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EUROPEAN COMMISSION

Regional Policy

Guide to COST-BENEFIT ANALYSIS of investment projects

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Chapter 2

- Chapter 2 illustrates the **standard methodology** for carrying out a CBA.
- It reviews the key information and the **six analytical steps** that a project examiner should consider for investment appraisal under the EU (Structural, Cohesion, IPA) Funds.

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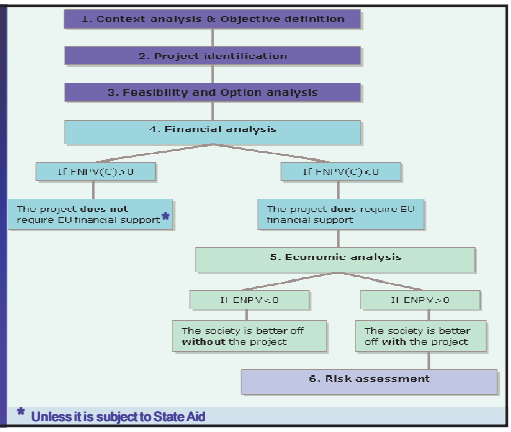
6 steps for a good appraisal



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Step 1.

Context and objectives

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1. Context analysis & Objective definition

- Analysis of **the context** within which the project is going to be implemented (e.g. GDP growth, demographic developments, etc.)
- Definition of **project objectives**: need to target socio-economic variables that are quantitatively measurable.
- Consistency with EU and National frameworks: the project is part of a larger planning exercise!

Step 2.

Project Identification

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2. Project identification

- Identification means that :
  - the object is a **self-sufficient unit of analysis**, i.e. no essential feature or component is left out of the scope of the appraisal ("half a bridge is not a bridge")
  - **indirect and network effects** are going to be adequately covered (e.g. changes in urban patterns, changes in the use of other transport modes)
  - whose costs and benefits are going to be considered **('who has standing'?)**

Step 3.

Feasibility & Option Analysis

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3a. Option identification

It aims at **identifying investment alternatives** along with their key features. A crucial information of this identification is the **demand induced** by each alternative

At least two feasible options should always be considered:

- **"Business as usual" (Do Nothing)**
- **Do Minimum Option**
- **Do Something Option**

Incremental approach

Note that CBA is carried out on an ***incremental* basis**, i.e. on the difference between

- a **scenario *with* the project** (do something or do minimum)
- and a **scenario *without* the project**, ie "*business as usual*" (do nothing or, in some cases, do minimum)

Important implications for projects expanding existing networks

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Step 3.

Feasibility & Option Analysis

3b. Feasibility analysis

It identifies the options potential constraints and related solutions with respect to the following aspects:

- **technical** (e.g. technology, size, location)
- **economic** (e.g. capital, labour)
- **regulatory** (e.g. Natura 2000 sites)
- **managerial** (e.g. PPP, timing)

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Step 3.

Feasibility & Option Analysis

3c. Option selection

- Two/three feasible options should be short-listed based on the results of the feasibility analysis
- The most suitable feasible option should then be chosen with a view to maximising the project socio-economic impact as gauged by the results of the economic analysis (complemented by the risk analysis results)

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Step 4. Financial Analysis

4. Financial Analysis

What is the project financial profitability?

How will the project be financed?

What will be the EU contribution?

Will the project be financially sustainable?

The answers to these questions are given by the financial analysis of the project

FINANCIAL VIABILITY

FINANCIAL PROFITABILITY | **FINANCIAL SUSTAINABILITY**

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Financial Analysis

Financial analysis

Methodology: Discounted cash flow (DCF)

- Only *cash flows* are considered (i.e., no amortisation, contingency reserves, etc.) over a given *reference period*
- Cash flows are *discounted* to present time

Financial analysis aims at:

- Evaluating the financial profitability of investment ("/C") and capital ("/K")
- Determining the appropriate (maximum) contribution from the Funds
- Checking the project's financial sustainability

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CBA time horizon

Reference period: number of years for which forecasts are provided in the cost benefit analysis. It should reflect the economic useful life of the asset.

