Practical use of cost-benefit analysis in context of EU assistance

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Marko Kristl
Michel Gaspard

INTRODUCTION

- CBA is based in economic theory and it developed as the economic theory was progressing; most intensive in transport.
- First application of CBA in US Flood Control Act 1936: a project is accepted if "… the benefits to whomsoever may accrue, are in excess to the estimated cost…".
- However: not an exact discipline, but applied social science, based on approximations, working hypotheses, affected by lacking data, resources and uncertainty.
- This workshop: CBA in the context of EU assistance who is managing development assistance under the mandate of EU MS. Principles are the same as for the national public or private projects.

Contents

A. Requirements regarding inputs to the CBA:

- ***Objective definition***
- ***Technical description***
- *Option selection*
- ***Demand analysis***

B. Financial analysis:

- *Definition, objective, structure*
- *Revenue/non revenue-generating projects*
- ***Definition of "Without the project" option***
- *Assumptions*
- *Checking the consistency*

Contents

C. Economic analysis:

- *Definition, objective, structure*
- ***Link to financial analysis***
- *Benefits (identification, assumptions)*
- *Checking the consistency*

D. Risk analysis:

- *Requirements*
- *Basic terms and methodological explanations*
- ***Application***

E. Other:

- *State aid issues*
- *Review of standard ToR for CBA*
- *Draft check-list for CBA report*

INTRODUCTION
Useful sources

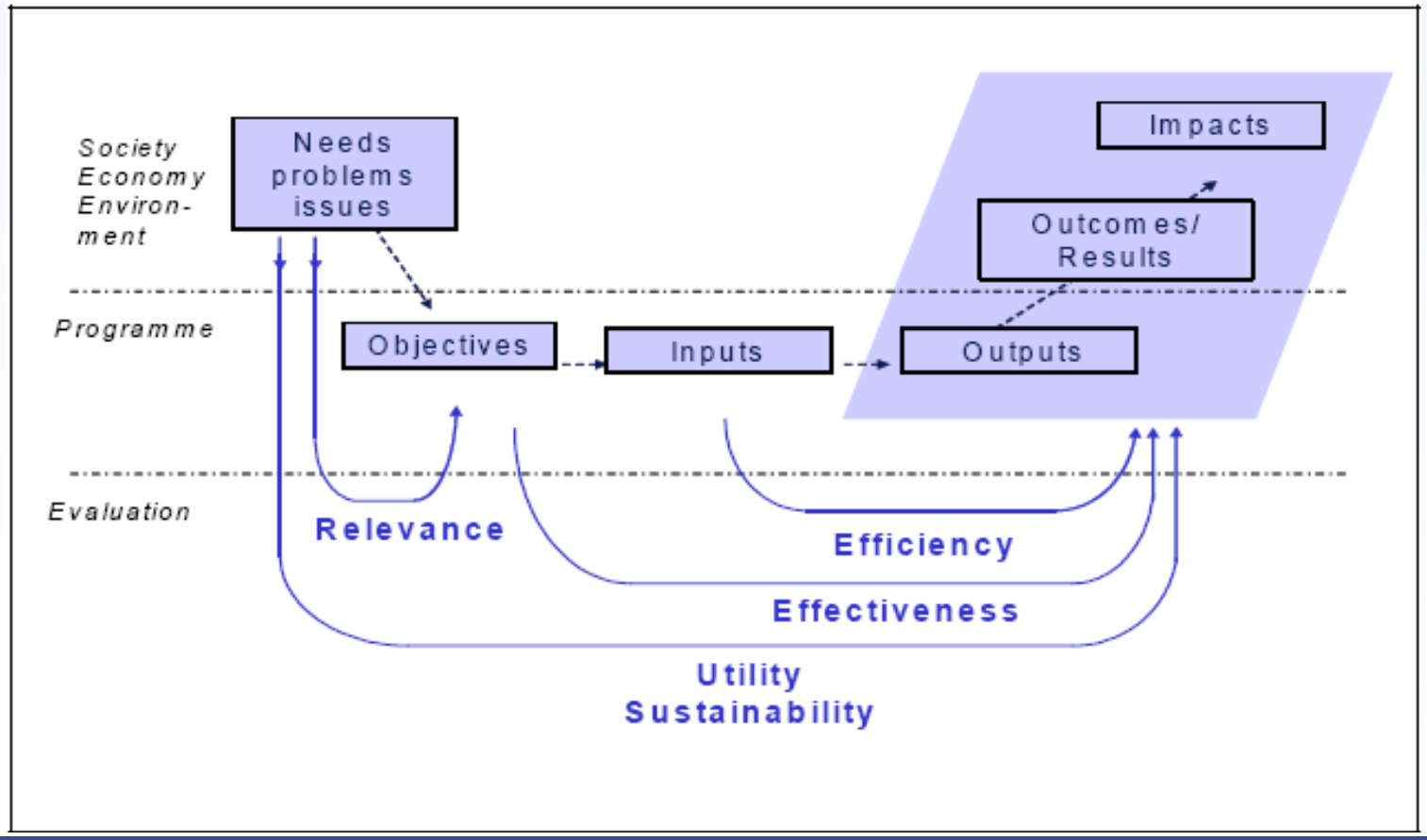
Useful sources (all available through Internet):

