



# Launch Event Guide to Cost-Benefit Analysis of Investment Projects

2 July 2015, Brussels

[www.ec.europa.eu/inforegio](http://www.ec.europa.eu/inforegio)

 @EU\_Regional #CohesionPolicy

 EUinmyregion





# INTRODUCTION

- Scope and objectives of CBA
- Roots and recent developments
- Sectors of application
- The core ingredients
- The CBA Guide over twenty years:1994-2014



# Scope and objectives of CBA

*"The purpose of CBA is to provide a **consistent procedure** for evaluating decisions in terms of their consequences"*

Dréze and Stern, 1987 in Auerbach and Feldstein, *"Handbook of Public Economics"*, North Holland.



# What is CBA?

- Cost-Benefit Analysis (CBA) is **an analytical tool** used to assess whether a project or a policy is desirable from the point of view of the society as a whole and it is worth implementing.
- Desirability is achieved when **total social benefits of an intervention exceed the total costs of that intervention.**
- **Benefits** are defined as increases in wellbeing and **costs** are defined as reductions in wellbeing.

# Traditions of CBA (1)

- **France, 1850's**

- *Ecole des Ponts et chausseés*
- *Dupuit, Arsène Jules Étienne Juvénal, De la mesure de l'utilité des travaux publics, Annales des ponts et chaussées (1844)*



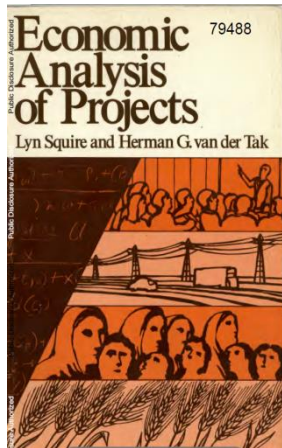
- **USA, 1930's:**

- *Flood Control Act (1936)*

- **USA, 1950's:** *attempts to codify the benefit-cost rules*

- *U.S. Army Corps of Engineers, Department of Agriculture, Bureau of Reclamation, Federal Power Commission*
- *Proposed practices for economic analysis of river basin projects - Green book (1950)*

# Traditions of CBA (2)

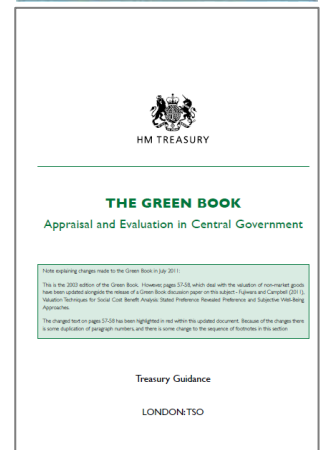
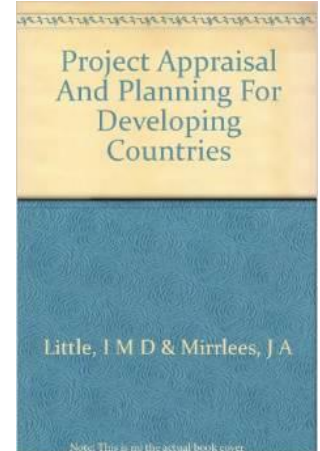


## • UNIDO, OECD, World Bank, 1970's

- *Guidelines for project evaluation, UNIDO (1972)*
- *Project appraisal and planning for developing countries by I.M.D. Little and J.A. Mirrlees, OECD (1974)*
- *Economic analysis of projects by L. Squire and H.G. van der Tak, World Bank (1975)*

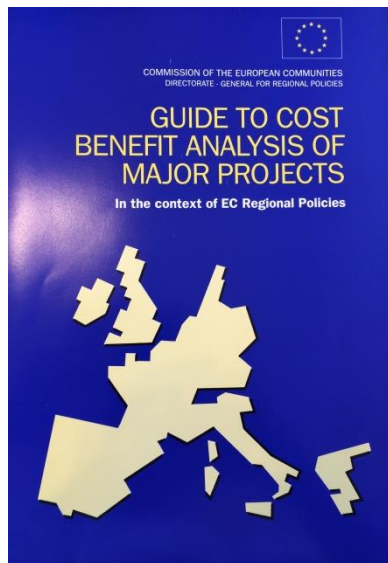
## • CBA in XXI century

- *UK, The Green Book – Appraisal and Evaluation in Central Government (2003)*
- *OECD, Cost-Benefit Analysis and the Environment, Pearce et al. (2006)*
- *EIB, The Economic Appraisal of Investment Projects at the EIB (2013)*
- *EC, several editions of the CBA Guide of investment project co-funded by Structural Funds, Cohesion Fund and Instrument for Pre-Accession (now ESI Funds). First edition in 1994 (brief document), the fifth edition published in December 2014.*