A ***residual value*** should be considered where appropriate

Sector	Reference period
Energy	15-25
Water & Environment	30
Railways	30
Roads	25
Industry	10
Other services	15

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Discount rate

- A **5% financial discount rate** *in real terms* is recommended as a benchmark for *public* investment projects co-financed by the Funds.
- Consistency must be ensured amongst the discount rates used for similar projects in the same region/MS

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Financial analysis at a glance

	FNPV(C)	SUSTAINABILITY	FNPV(K)
Total investment costs			
Land	-	-	
Buildings	-	-	
Equipment	-	-	
Extraordinary Maintenance	-	-	
Licences	-	-	
Patents	-	-	
Other pre-production expenses	-	-	
Changes in working capital	-(+)	-(+)	
Residual value	+		+
Total operating costs			
Raw materials	-	-	-
Labour	-	-	-
Electric power	-	-	-
Maintenance	-	-	-
Administrative costs	-	-	-
Other outflows			
Interest		-	-
Loans reimbursement		-	-
Taxes		-	
Total operating revenues			
Output X	+	+	+
Output Y	+	+	+
Sources of financing			
Community assistance		+	
National public contribution		+	-
National private capital		+	-
Loans		+	
Other resources (e.g. operating subsidies)		+	

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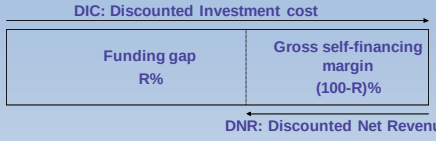
What is the "*Funding-Gap*"?



Funding gap

The "funding gap" is the part of the investment cost which is not going to be paid back by the project net revenue. The funding-gap rate is the complementary to 100% of the gross self-financing margin.

Funding gap rate: $R = \frac{DIC - DNR}{DIC}$

* Discounted net revenue = + discounted revenue – discounted operating costs + discounted residual value

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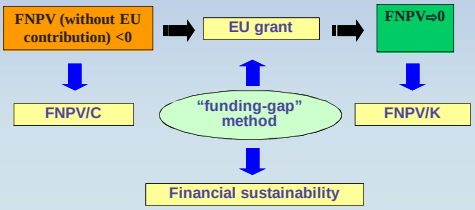
Rationale of EU grant

The rationale of the EU grant

The EU grant targets the project "*funding gap*". The Community contribution aims to guarantee a given level of financial profitability so that the project can be implemented.



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Step 5.

Economic Analysis

5. Economic Analysis

It aims to assess the project economic desirability. It differs from the financial analysis because:

- It is carried out from the **point of view of the whole society,** while the financial analysis is done from the point of view of the project owner(/operator)
- It also **considers non-market impacts** (e.g. savings in travel times, changes in externalities, etc.)

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Economic Analysis

Rationale of the economic analysis

The economic analysis is done at *shadow (accounting) prices*:

- project's inputs should be valued at their *opportunity cost* (e.g. opportunity cost of labour, depends on whether the worker was previously employed or not)
- the outputs should be valued at consumers' *willingness to pay* (e.g. WTP for improved water quality in rivers).

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Economic Analysis

- Financial (observed) prices may be distorted or even absent; they do not always reflect opportunity cost and willingness to pay.
- Starting from the financial analysis cash-flows we need to find the economic cash-flows:

1. *From market to accounting (shadow) prices*
2. *Monetisation of non-market impacts*
3. *Inclusion of indirect effects (if relevant)*

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What decision rule?

The economic analysis results

Using the economic cash-flows expressed at shadow prices and the social discount rate (5.5%) it is possible to determine:

- **Economic net present value (ENPV):** a project is desirable from a socio-economic point of view if ENPV > 0
- **Economic rate of return (ERR):** should be greater than the social discount rate
- **Benefit-Cost ratio (B/C):** should be greater than 1

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Step 6.

