



Preparation of technical documentation for infrastructure projects

Economic and financial analysis



Introduction

- Investment decisions require tools based on which they are made
- Cost-Benefit Analysis (CBA) is an analytical tool for judging the economic advantages or disadvantages of an investment decision
- Assessing costs and benefits
- Opportunity cost
- Long-term perspective
- Incremental approach
- Microeconomic approach
- Calculation of economic and financial performance indicators
- EU guide to CBA: https://ec.europa.eu/inea/sites/inea/files/cba_guide_cohesion_policy.pdf

Reference periods

Sector	Reference period (years)
Railways	30
Roads	25-30
Ports and airports	25
Urban transport	25-30
Water supply/sanitation	30
Waste management	25-30
Energy	15-25
Broadband	15-20
Research and Innovation	15-25
Business infrastructure	10-15
Other sectors	10-15

Source: ANNEX I to Commission Delegated Regulation (EU) No 480/2014.

Incremental approach

- CBA compares a scenario with-the-project with a counterfactual baseline scenario (without-the-project)
- Without project scenario is defined as what would happen in the absence of the project
- With project scenario includes proposed investments, all cost, revenues, etc.
- Projections are made of all cash flows related to the operations in the project area for each year during the project lifetime
- CBA only considers the difference between the cash flows in the with project and the without project.
- The financial and economic performance indicators are calculated on the incremental cash flows only.

Standard CBA steps

- Description of the context
- Definition of objectives
- Identification of the project
- Technical feasibility & Environmental sustainability
- **Financial analysis**
- **Economic analysis**
- Risk assessment

Financial analysis

Objectives

- Assess the consolidated project profitability
- Assess the project profitability for the project owner (and some key stakeholders)
- Verify the project financial sustainability (a key feasibility condition)
- Outline the cash flows which are the basis for calculation of the socio-economic costs and benefits

Financial analysis

Methodology

- Discounted Cash Flow (DCF) method
- Only cash inflows and outflows are considered in the analysis
- As a general rule, analysis is carried out from the point of view of the infrastructure owner (consolidated financial analysis also possible)
- Financial Discount Rate (FDR)
- Time horizon (or reference period)
- Constant (real) prices
- Net of VAT, if VAT is recoverable

Financial analysis

Costs and revenues

- Investment cost, replacement costs and residual value:

		Years						
	Total	1	2	3	4-9	10	11-29	30
Start-up and technical costs		6,980		1,816				
Land		1,485	757					
Buildings			37,342	17,801				
Equipment			11,355	23,273				
Machinery			25,722					
Initial Investment	126,531	8,465	75,176	42,890				
Replacement costs						11,890	9,760	
Residual value								-4,265
Total Investment costs	152,655	8,465	75,176	42,890		11,890	9,760	-4,265

These can include also costs, e.g. for feasibility studies, borne before the start of the evaluation period, although not eligible for EU funding.

In the example, expenditures of EUR 11.9 and 9.8 million are expected in year 10 and 20, respectively, to replace short life equipment and machinery.

The residual value is considered with negative sign because it is an inflow.

- Operating costs and revenues:

		Years						
	Total	1-3	4	5	6	...	29	30
Service 1		0	11,355	11,423	11,492	...	11,979	11,979
Service 2		0	243	243	243	...	243	243
Total revenues	407,862	0	11,598	11,666	11,735	...	12,222	12,222
Personnel		0	1,685	1,685	1,685	...	1,685	1,685
Energy		0	620	623	626	...	648	648
General expenditure		0	260	260	260	...	260	260
Intermediate services		0	299	299	299	...	299	299
Raw materials		0	2,697	2,710	2,724	...	2,821	2,821
Total operating costs	153,487	0	5,561	5,577	5,594	...	5,713	5,713
Net revenues	254,375	0	6,037	6,089	6,140	...	6,509	6,509

During the construction phase no operating revenues and costs usually occur.

Personnel costs are assumed to be fixed along the reference period, while energy requirements are variable and follow the expected production growth.

Financial analysis

Sources of financing

- Union assistance (the EU grant);
- National public contribution (central, regional or local government level, if any);
- Project promoter's contribution (loans or equity), if any;
- Private contribution under a PPP, (equity and loans) if any.

Financial analysis

Financial profitability and performance indicators

Financial net present value – FNPV(C) - and financial rate of return – FRR(C) - on investment

$$FNPV(C) = \sum_{t=0}^n a_t S_t = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \dots + \frac{S_n}{(1+i)^n}$$

Financial net present value – FNPV (K) - and the financial rate of return - FRR (K) - on national capital.