# Traditions of EC CBA Guide

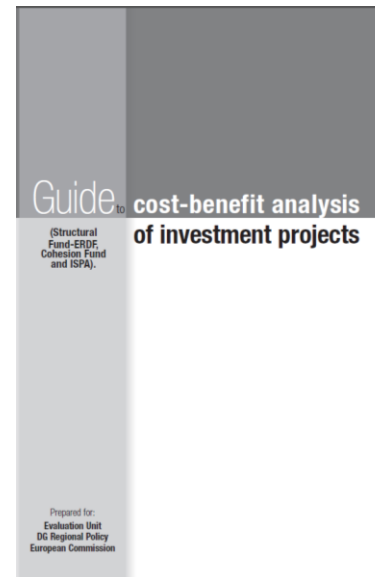
**1994:** 1st edition, 28 pages



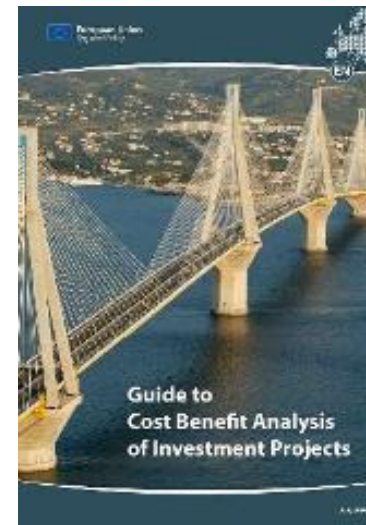
**1997:** 2nd edition, 84 pages



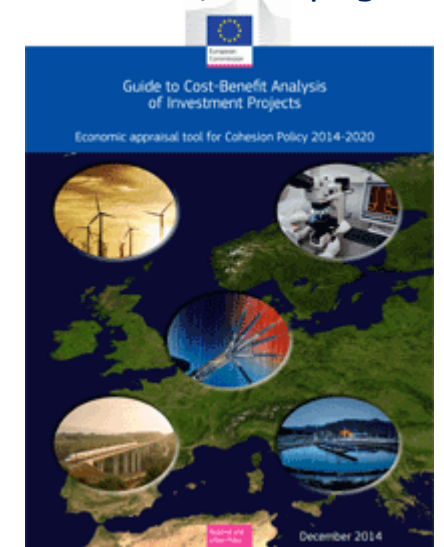
**2002:** 4<sup>th</sup> edition, 133 pages



**2008:** 4<sup>th</sup> edition, 257 pages



**2014:** 5<sup>th</sup> edition, 364 pages





# Evidence from the ground

- Some information on CBA international practice are drawn from the results of a survey conducted on ***selected OECD countries*** addressing the actual use, practice and role of CBA in ex-ante project appraisal.

***OECD, Government at glance, Forthcoming publication.***

*Available from July, 6th 2015*

<http://www.oecd.org/gov/govataglance.htm>



# Scope and objectives: evidence from the ground

In the **framework of the EU funds**, the purpose of CBA is to **facilitate a more efficient allocation of resources**, demonstrating the convenience for the society of a particular intervention rather than possible alternatives. In doing so, it provides key support in assessing the contribution to **Cohesion Policy objectives** and to the achievements of **Europe 2020 targets**.

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*

- Justification for **project selection/decision and financing** (e.g. Austria, Canada, The Netherlands, Sweden, New Zealand).
- Tool for **prioritising investment** at the central level (e.g. Denmark, UK)
- **Accountability and Transparency** tool (e.g. Sweden, UK).
- Technical assessment **supporting project design** in the feasibility phase (e.g. Canada, Sweden).
- Tool for **project monitoring** (e.g. Sweden, UK)
- Tool for **policy learning** (e.g. UK)

# Sectors of CBA application: evidence from the ground



**Rail** (e.g. Austria, Denmark, Canada, Sweden, Netherlands).

**Urban transport** (e.g. New Zealand, Austria, Denmark, Canada, Sweden, Netherlands)

**Airports, ports and waterways** (e.g. Austria, Canada, Sweden, Netherlands, UK)



**Education** (e.g. Canada, UK)

**Culture and leisure** (e.g. New Zealand, Canada, UK)



**Water supply and wastewater** (e.g. Canada, Netherlands)

**Solid waste management** (e.g. Canada, UK)

**Other environmental projects: risk prevention and mitigation, natural asset conservation, etc.** (e.g. Canada, Sweden, UK)