- CBA Guidelines (2002, 2008)
  http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf
- Working document 4
  http://ec.europa.eu/regional_policy/sources/docoffic/2007/working/wd4_cost_et.pdf
- WB Transport notes
  http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/0,,contentMDK:20457194~isCURL:Y~menuPK:337136~pagePK:210058~piPK:210062~theSitePK:337116,00.html
- WB Handbook on economic analysis of investment operations
  http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2007/06/25/000020439_20070625152441/Rendered/PDF/207330REVISED.pdf
- HEATCO
  http://heatco.ier.uni-stuttgart.de/
- Handbook on estimation of external costs in the transport sector (IMPACT)
  http://ec.europa.eu/transport/costs/handbook/doc/2008_01_15_handbook_external_cost_en.pdf

BASIC INPUTS
Objective definition

- What we want to do.
- Clear relationship between:

  needs – project objectives – project – expected results



BASIC INPUTS
Objective definition

Specific problems in transport sector (road, rail, airport, port):

- Insufficient capacity (2-lane road, single track rail, land-side/air-side airport; growing demand)
- Traffic safety
- Location of infrastructure in settlements (noise, pedestrian/cyclist safety, exhaust, separation)
- Insufficient bearing capacity, energy supply, pavement/track/subgrade condition
- Land use development, public transport development
- Insufficient security standard (airports)

BASIC INPUTS
Objective definition

Usual transport project objectives:

- Improve transport efficiency through reduction of travel time (throughput time in airport)
- Improve transport efficiency through reduction of operation and maintenance cost (users, infrastructure operator, operators)
- Improve traffic safety
- Improve security
- Reduce environmental impact
- Improve accessibility

Not a good objective:

- … complete motorway from A to B … (←output)
- … development of troubled regions …(← programme)

BASIC INPUTS
Objective definition

SMART objectives:

- **S**pecific – specify what you want to achieve
- **M**easurable – You should be able to measure whether you are meeting the objectives or not
- **A**chievable - Are the objectives achievable and attainable
- **R**ealistic – Can you realistically achieve the objectives with the resources you have
- **T**ime – When do you want to achieve the set objectives

Application form requires targets; if a problem is low travel speed when is the speed adequate then?

BASIC INPUTS
Objective definition

Relevance for CBA:

- By knowing the needs and purpose of the project we may focus CBA accordingly
- CBA as a tool which is telling us how good objectives are met (important when used for option selection or project ranking)
- European commission will compare CBA results against project objectives (e.g. if railway station is relocated because of operational difficulties then the main benefit should not be the value of released land)

BASIC INPUTS
Objective definition

Väo - Maardu Case:

- Current situation: FS section 3.4, 3.5, 4.1, 4.2, 7.1
- Objectives: FS 8.1
- Targets: none

BASIC INPUTS
Options

When identifying what to do about the problem the FS should consider project variables such as:

- Technology (mode, technology within the mode)
- Location (or alignment)
- Size and timing (design standard, rolling stock, phasing/staging)

Phasing and staging:

- Should ensure operational, independent projects
- Stages: motorway sections (2 finished, 1 under construction, 2 more planned)
- Phases: rail GSM-R first, then ETCS
- Reasons: availability (cost), operational

BASIC INPUTS
Options

Part of FS is selection of optimum variant: criteria may include economic (CBA), environmental, other. When preparing documentation for decision-to-proceed (or a funding request to bank or funding agency - EU) we usually deal with one option only. It is therefore necessary to present that this is the best one.