Risk Assessment

6. Risk assessment

It should be included in the CBA to deal with uncertainty.

This is mainly done in two steps:

1) *Sensitivity analysis:* aims at identifying the project's *critical variables*.

2) *Risk analysis*: by assigning appropriate probability distributions to the critical variables, expected values for the financial and economic performance indicators can be estimated.

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Sensitivity analysis

Sensitivity analysis

- Apply a given percentage change (e.g. 20%) to the project disaggregate variables (e.g. raw materials, land, wages and not just aggregate "investment cost" variable)
- Determine the *critical variables*, i.e. variables to which the performance indicators (e.g. FNPV/C or ENPV) are most sensitive
- A possible rule of the thumb is to consider a variable critical when a 1% variation in the variable results in
  - 1% change (one percentage point) in the IRR;
  - 1% change in the NPV.

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Risk analysis

Risk analysis

- Need to assume probability distributions for the critical variables identified in the sensitivity analysis
- Probability distributions can be discrete or continuous and can be based on objective (e.g. time series) or subjective (e.g. experts opinion) data
- Once the probability distributions for the critical variables are defined it is possible to determine the project *expected* performance indicators

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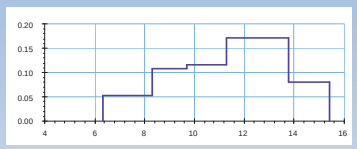
Step 6.

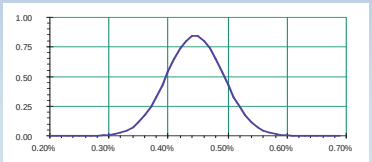
Risk Assessment

Probability distribution of critical variables

Discrete distribution



Continuous distribution



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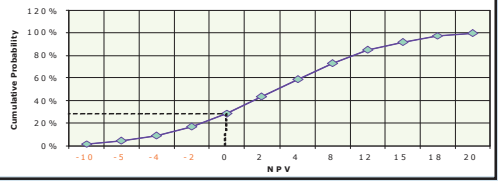
Step 6.

Risk Assessment

Results of the risk analysis

- Risk analysis consists in the calculation of the probability distribution of the project's NPV (or IRR).
- A helpful way of presenting the result of the risk analysis is to express it in terms of **cumulated probability of the project's NPV** (or IRR). This allows assessment of the project risk by verifying whether the cumulative probability is higher or lower than a reference value that is considered to be critical.



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Step 6.

Risk Assessment

Assessment of acceptable levels of risk

- Often the NPVs and IRRs reported in project appraisal reports refer to best or baseline estimates, perhaps meaning 'most likely' values (or mode). However, the criterion for project acceptability should be that of the **expected value** (or mean) of such indicators, calculated from the underlying probability distributions.

Risk prevention

- The results of the risk assessment should be used to improve project design and management. Risk mitigation measures should be envisaged where relevant.

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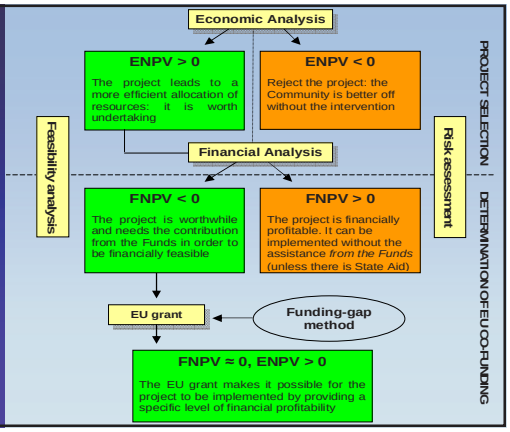
CBA and Funding-gap method



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For more info

For more details on CBA and the grant calculation method see:

- DG REGIO CBA guide
http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf
- DG REGIO working document n° 4 on CBA indicative methodology
http://ec.europa.eu/regional_policy/sources/docoffic/2007/working/wd4_cost_en.pdf

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Thank you for your attention!

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