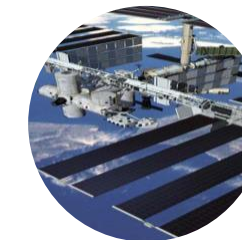


**ICT:** telecommunications, broadband, ICT applications to businesses and citizens (e.g. Canada, UK)

**Health** (e.g. Canada, Sweden)



**Energy: production, transmission and distribution** (e.g. Denmark, Canada, Sweden)

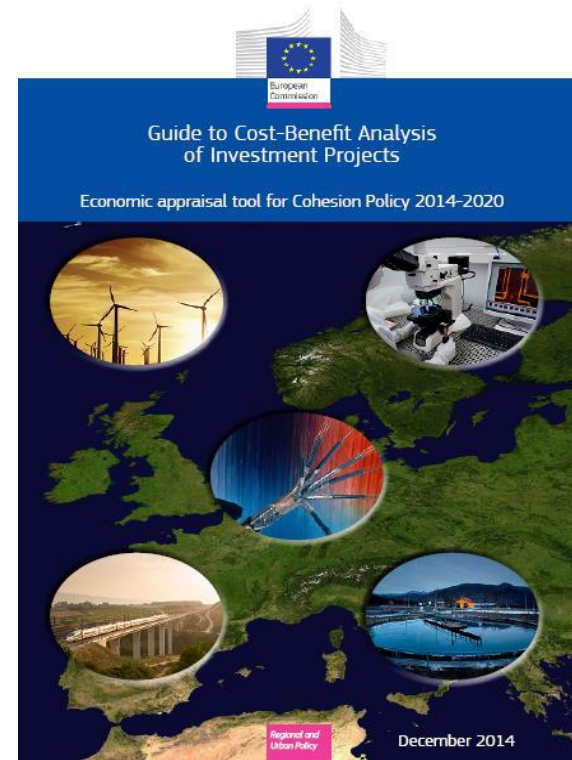
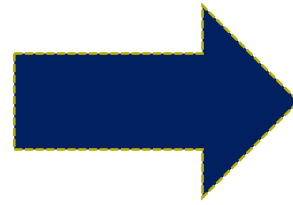
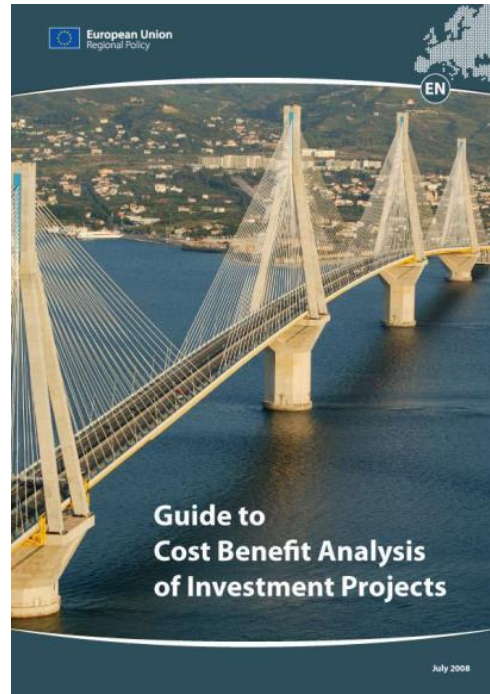


**Scientific research** (e.g. Canada, UK)

**Technological development and innovation:** science parks, technological parks, incubators, etc. (e.g. Canada, UK)

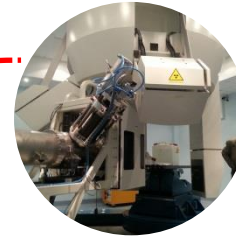


# Sectors of CBA application in the EU28



## A novelty of the fifth edition: Research, development and innovation

- It is expected that over 2014-2020 period a portfolio of CBAs of **RDI infrastructures** will be gradually built within the Member States, following the high priority given to **research and innovation for the EU growth strategy**.
- RDI infrastructures are **science and technology facilities** developed with the main purpose of acquiring new knowledge in a given scientific and technological field.



*Innovation  
infrastructures*



*Infrastructures for  
applied research and  
experimental  
development*



*Infrastructures for  
fundamental  
research*

# RDI - financial analysis. Typical items

## *Investment, operation and maintenance costs, revenues and sources of financing*



Investment cost	O&M costs	Examples of operating revenues	Examples of financing sources
<ul style="list-style-type: none"> <li>- Planning and design costs</li> <li>- Land acquisition</li> <li>- Construction costs, possibly disaggregated by civil works and installations, materials, labour, etc.</li> <li>- Energy, waste disposal and other utilities consumed during the construction period</li> <li>- Road access</li> <li>- RDI equipment, including information technologies (particularly for data storage or elaboration)</li> <li>- Intellectual property purchase costs</li> <li>- Testing</li> <li>- Start-up costs</li> </ul>	<ul style="list-style-type: none"> <li>- Materials and equipment</li> <li>- Consulting services</li> <li>- Cost of scientific personnel</li> <li>- Cost of administrative and technical staff</li> <li>- Cost of obtaining and maintaining patents</li> <li>- Energy, waste disposal and other utilities</li> <li>- Promotional campaigns and other outreach expenditure targeted to the general public</li> <li>- Training courses connected to the infrastructure's operation and management</li> <li>- Removal of potential pollutions / brownfield site treatment at the end of the life cycle of the infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>- Licence revenues gained from patents' commercialisation</li> <li>- Sale of consultancy services</li> <li>- Revenues from industrial research contracts and pre-commercial procurement contracts</li> <li>- Entry fees to the laboratory and for the use of research equipment charged to researchers and businesses</li> <li>- Student/master/PhD fees</li> <li>- Spin-off equity realisations</li> <li>- Research grants involving a transfer of ownership of a specific research output</li> <li>- Sale or rent of new buildings used for the project's objective</li> <li>- Revenues from the target population using the research outputs (e.g. patients receiving an innovative treatment)</li> <li>- Revenues from outreach activities to the wider public (e.g. bookshops' sales, entry fees, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>- National/regional public contributions</li> <li>- National/regional private contributions</li> <li>- EU contribution</li> <li>- Other national/regional funding schemes for RDI activities</li> <li>- Public grants to research, e.g. under the Horizon 2020 framework</li> <li>- Ordinary public transfers</li> </ul>