Option selection should be documented:

- Short technical description and location on map
- Selection procedure (who, when, regulation)
- Selection criteria (economic, environmental, other)
- Main conclusions of FS (which option selected; advantages)

BASIC INPUTS
Options

Väo - Maardu Case:

- Comparison of interchange solutions: FS 6.1.3, Appendix 8 (multi-criteria analysis)
- Selected variants: FS Appendix 9
- Staging:

BASIC INPUTS
Technical description

Not a core part of CBA but necessary to:

- Understand the project (consistency with needs/objectives; cost)
- Provide necessary inputs for CBA (road width, length, speed, type of intersections, etc.)

Format:

- Alignment/ location on map
- Major works components
- Description example:
- Missing: protective measures (overpasses for wildlife, underpasses for amphibians, safety and protective fences), resting area; in urban areas re-location of public utilities

BASIC INPUTS
Technical description

- Based on technical description: key output indicators (for EU projects): km of roads, rail, bridges, tunnels, number of interchanges.
- Output indicators will be included in EC decision and later compared with implemented project.
- Example: Slovenian motorway (decision).

Indicators		**Unit**	**Number**
Principal indicators			
1 Section length		km	17,2
2 Structures	Overpass bridges	number	10
	Motorway bridges	number	9
	Underpasses (amphibians)	number	9
	Overpasses for game	number	3
3 Interchanges		number	2
4 Resting area road works –both sided (plateau)		number	1
5 Noise protection barriers		m	1000

BASIC INPUTS
Technical description

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Väo - Maardu Case:

- Technical description: FS Section 6
- Key output indicators:

BASIC INPUTS
Presentation of demand analysis

- Pre-requisite for CBA. For a large road/rail project formal traffic model is required (in airport modelling rare, but gaining recognition).
- 4-stage traffic model: trip generation, trip attraction, modal split, assignment to network.
- Checking the consistency of demand analysis not part of this exercise
- Regardless of the method, please present:

Microsoft Word Document

- Growth rate verification: http://ec.europa.eu/dgs/energy_transport/figures/trends_2030_update_2007/energy_transport_trends_2030_update_2007_en.pdf

BASIC INPUTS
Presentation of demand analysis

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Väo - Maardu Case:

- FS Section 4
- Traffic survey (volumes and direction)
- Forecast based on population, car ownership, average annual mileage, road class, local conditions
- No traffic modelling or simulation (no re-assignement, delays in the intersections estimated with HCM formulas)

WITHOUT THE PROJECT OPTION
Definition of alternatives for appraisal

- First step of financial and economic analysis
- Terminology:

  World Bank: With the project, Without the project

  UK: Do Something, Do Minimum, Do nothing

  EU CBA Guide: both; “Business as usual”
- At least two options:

  Without the project/Do Minimum option is a reference case for With the project/Do something option (incremental approach).
- Do nothing ≠ “no change” option (traffic growth, user cost).
- Could have more then one Do Something.

WITHOUT THE PROJECT OPTION
Definition of alternatives for appraisal

- In many cases: Do Minimum = Do nothing (e.g. existing network without modifications)
- Special cases: Do minimum ≠ Do nothing

a) Works in the network carried out regardless of the project

b) Existing network requires improvements to avoid catastrophic scenario (if overcapacity demand outside peak hours is forecasted); if Do minimum is 20 % or more of cheapest Do something, then Do minimum should compared against Do nothing.

c) Traffic conditions can be approved without capital expenditure (optimized traffic flows in the intersections).

WITHOUT THE PROJECT OPTION
Definition of alternatives for appraisal

- Incremental analysis: only a difference in estimated cash flows for the two options (With the project – without the project).
- Remaining historical cost in WD4: as an alternative where incremental doesn't work. Intended basically for water sector where it is not possible to single out incremental project revenue from the total network revenue.

WITHOUT THE PROJECT OPTION
Definition of alternatives for appraisal

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Väo - Maardu Case:

- CBA report 3.1.1
- Base alternative: congestion outside peak hours?

FINANCIAL ANALYSIS
Definition, objective, structure

- Analysis of (incremental) cash flows from point of view of the project operator.
- Cash flows only (no depreciation, reserves, etc.).
- Objectives:

a) To calculate financial performance indicators;
b) To structure the funding of the project;
c) To asses the financial sustainability of the project.

