenues of auction.

17 OUTCOMES OF PANEL DISCUSSIONS

Content and temporal consistency

Definition of contents and use of the ex post analysis should be improved: They should include the monitoring of project implementation as well as the analysis of real data. As far as possible, a ex-post studies should use methodologies that are similar to the ones used for ex ante appraisal.

Moderation of project optimism

CBA compares benefits, which are often uncertain, with costs, which are certain. Evaluators should therefore adopt a more pessimistic approach to assessment (M. Ponti, 2006).

Quality of data at macro level

For the moment, macroeconomic models are very bad at providing data that are meaningful for CBA (P. Mackie, 2006).

Influence of financing scheme on CBA quality

The low quality of CBA carried out for projects funded by DG Regio can possibly be attributed to DG Regio's top-down financing scheme (A. Kopp, 2006) and / or to collusion between promoter and evaluator (M.Florio, 2006).

Spatial dynamics' lack of accuracy

Spatial dynamics is tackled at national level only, which provides results that are not sufficiently accurate for ex-ante studies. This could be amended by producing regional scenarios (C. Reynaud, 2006).

Similarities and differences: infrastructure, operation and congestion costs

Energy and transport are both considered network economies. Nevertheless, the two sectors present numerous differences. For instance, most infrastructure investment require public funding in the transport sector, whereas they do not need any in the energy sector (J. Rossat, 2006). The situation is similar for operation.

On energy networks, electricity operators pay the congestion cost, whereas on transport networks congestion costs are borne by the users (M. Florio, 2006).

In the transport sector, provision of new road capacities induces additional transport demand. On the contrary, provision of new electricity lines has very little effect on demand. (C. Doll and P. Huber, 2006) (or: the energy sector is characterized by a low elasticity of demand).

18 REFERENCES

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Eberhard Claus, "*European Investment Bank (EIB) Politics and feasibility studies – EIB view*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Florio Massimo, "*International overview: USA, Canada and Japan*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Huber Philippe, "*Switzerland Risk assessment in energy infrastructures*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Kopp Andreas, "*Transport infrastructure evaluation – The OECD/ECMT view*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Mackie Peter, "*Harmonised guidelines for projects' assessment at EU level – HEATCO experience*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Murray Barry, "*Examining energy infrastructure projects Ex Post – The Operator View*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Ponti Marco, "*Critical Issues of the Assessment Process*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Püttgen Teddy, "*Trends in evaluation of energy infrastructure projects USA and Europe*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Rossat Jacques, "*Market and electricity interconnection – Problems and Cures*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

Scholten Bas, "*The Netherlands Ex Post vs. Ex Ante, Overlooked issues, ECOTRANS experience*", EVA-TREN 1st Experts'Workshop: Theoretical basis in perspective, Lausanne, November 7, 2006.

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Maffii Silvia, *"Minutes of the meeting",* internal document, TRT, Milano, 2007.

19 EXPERTS' WORKSHOP PARTICIPANTS

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22 WORKSHOP SESSIONS

November 7, 2006 EXPERTS' WORKSHOP _ *morning session*	
08.30	Registration and coffee – Space Odyssea
09.00	Opening Welcome ***Prof. Francis Luc Perret, Vice President of EPFL***
09.10	Introduction of the EVA TREN Project ***Dr. Silvia Maffi, Transporti e Teritorio (TRT) Milan***
09.20	Critical Issues of the Assessment Process ***Prof. Marco Ponti, Transporti e Teritorio (TRT) Milan***
09.40	Presentation of WP1 results ***Aaron Scholz, Institute for Economic Policy Research (IWW) Karlsruhe***
10.00	Harmonised guidelines for projects' assessment at EU level – HEATCO experience ***Prof. Peter Mackie, Institute for Transport Studies (ITS) Leeds***
10.15	Morning Coffee
10.30	*Chairman's opening Welcome* Introduction for the section "Examining the real cases, ex-ante vs. ex-post analysis" ***Dr. Claus Doll, Project Manager , Division of Sustainability and Infrastructures, Fraunhofer Institute for Systems and Innovation Research (ISI)***
10.40	Transport infrastructure evaluation – The OECD/ECMT view ***Dr. Andreas Kopp, Chief Economist ECMT and Joint OECD/ECMT Transport Research Centre***
10.55	Politics and feasibility studies – EIB view ***Dr. Claus Eberhard, Projects Directorate Rail & Road Division, European Investment Bank (EIB)***
11.10	Institutional decision making developments in the Netherlands ***Dr. Pauline Woertelboer, AVV Transport Research Centre, Netherlands***
11.25	Panel discussion
12.15	Lunch for Speakers and Delegates

November 7, 2006 EXPERTS' WORKSHOP _ Afternoon Session	
13.15	Ex Post vs. Ex Ante, Overlooked issues, ECOTRANS experience ***Dr. Bas Scholten, Senior Consultant, ECORYS Transport, Rotterdam, The Netherlands***
13.30	Examining energy infrastructure projects Ex Post – The Operator View ***Dr. Barry Murray, Managing Director, Electricity Market Services Limited, UK***
13.45	Risk assessment in energy infrastructures ***Mr. Philippe Huber, Head of Grid Planning and Studies, ETRANS AG, Switzerland***
14.00	Panel Discussion
14. 30	Afternoon Tea
14.45	International overview: USA, Canada and Japan ***Prof. Massimo Florio, Centre of Industrial Studies Milan (CSIL)***
15.00	Key issues for good assessments: Critical analysis, on going research and new developments of appraisal methods ***Dr. Claus Doll, Project Manager , Division of Sustainability and Infrastructures, Fraunhofer Institute for Systems and Innovation Research (ISI)***
15.15	Trends in evaluation of energy infrastructure projects USA and Europe ***Prof. Teddy Püttgen, Director Energy Center of EPFL Lausanne***
15.30	Market and electricity interconnection – Problems and Cures ***Mr. Jacques Rossat, Ex Commerce and Trading Director of EOS***
15.45	Panel discussion, Day overview ***Chairman Prof. Massimo Florio, Centre of Industrial Studies Milan (CSIL)***
17.00	Assessing the expectations of partners – EVA TREN next steps ***Dr. Silvia Maffi, Transporti e Teritorio TRT Milan***

EVA-TREN 1st experts' Workshop was organised by EPFL-LEM: Ms Georgeta Geambasu, Dr. Aymeric Sevestre and Dr. Tristan Chevroulet (coordinator).