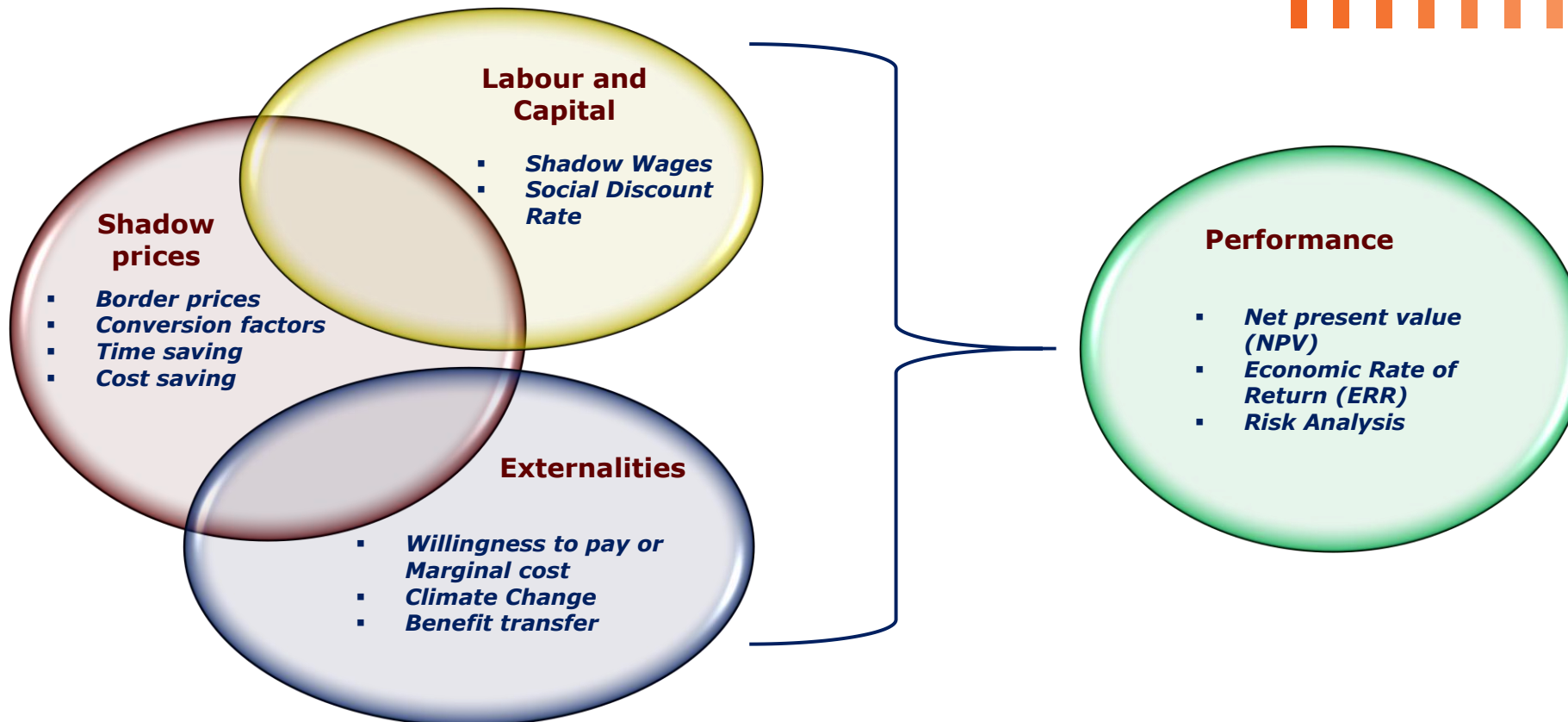
# RDI – economic analysis. Typical items

## Target groups, benefits and related evaluation approach

Benefit	Evaluation approach	Target groups							
		Businesses		Researchers, young professionals and students			Target population and general public		
		Already existing businesses	Spin-offs and start-ups	Academics and researchers	Researchers within businesses or outside academia	Students	Target population at environmental risk	Target population at health risk	General public
Establishment of more numerous or more long-lived start-ups and spin-offs	Shadow profit		**	*	*	*			
Development of new/improved products and processes	Shadow profit or value of patents	**	**	*	*				
Knowledge spillovers to non-user businesses	Shadow profit or avoided cost	**	*						
Value of scientific publications	Marginal production cost			**	*				
Human capital development	Incremental lifelong salary				**	**			
Social capital development	Qualitative analysis			*	**	**			
Reduction of environmental risk	Avoided cost or WTP	*					**		
Reduction of health risk	VOSL or QALY							**	
Cultural effects	WTP								**

Note: ++ very relevant; + moderately relevant;  
VOSL: value of statistical life; QALY: quality-adjusted life year.