- Sequence:

1. Financial profitability of the investment;
2. Funding (including grant calculation, loans)
3. Financial sustainability
4. Financial profitability of national capital

FINANCIAL ANALYSIS
Financial profitability of the investment (FRR/C)

	Item/Year	1	2	…	n
1	**Revenues (WP-WO)**				
2	Operating cost (WP-WO)				
3	Total investment cost (WP-WO)				Residual value (-)
4	**Total outflows (=2+3)**				
5	**Net cash flow (=1-4)**				
6	**Net present value of the investment (FNPV/C)**	(NPV of flows in line 5)			
7	**Internal rate of return (FRR/C)**	(IRR of flows in line 5)			

FINANCIAL ANALYSIS
Funding gap

	Main elements and parameters		Value not discounted	Value discounted
1	Reference period (years)			
2	Financial discount rate (%)			
3	Total investment cost (in euro, not discounted)			
4	Total investment cost (in euro, discounted)			
5	Residual value (in euro, not discounted)			
6	Residual value (in euro, discounted)			
7	Revenues (in euro, discounted)			
8	Operating costs (in euro, discounted)			
9	Net revenue = revenues – operating costs + residual value (in euro, discounted) = (7) – (8) + (6)			
10	Eligible expenditure (Article 55 (2)) = investment cost – net revenue (in euro, discounted) = (4) – (9)			
11	Funding gap rate (%) = (10) / (4)	**X**		

FINANCIAL ANALYSIS
Community contribution

Euro	TOTAL PROJECT COSTS (A)	INELIGIBLE COSTS (B)	ELIGIBLE COSTS (C)=(A)-(B)
1. Planning/design fees			
2. Land purchase			
3. Building and construction			
4. Plant and machinery			
5. Contingencies			
6. Price adjustment (if applicable)			
7. Technical assistance			
8. Publicity			
9. Supervision during construction implementation			
10. Sub-TOTAL			
11. (VAT)			
12. TOTAL			**Y**

FINANCIAL ANALYSIS
Community contribution

	Community contribution	**Value**
1.	Eligible cost (in euro, not discounted) (Section H.1.12(C))	**Y**
2.	Funding gap rate (%) = (E.1.2.11)	X
3.	Decision amount, i.e. the "amount to which the co-financing rate for the priority axis applies" (Article 41 (2)) = (1)*(2) (respecting the maximum public contribution according to state aid rules)	
4.	Co-financing rate of the priority axis (%)	85
5.	Community contribution (in euro) = (3)*(4)	

FINANCIAL ANALYSIS
Financial profitability of the capital (FRR/K)

	Item/Year	**1**	**2**	**…**	**n**
1	Revenues (WP-WO)				
2	Residual value				
3	**Total inflows (=1+2)**				
4	Operating cost (WP-WO)				
5	Interest				
6	Loan reimbursement				
7	Private equity (if PPP)				
8	Total national public contribution				
9	**Total outflows (=4+5+6+7+8)**				
10	**Net cash flow (=3-9)**				
11	**Net present value of the investment (FNPV/K)**	(NPV of flows in line 10)			
12	**Internal rate of return (FRR/K)**	(IRR of flows in line 10)			

FINANCIAL ANALYSIS
Financial sustainability

	Item/Year	**1**	**2**	**…**	**n**
1	EU grant				
2	National public contribution				
3	Loans				
4	Other funding				
5	Total financial resources (=1+2+3+4)				
6	Revenues				
7	**Total inflows (=5+6)**				
8	Total investment cost				
9	Total operation and maintenance cost				
10	Loan repayments (interest and principal)				
11	Taxes				
12	**Total outflows (=8+9+10+11)**				
13	**Total cash flow (=12-7)**				
14	**Cumulated total cash flow**				

FINANCIAL ANALYSIS
Non revenue-generating projects

- Scope of FA dependent on whether the project is generating revenues or not.

- Non revenue-generating projects:

a) Projects with no revenues (e.g. un-tolled motorways),
b) Projects where revenues do not cover operating cost (e.g. some railways),
c) Projects subject to state aid rules.

- Some components of FA still relevant:

a) Investment cost break-down,
b) Price level used (constant, current prices),
c) Eligibility of cost (appl. for EU supported projects),
d) EC grant calculation (appl. for EU supported projects).

FINANCIAL ANALYSIS
Non revenue-generating projects

Item	Cost category	Value (EUR)
I	Design and supervision, of which:	
	Preliminary design and studies	
	Detailed design	
	Supervision	
II	Land, of which:	
	Land purchase	
	Site preparation	
III	Earthworks	
IV	Construction works, of which:	
	Tunnels	
	Bridges	
	Other (if applicable)	
V	Installations, equipment	
VI	Noise protection	
VII	Other (specify)	
VIII	Contingencies	
IX	Total investment cost (excl. VAT)	
X	VAT	
XI	Total investment cost (incl. VAT)	