Calculation of performance indicators: $0 = \sum \frac{S_t}{(1 + FRR)^t}$

	Years							
	1	2	3	4	5-9	10	11-29	30
Total revenues				11,598	...	12,011	...	12,222
Residual value								4,265
Total inflows	0	0	0	11,598	...	12,011	...	16,487
Total operating costs				5,561	...	5,662	...	5,713
Initial Investment	8,465	75,176	42,890					
Replacement costs						11,890	9,760	
Total outflows	8,465	75,176	42,890	5,561	...	17,552	...	5,713
Net cash flow	-8,465	-75,176	-42,890	6,037	...	-5,540	...	10,774
FNPV(C)	- 34.284							
FRR(C)	1.4%							

Financial analysis

Financial sustainability

- The project is financially sustainable when the risk of running out of cash in the future, both during the investment and the operational stages, is expected to be zero.
- Project promoters should show how the sources of financing available (both internal and external) will consistently match disbursements year-by-year.
- Financial sustainability example:

	Years							
	1	2	3	4	5-9	10	11-29	30
Sources of financing	8,465	75,176	42,890					
Total revenues				11,598	...	12,011	...	12,222
Total inflows	8,465	75,176	42,890	11,598	...	12,011	...	12,222
Initial investment	8,465	75,176	42,890					
Replacement costs						11,890	9,760	
Loan repayment (including interest)					1,789	1,789	1,789	
Total operating costs				5,561	...	5,662	...	5,713
Taxes				604	...	-733	...	651
Total outflows	8,465	75,176	42,890	5,561	...	19,341		5,713
Net cash flow	0	0	0	6,037	...	-7,329	...	6,509
Cumulated net cash flow	0	0	0	6,037	...	20,726	...	133,835

The cumulated cash flow should be zero (or positive) during the construction phase

Financial sustainability is verified if the cumulated net cash flow row is greater than zero for all the years considered.

Economic analysis

- Will the society be better-off with the project?
- Shadow prices to reflect the social opportunity cost of goods and services, instead of market prices
- From market to shadow prices
- Evaluation of direct benefits
- Evaluation of non-market impacts and correction for externalities
- Economic performance indicators
 - Economic Net Present Value (ENPV): the difference between the discounted total social benefits and costs;
 - Economic Rate of Return (ERR): the rate that produces a zero value for the ENPV;
 - B/C ratio

Economic analysis

- Calculation of performance indicators:

	CF	Years								
		1	2	3	4	5	6-15	16	17-29	30
Willingness to pay 1		0	0	0	19,304	19,419	...	20,365	...	20,365
Willingness to pay 2		0	0	0	437	437	...	437	...	437
Reduced noise emission		0	0	0	4,200	4,200	...	4,200	...	4,200
Reduced air pollution		0	0	0	1,900	1,900	...	1,900	...	1,900
Total Benefits		0	0	0	25,841	25,957	...	26,902	...	26,902
Total operating costs	0.88	0	0	0	4,882	4,897	...	5,016	...	5,016
Initial Investment	0.97	8,228	73,071	41,689	0	0	...	0	...	0
Replacement costs	0.98	0	0	0	0	0	11.664	0	9.575	0
Residual value	0.97	0	0	0	0	0	...	0	...	-4,146
Total costs		8,228	73,071	41,689	4,882	4,897	...	23,428	...	871
Net economic benefits		-8,228	-73,071	-41,689	20,959	21,060	...	3,474	...	26,032
ENPV		212,128								
ERR		14.8%								
B/C ratio		2.04								

This CF is lower than CFs for investment because it includes a shadow wage correction for labour in a context of unemployment.

Financial Revenues have been replaced with user willingness to pay for the use of the service rendered.

These are positive externalities.

The application of a CF lower than 1 to the project inputs has the effect of reducing the social cost and improving the economic performance.

Risk assessment

- A risk assessment must be included in the CBA
- This is required to deal with the uncertainty that always permeates investment projects, including the risk that the adverse impacts of climate change may have on the project
- The recommended steps for assessing the project risks are as follows:
 - sensitivity analysis,
 - qualitative risk analysis,
 - probabilistic risk analysis,
 - risk prevention and mitigation.

CBA in projects prepared by PPF6

- CBA in water management sector projects
 - Main points
 - Questions/discussions
- CBA in energy efficiency projects
 - Main points
 - Questions/discussions

Questions and Answers

EU PROJECT PREPARATION FACILITY PROJECT

All documents, information, materials and pictures from this EU PPF training are available for download in the download section of our site www.ppf.rs

Questions and assistance

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Thank you for your attention!