# Selected ingredients of CBA: evidence from the ground



# ...BORDER PRICES FOR TRADABLE GOODS

The **border price rule** is generally used to estimate shadow prices of internationally marketable goods entering as inputs in the project. It is gathered from the Little and Mirrlees (1974) approach to project evaluation.

The border price method is based on the estimation of the **trade opportunity cost of goods**, under the assumption that international prices reflect the economic value of imported goods better than domestic prices

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020,  
December 2014.*

**Amongst the surveyed OECD member**, the notion of border prices, which was a core concern of CBA in the 1970s, is applied for instance in Sweden. **In general shadow pricing through conversion factors is not widespread.**

Border prices represent often the **appropriate shadow price of tradable goods and tradable sub-components of non-tradable goods**. This approach allows to identify the economic value of goods and it is particularly justifiable when there are market imperfections which distort domestic market prices. For example, **there is still no effective single market for electricity in the EU.**



# ...CONVERSION FACTORS as a SHORTCUT

**Shadow prices** are used to reflect the social opportunity cost of goods and services, instead of prices observed in the market, which may be distorted.

The **standard approach** suggested by the guide is to move from financial to economic analysis.

Transforming inputs market prices into shadow prices is completed through the application of **Conversion Factors**. These are defined as the ratio between shadow prices and market prices.

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020,  
December 2014.*

- In several countries, economic analysis is often carried out ***without starting from the financial analysis***.
- This reflects the ***separation*** between funding decisions and appraisal.
- The ***integration*** of financial and economic appraisal in the CBA Guide is similar to the approach of some international institutions.

# ...TIME SAVING

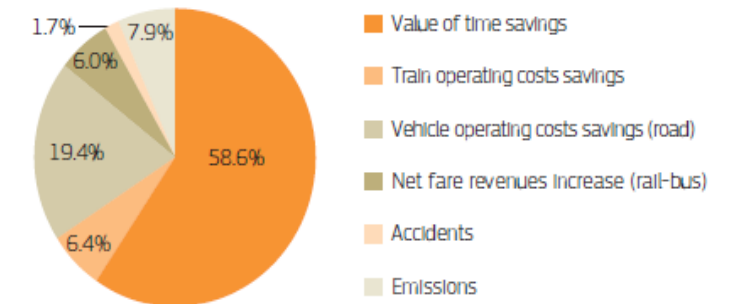
**Travel time saving** is one of the most significant benefits that can arise from the construction of new, or improvement of, existing transport infrastructure.

**Different methods** (e.g. revealed preference method, cost saving approach) are possible to value time for passengers, whilst a distinction is usually made between the estimation of work and non-work travel time.

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*

- **All surveyed OECD member takes** into account time saving in the economic analysis.
- Time saving generally accounts for the **largest share of benefits**.

*Example: weight of the benefit categories in the overall impact of a transport project.*



# ...COST SAVINGS

**Cost savings** in O&M or investment are typical benefit, of a purely financial nature, of some projects such as the integrated water service.

A good practice is that cost savings are **accounted for and included on the cost side as a negative**, i.e. as decreasing costs and with appropriate conversion factors.

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020,  
December 2014.*

**All surveyed OECD member takes** into account cost saving in the economic analysis.



*Integrated solid waste management*



*Waste water management*

# ...WILLINGNESS TO PAY or MARGINAL COST

The **willingness-to-pay** (WTP) approach, together with that of the **willingness-to-accept** (WTA), can be usefully applied to quantify both the direct benefits and the impacts, negative or positive, of the external effects of the project

**Different methods** can be adopted to empirically estimate the WTP as a welfare measure. **Three main methodological categories**: revealed preference methods; stated preference methods; benefit transfer method.

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*

For example, **Canada CBA Guide for Regulatory Proposals** makes reference to the willingness to pay and willingness to accept concepts as fundamental to value valuing benefits.

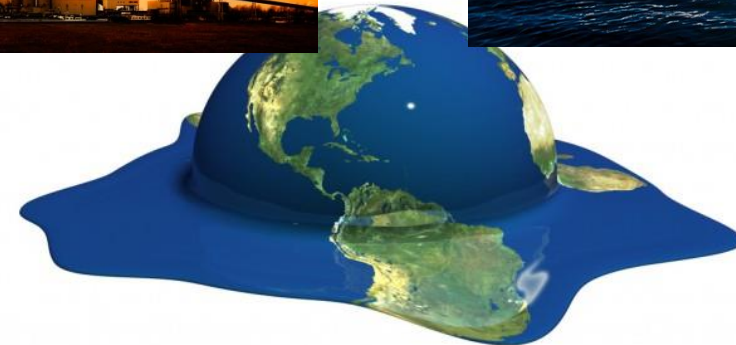


# ...CLIMATE CHANGE

**Any CBA should integrate the economic cost of climate change** resulting from **positive or negative variations of GHG emissions** (e.g. CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>).