FINANCIAL ANALYSIS
Non revenue-generating projects

Item	Cost category	Value (EUR)
I	Design and supervision, of which:	
	Preliminary design and studies	
	Detailed design	
	Supervision	
II	Land, of which:	
	Land purchase	
	Site preparation	
III	Earthworks	
IV	Landside and airside infrastructure, of which:	
	Passenger terminal (all components)	
	Cargo terminal	
	Parking zones & facilities	
	Rail station (or connection as well)	
	Jetways (and other aircraft access improvements)	
	Runways	
	Taxiways	
	Aircraft parking zones	
	Control centre	
	Radar centre	
	Depot/Garage	
	Fire station	
	Air traffic control systems	
	Security devices	
	Other infrastructure works	
	Other equipment	
V	Other (specify)	
VI	Contingencies	
VII	Total investment cost (excl. VAT)	
VIII	VAT	
IX	Total investment cost (incl. VAT)	

FINANCIAL ANALYSIS
Non revenue-generating projects

Ineligible cost:

- Expenditure outside eligibility period;
- Ineligible under national rules;
- Other not presented for co-financing;
- Cohesion fund (transport): TEN-T network.

FINANCIAL ANALYSIS
Non revenue-generating projects

Euro	TOTAL PROJECT COSTS (A)	INELIGIBLE COSTS (B)	ELIGIBLE COSTS (C)=(A)-(B)
1. Planning/design fees			
2. Land purchase			
3. Building and construction			
4. Plant and machinery			
5. Contingencies			
6. Price adjustment (if applicable)			
7. Technical assistance			
8. Publicity			
9. Supervision during construction implementation			
10. Sub-TOTAL			
11. (VAT)			
12. TOTAL			

		Value
1.	Eligible cost (in euro, not discounted) (Section H.1.12(C))	
2.	Funding gap rate (%) = (E.1.2.11)	100
3.	Decision amount, i.e. the “amount to which the co-financing rate for the priority axis applies” (Article 41 (2)) = (1)*(2) (respecting the maximum public contribution according to state aid rules)	
4.	Co-financing rate of the priority axis (%)	85
5.	Community contribution (in euro) = (3)*(4)	

FINANCIAL ANALYSIS
Non revenue-generating projects

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Väo - Maardu Case:

- Cost breakdown: FS 9.1.7
- Financial analysis: CBA report 4

FINANCIAL ANALYSIS
Revenue-generating projects

General assumptions:

- Evaluation period WD4, 25-30 years road, 25 years port and airport (construction+operation).
- Discount rate: 5% in real terms (or any other if justified)
- Price level: constant price (indicate the base year) or current price (inflation included). Current price recommended if significant discrepancies in relative prices evident. Formula for nominal discount rate:

  $(1+n)=(1+r)*(1+i)$

FINANCIAL ANALYSIS
Calculation of residual value

- At the end of the eval. Period infrastructure is not without the value; it will continue to generate revenue.
- In theory: value of an asset is NPV of all future cash flows → residual value is future value of all cash flows which appear after the evaluation period.
- Three ways to calculate:

a) Market value at the end of evaluation period;
b) Standard depreciation formulas;
c) NPV of cash flows in the remaining life of the project.

- Method (a) not usual in infrastructure (no market).

FINANCIAL ANALYSIS
Calculation of residual value

- Method (b) Depreciation of road infrastructure: installations 15 to 30 years, road structure 30 years, excavations, embankments, bridges, tunnels 80 to 100 years, indefinite for land (consistency with cost breakdown!). Airports: buildings 20 to 40 years; runways and taxiways 15 to 30 years; aircraft parking zones 15 to 30 years; vehicles 4 to 10 years; electro technical appliances (including telecom) 7 to 15 years; computer hardware 3 to 10 years; land is not depreciated.
- Method (c) NPV of cash flows: self-explanatory; possible to use the perpetuity formula:

$$P_n = \frac{D_{n+1}}{k - g}$$

P_n: price of the asset at the time n;
D_{n+1}: net revenue at the time n+1;
k: required rate of return;
g: expected growth rate for net revenue (may be zero).

FINANCIAL ANALYSIS
Operation and maintenance cost

- Routine maintenance, periodic maintenance, operation (e.g. toll system in road, traffic management in rail)
- With new motorway/rail: additional cost for new road, routine of existing doesn't change, periodic decreases.
- Periodic: fixed periods (e.g. wear course every 15 years, marking on 7 years, etc.) or spread over entire period or modelled (HDM).
- Historic data: may not be appropriate if current spending insufficient (maintenance back-log).
- Standard calibration package to assure consistent use of maintenance related parameters in HDM (road network definition, technical parameters of roads, road condition, vehicle fleet, maintenance strategy)?

FINANCIAL ANALYSIS
Revenues

- Only payments paid directly by the users: tolls by drivers, rail access charges by train operators, airport charges by the operators (exclude subsidies and tax).
- Operating subsidies may not be included in FRR/C (project) and funding gap calculation, but may be included in FRR/K (capital) and sustainability.
- Present assumptions:

a) Tariff, net of subsidies and tax;
b) Tariff changes in time (in real terms);
c) Average discounts (applicable in airports);
d) Tariff classes consistent with traffic forecast?

- For airports: landing and take-off charges; passenger charges; parking charges; cargo charges; other income (car parks, lease of property).

FINANCIAL ANALYSIS
Revenues

- Special case: Vignette revenue.
- Vignette: time related access charge (toll: distance related payment).
- Incremental analysis: Will project raise revenues or not?
- Vignettes generally do not increase revenues, because users are buying them to access the network, not only the section in question (given that the price of the vignette doesn't change with extension of network).
- Vignette revenue is not incremental to the project.

FINANCIAL ANALYSIS
Revenues

Vignette system presentation:

- Charge type: a “Euro” vignette, allowing time-limited access to the network (not a distance related toll);
- Vehicle type: for trucks over 12 tonnes only;
- Relevant network: entire main roads and motorway network (… km);
- Collection: vignette revenue will be collected through the State Treasury and will be part of State budget;
- Allocation of collected funds: maintenance and development of infrastructure.

FINANCIAL ANALYSIS
Checking the consistency of financial analysis

- Validation: are we doing the right things?
  Verification: are we doing it the right way?
- Two approaches:

1. Check every assumption, calculation procedure (e.g. discounting) and input data and verify the final results; or
2. Take the main inputs, put it in a template financial model and compare the final results with original.

FINANCIAL ANALYSIS
Checking the consistency of financial analysis

Verification:

- Is “Without the project” scenario consistent with the requirements?
- Are all inputs for the financial analysis presented (evaluation period, discount rate, base year/inflation indices, residual value, operation and maintenance cost, tariff for revenues, etc.)
- Can all assumptions be verified as consistent?
- Investment cost break-down available?
- Do tables contain yearly streams of all cash flows, disaggregated per individual cost and revenues?
- Is it possible to reproduce the calculations (is there a clear audit trail between assumptions, calculation procedures and outputs)?
- Are calculations correct (discounting, use of inflation indices, use of exchange rates, etc.)?
- Is funding gap rate calculation based on FRR_C cash flows?
- Is there overcompensation of the beneficiary?
- Is all cost eligible?
- Is VAT treated correctly?
- Are conditions for the inclusion of contingencies met?

FINANCIAL ANALYSIS
Checking the consistency of financial analysis

Other points:

- Focus on most critical elements of contribution calculation.
- Is cost in terms of MEUR/km (road, rail) or EUR/m^2 (bridges, tunnels, airport) consistent with benchmarks?
- Are assumptions for residual values consistent with established benchmarks (like Railpag, http://www.railpag.com)?
- Routine and periodic maintenance, design and supervision as % of works value?

FINANCIAL ANALYSIS
Väo - Maardu Case

Väo - Maardu Case:

- All cost eligible
- Residual value calculation simplified, but plausibel.
- 9.7 MEUR/km (excl VAT); this info not very relevant.

ECONOMIC ANALYSIS
Definition, objective, structure

- Undertaken using economic values, from the viewpoint of the society.
- It includes changes in the use of resources (time, fuel, health, etc.) but doesn't include transfers within society (toll payments, charges, taxes).
- Done in constant price.
- Objective:

a) To see if the society is better-off with or without the project;
b) To rank and select the most efficient alternative;
c) To provide documentation of decision process to legislatures and the public.

ECONOMIC ANALYSIS
Definition, objective, structure

	Item/Year	1	2	…	n
1	Value of time – existing traffic (WO)				
2	Value of operating cost – existing traffic (WO)				
3	Maintenance cost (WO)				
4	Cost of traffic accidents (WO)				
5	Cost of environmental externalities (optional) (WO)				
6	**User cost and externalities without the project**				
7	Value of time (WP): for diverted traffic for remaining traffic for generated traffic (rule of half*)				
8	Value of operating cost (WP): for diverted traffic or remaining traffic for generated traffic (rule of half*)				
9	Maintenance cost (WP)				
10	Cost of traffic accidents (WP)				
11	Cost of environmental externalities (optional) (WP)				
12	**User cost and externalities with the project**				
13	**Benefits (=6-12)**				
14	**Investment cost**				Residual value (-)
15	**Total cash flow (=13-14)**				
16	**Net present value of the investment (ENPV)**	(NPV of flows in line 15)			
17	**Internal rate of return (EIRR)**	(IRR of flows in line 15)			

ECONOMIC ANALYSIS
Link to financial analysis

- Make sure that financial and economic analysis describing the same thing (can be done at different stages during the project development).
- The link is twofold:

1. Assumptions relevant for both should be the same (evaluation period, investment cost, residual value, operation and maintenance cost, Without the project scenario);
2. Financial values need to be properly corrected for fiscal effects (transfers!).