The proposed approach to integrate climate change externalities into the economic appraisal is based, in part, on the **EIB Carbon Footprint Methodology** and is consistent with the **EU Decarbonisation Roadmap 2050**.

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*



The **social value of CO<sub>2</sub> emissions** is included in the CBA by most OECD surveyed countries.



# ...BENEFIT TRANSFER

It consists of ***taking a unit value for a non-market good*** estimated in an original study and ***using this estimate, after some adjustments, to value benefits (or costs)*** that arise when a policy or project is implemented ***elsewhere***.

For all types of adjustments, the quality of ***the original study is of paramount importance*** for the validity of the method

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020, December  
2014.*

Some databases have been set up to facilitate benefit transfer:

***e.g. Environmental Valuation Reference Inventory (EVRI)***



- A Canadian comprehensive storehouse of over ***4,000 international studies*** providing values, methodologies, techniques and theories on environmental valuation.
- Free access is available to all citizens of member countries - ***Australia, Canada, France, New Zealand, UK and USA.***
- Since France and United Kingdom joined the EVRI Club in 2002, ***Europe's representation*** in the database has increased to about ***1,200 study summaries.***

# ...SOCIAL COST OF LABOUR: SHADOW WAGES

Typically, in an economy characterised by extensive unemployment or underemployment, this may be less than the actual wage rates paid.

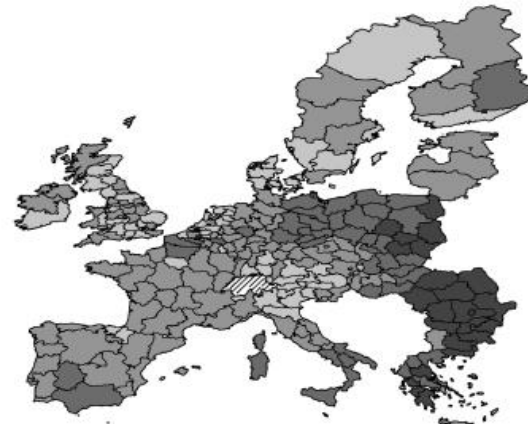
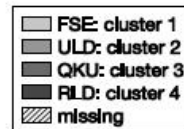
**Shadow wage** is used to reflect the social opportunity cost of labour (skilled and unskilled workers).

The methodology to estimate the shadow wage at the national/regional level is illustrated in Annex IV of the Guide.

*EC, Guide to Cost-Benefit Analysis of Investment Projects  
Economic appraisal tool for Cohesion Policy 2014-2020, December  
2014.*

Sweden and the UK are amongst the **few countries using shadow wage rates** in the economic analysis.

*Cluster analysis to identify the four labour market cases*



An applied methodology:

*Each region is assigned to one of the four labour market conditions by means of a cluster analysis: fairly socially efficient (FSE), quasi-Keynesian unemployment (QKU), urban labour dualism (ULD) and rural labour dualism (RLD)*

Florio, M. (2014) *Applied Welfare Economics*, London: Routledge.

# ...SOCIAL COST OF CAPITAL: the social discount rate

The discount rate in the economic analysis of investment projects, the **Social Discount Rate** (SDR) reflects the social view on how future benefits and costs should be valued against present ones.

**5%** social discount rate is used for major projects in **Cohesion countries** and **3% for the other Member States**.

Annex II of the Guide discusses the empirical approaches used for SDR estimation and provides examples of estimates at country level.

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*

***Not all surveyed OECD member states have a standard SDR.*** Where adopted, it is ***computed at central level*** and recommended to all players who are expected to comply with them. It is occasionally substituted by financial signals.

The ***social rate of time preference*** is adopted in e.g. France, Germany, Italy, Portugal, Slovak Republic, Spain, UK, USA.

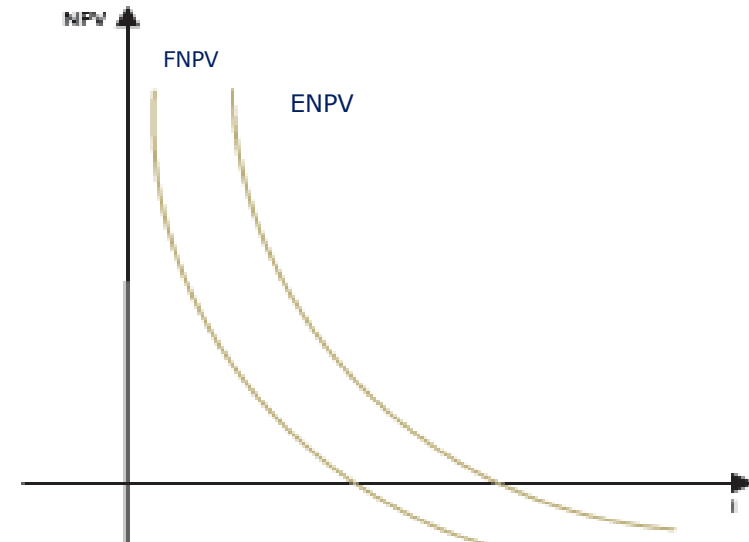


# Economic Performance Indicators: NPV and ERR

It is possible to measure the economic performance of the project by calculating the following indicators:

- **Economic Net Present Value** (ENPV): the sum of the discounted net flows of a project.
- **Economic Rate of Return** (ERR): the discount rate that zeroes out the net present value of flows of costs and benefits of an investment;
- **B/C ratio**: the ratio between discounted economic benefits and costs.

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*



# ...RISK ANALYSIS

**Risk assessment is mandatory for any CBA** (Art. 101 of Regulation N. 1303/2013).

**Recommended steps** for assessing the project risks are:

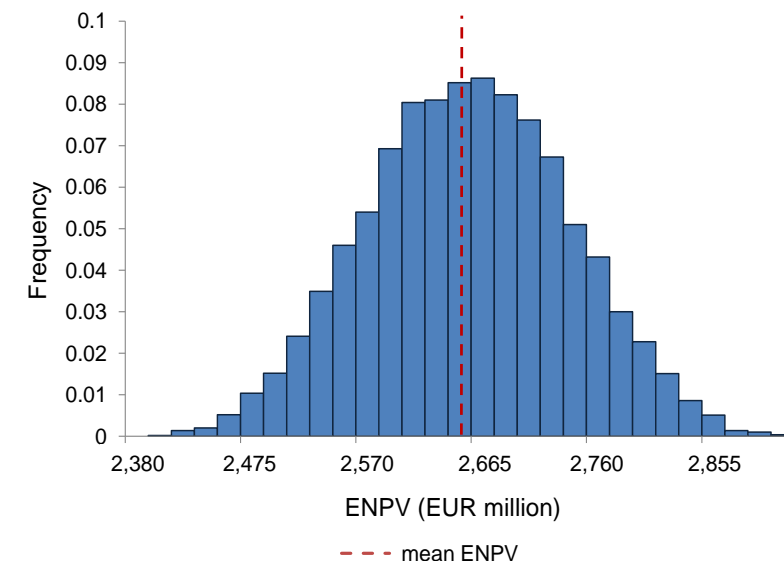
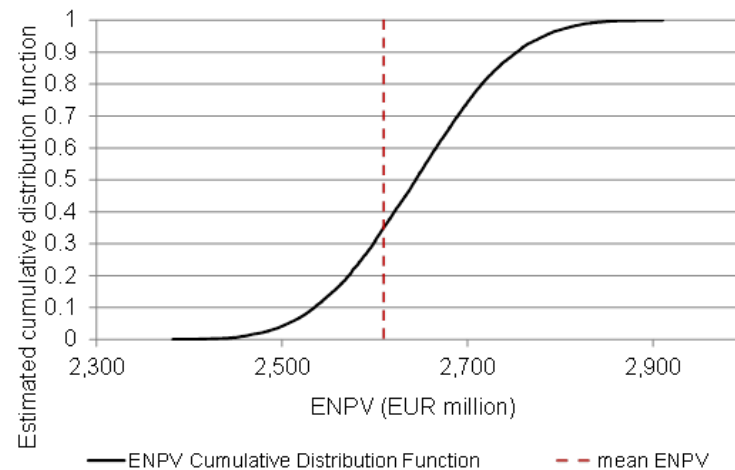
- sensitivity analysis
- qualitative risk analysis
- probabilistic risk analysis
- risk prevention and mitigation.

## Qualitative risk analysis

*EC, Guide to Cost-Benefit Analysis of Investment Projects Economic appraisal tool for Cohesion Policy 2014-2020, December 2014.*

The treatment of uncertainty is often **limited to scenario and sensitivity analysis**. A proper risk analysis regularly performed in UK and **more occasionally elsewhere**. Sweden, the Netherlands and the UK apply risk analysis with the use of **Montecarlo simulations**.

*Example of cumulated and punctual probability distribution of the ENPV*





# CBA guide: an intellectual enterprise

- CBA has a ***long standing academic and professional tradition***, and is still expanding its scope.
- International institutions have been in the ***forefront of project evaluation***.
- The European Commission was a latecomer, but know it is a ***worldwide trendsetter*** in CBA applications.



# CBA guide: an intellectual enterprise

- The true EU added value is the opportunity of ***mutual learning*** across the governments of 28 Member States, and beyond.
- The Guide as ***an intellectual enterprise***: a step forward for ***better investments to 2020***.



# CBA RESEARCH: NEW IDEAS AROUND THE WORLD...

## Society for Benefit-Cost Analysis



Home | About SBCA | News | Journal of Benefit-Cost Analysis | Events | Membership | Resources

The Society for Benefit-Cost Analysis is an international, multi-disciplinary academic society devoted to providing and improving the quality of public investment analysis. Our members work to government, academic, nonprofits, and the private sector and address a wide range of policy issues. [Read more](#)

[Join the Society](#)

[Attend our conference](#)

[Read our journal](#)

[Support our mission](#)

[Join our mailing list](#)

[View jobs & other resources](#)

### New Issue of Journal of Benefit-Cost Analysis

The first issue of Volume 6 (2013) of the Journal of Benefit-Cost Analysis is now available online. This issue is our first to be published through our new partnership with Cambridge University Press.