- Fiscal effects: VAT and other indirect taxation (e.g. social security transfers).
- Indirect taxation: in order of 10-15% for capital expenditure, 25-30% for operational expenditure (after VAT).
- Fuel: net of VAT and excise duties.

ECONOMIC ANALYSIS
Link to financial analysis

- CBA Guide: conversion from market to accounting price, where markets inefficient. Not very relevant for transport, where we don’t have market prices for the most important project impacts: value of time, human life, exposure to noise and polluted air.
- Treatment of assets already owned by the Promoter (laand, buildings): in financial analysis no financial transaction; in economic analysis these should have been given a fair price and included in the economic evaluation.

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

- Constant price (indicate base year).
- Discount rate: 5.5% (or any other if justified).
- <u>Value of time:</u>

1. Network travel time (veh h),
2. Travel time price (EUR/h/pers, per travel purpose),
3. Travel purpose mix,
4. Occupancy rate (pers/veh),
5. Similar for freight (cargo holding time).

- Network travel time: traffic modelling or evaluation software (e.g. HDM, TUBA, COBA) or in a simpler cases using the speed/flow formulas (spreadsheet).

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

- Travel time price: 3 main economic theoretic approaches (marginal labour productivity, Hensher approach, willingness-to-pay). Widely adopted for work trips labour productivity approach (average wage or GDP/capita), for non-work trips WTP approach is used (DGREGIO, WB).
- HEATCO VoT: published in Guide, a reference, can also be used for appraisal, if no better sources available).
- Elasticity of VoT unit values to GDP: around 0.7 (HEATCO values have base year 2002).

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

Values for Estonia (EUR 2002, per passenger per hour, not adjusted for PPP):

Business air	17.66
Business bus	10.30
Business car, train	12.82
Commute short distance	7.44
Commute short distance	3.58
Commute short distance	4.99
Commute long distance	9.55
Commute long distance	4.60
Commute long distance	6.40
Other short distance	6.24
Other short distance	3.01
Other short distance	4.18
Other long distance	8.01
Other long distance	3.86
Other long distance	5.36

Values for Estonia (EUR 2002, per freight tonne per hour, not adjusted for PPP):

Road	1.90
Rail	0.78

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

- Vehicle operating cost (VOC): distance, speed, alignment (geometry), condition (speed; wear and tear).
- Minimum for 4 vehicle classes: car, bus, light goods vehicle, heavy goods vehicle.
- Use of software; inputs: network, vehicle fleet characteristics, speed, unit price for vehicles, fuel, lubricants, tyres, etc. (all cost net of taxes).
- Important VOC savings: shortened route (bridges, tunnels to pass natural obstacles) or significantly improved vertical profile of alignment.
- VOC can also increase with the project: higher speeds, longer route (to avoid settlements).

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

- Accident cost:

1. Transport work (veh km), per road type,
2. Risk of accident impact (death, serious injury, slight injury, material damage only) per veh km, per road type,
3. Cost per accident impact (death, serious injury, slight injury, material damage).

- First two points describe the physical impact of the project, the third one a price.
- Accident cost: medical treatment and rehabilitation, legal and emergency services, material damages, production loss (premature death, reduced working capacity and extended leave for medical reasons); also value of safety per se (reduced quality of life) may be included (estimated by willingness to pay).

ECONOMIC ANALYSIS
Benefits (identification, assumptions)

Values for Estonia (EUR 2002, not adjusted for PPP):

Fatality:	352,000
Severe injury:	46,500
Slight injury:	3,400

Damage only: locally derived values.

- Elasticity of VoT unit values to GDP: 1.00 (HEATCO values have base year 2002).

ECONOMIC ANALYSIS
Checking the consistency of economic analysis

- Validation: are we doing the right things?
  Verification: are we doing it the right way?
- Two approaches:

1. Check every assumption, calculation procedure (e.g. discounting) and input data and verify the final results; or
2. Take the main inputs, put it in a template economic model and compare the final results with original.

ECONOMIC ANALYSIS
Checking the consistency of economic analysis

Validation:

- Is the economic analysis consistent with project objectives (identification, quantification and monetisation of project impacts)?

Verification:

- Is there a link to financial analysis (same inputs, fiscal correction)?
- Are all inputs for the economic analysis presented (discount rate, base year, value of time, value of accidents, GDP growth rate, elasticities of VoT and accident cost to GDP, vehicle operating cost, etc.)
- Can all assumptions be verified as consistent (e.g. comparison with HEATCO)?
- Do tables contain yearly streams of all cash flows, disaggregated per individual cost and benefits?
- Is it possible to reproduce the calculations (is there a clear audit trail between assumptions, calculation procedures and outputs)?

ECONOMIC ANALYSIS
Checking the consistency of economic analysis

Other points:

- Is benefit composition consistent with the project and project objectives?
- Checking the VoT savings: translate savings into increase in speed and asses if this is consistent with traffic modelling/design?
- Specific issue: HDM transparency (“black box”). The road user cost module interesting to calculate VOC, but other features are less transparent. Banks use own spreadsheet models to confirm the calculations.
- If detailed financial analysis was not done (which would include verification of investment, operation and maintenance cost), this needs to be verified when checking the consistency of economic analysis.

ECONOMIC ANALYSIS
Väo - Maardu Case

- CBA report 3.
- No fiscal correction (other then VAT and excise duty)
- Unit VoT: CBA report 3.3.3; lower then HEATCO, adequate elasticity.
- Network travel time: calculated with HDM.
- Accident reduction rate: adequate method.
- Accident unit values: CBA report 3.3.3; lower then HEATCO, adequate elasticity.
- Consistency of economic analysis: CBA report 3.4 (main benefit time reduction, large proportion of VOC reduction)?
- CBA report Economic cost stream (Year 2030)?

CHECK LIST FOR CBA REPORT
Application form for EU assistance

A. ADDRESSES AND REFERENCES

B. PROJECT DETAILES
B.1 Title of the project
B.2 Categorisation of the project
B.3 Compatibility and coherence with the OP
B.4 Project description ✓
B.5 Project objectives ✓

C. RESULTS OF FEASIBILITY STUDIES
C.1 Demand analysis ✓
C.2 Options considered ✓
C.3 Main conclusions of feasibility studies ✓

D. TIMETABLE
D.1 Project timetable
D.2 Project maturity

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Application form for EU assistance

E. COST-BENEFIT ANALYSIS
E.1 Financial analysis ✓
E.2 Socio-economic analysis ✓
E.3 Risk and sensitivity analysis ✓

F. ANALYSIS OF ENVIRONMENTAL IMPACT

G. JUSTIFICATION FOR PUBLIC CONTRIBUTION
G.1 Competition (state aids) ✓
G.2 Impact of Community assistance

H. FINANCING PLAN ✓

I. COMPATIBILITY WITH COMMUNITY POLICIES AND LAW

J. ENDORSEMENT


Microsoft Word Document

INTRODUCTION

CBA as part of **Project Feasibility Study,** basis of **Funding Application**

Feasibility Study

- A1- Executive Summary
- A2- Socio-economic context
- A3- Supply and Demand for the Project's outputs
- A4- Technological alternatives and production plan
- A5- Human resources
- A6- Location
- A7- Implementation
- A8- Financial analysis
- A9- Socio-economic Cost-benefits analysis
- A10- Risk Analysis

Funding Application

- A.ADDRESSES AND REFERENCES
- B.PROJECT DETAILS
- C.RESULTS OF FEASIBILITY STUDIES
- D.TIMETABLE
- E. COST-BENEFIT ANALYSIS
- F. ANALYSIS OF THE ENVIRONMENTAL IMPACT
- G.JUSTIFICATION FOR THE PUBLIC CONTRIBUTION
- H.FINANCING PLAN
- I. COMPATIBILITY WITH COMMUNITY POLICIES AND LAW
- J. ENDORSEMENT OF COMPETENT NATIONAL AUTHORITY
- ANNEX I DECLARATION BY AUTHORITY RESPONSIBLE FOR MONITORING NATURA 2000 SITES
- ANNEX II – COST-BENEFIT ANALYSIS

CHECK LIST FOR CBA REPORT
Draft check list

See .xls!

REVIEW OF STANDARD TOR FOR CBA
Current requirements

See .doc!

REVIEW OF STANDARD TOR FOR CBA
Possible improvements

See .doc!