The issue includes articles by leading experts including Arnold Harberger, Glenn Jenkins, Richard Diekhöfer, John Graham, James Hamrick, and more. [Read more](#)

### MILAN SUMMER SCHOOL 5th Edition

#### Cost Benefit Analysis of Investment Projects

The New Programming Period 2014-2020

18 - 23 September 2015 - Milan - Fee: 1000 € - [APPLY](#)

**Home**

- Admission
- Lecturers
- Venue
- Accommodation
- Useful Links
- Photo Books 2014

**CONTACTS**

**Project Coordinator**  
Davide Sartori  
Email: [sartori@aimilano.com](mailto:sartori@aimilano.com)

**Organization**  
Delfino Catalano  
Tel: +39 02 76000000 | 02 7804987  
Email: [catalano@aimilano.com](mailto:catalano@aimilano.com)

**Previous Editions**

**Video Course 2012**

GET A 4 HOURS VIDEO COURSE + 250 PAGES TEACHING MATERIAL

## Government at a Glance 2015



### 2015 Organizational Affiliates

Patron

- Eastern Research Group
- Economic Policy Institute
- Erasmus Institute
- George Washington University Regulatory Studies Center
- Industrial Economics, Copenhagen
- Mathematica Policy Research
- NERA Economic Consulting
- Tufts University School of Public Policy and Public Administration, George Washington University

### MILAN SUMMER SCHOOL 2015

Application deadline extended till June 30th, 2015

The School focuses on the ex-ante appraisal (Cost Benefit Analysis) of Major Projects asking for co-financing under the European Structural and Investment Funds in the Programming Period 2014-2020.

**The NEW Guide to Cost Benefit Analysis of Investment Projects**

The School has been designed with consideration for the recent developments in EU policies and methodology for cost benefit analysis and the international best practice, and builds on the considerable experience gained in project preparation and appraisal during the previous programming periods of the Cohesion Policy. The focus is on the New Guide to Cost Benefit Analysis, published by the European Commission in December 2014.

Davide Sartori, Lead author of the Guide as well as School coordinator, will present in detail, together with his team, the new methodological approach adopted by the EC to offer practical guidance on Major Project appraisal, as embedded in the Cohesion Policy Regulation 2014-2020. The objective is to illustrate common principles and rules for application of the CBA into the practice of different domains, including research & innovation, broadband, transport, environment and energy. The main change with respect to the previous edition concerns a restructured operational approach and a stronger focus on the new investment priorities of the Cohesion Policy.

**FACULTY**

The School faculty consists of experts from the team involved in the preparation of the new edition of the Guide to Cost Benefit Analysis of Investment Projects, including its authors, national advisors and academic peer reviewers. The following institutes will participate:

- CEIS Centre for Industrial Studies
- European Commission, DG Regional and Urban Policy
- European Investment Bank
- University of Milan

To know more about the speakers see the [Lecturers page](#).

**TARGET**

The School targets a wide range of users, including desk officers in the European Commission, civil servants in the Member States and Candidate Countries, staff of financial institutions, consultants and practitioners involved in the preparation or appraisal of investment projects. It is designed for professionals and researchers who are dealing with the programme and project management of the EU Funds and for decision-makers of major projects in the fields of transport, environment, energy and telecommunications, research, and urban development.

A mixed audience with practitioners coming from different institutions (institutional and non) is particularly welcome.

**METHOD**

## Cost/Benefit Analysis in the Research, Development and Innovation Sector

HOME | TEAM | PROJECT | DELIVERABLES | AGENCIA | EVENTS | GALLERY | DOWNLOADS

Funded by the European Investment Bank - University Research Sponsorship Programme (EURIS)

The research project "Cost/Benefit Analysis in the Research, Development and Innovation Sector" aims at developing and testing a model for evaluating Big Science. The developed model will enable funding agencies to assess the potential future net social benefits generated by a research infrastructure and the uncertainty and risks associated to it. See the video and the [power point presentation](#) to further info on the purposes of the project.

The project team is composed by the Departments of Economics, Management and Quantitative Methods (SEM) and Physics of the University of Milan and the independent research centre CSIL. [See team for more information.](#)

The project is financed by the European Investment Bank Institute (EIB Institute) in the frame of its EIB University Research Sponsorship Programme (EURIS), which provides grants to EU University Research Centres working on research topics and themes of major interest to the Bank. The call for proposals launched by the EIB Institute is available [here](#).

### News

2015 June 11  
Massimo Florio presents "Cost-Benefit Analysis of the LHC to 2025 and Beyond: How I'd Invest If" at CEPR Colloquium. [See more](#)

2015 June  
The case study on CNAO have been released in the form of academic working papers in the Department of Economics, Management and Quantitative Methods series. [See working paper](#).

2015 March 10-20  
Massimo Florio presented the "The Evaluation of Research Infrastructures: a Cost-Benefit Analysis Framework" at the 2015 Annual Conference and Meeting of the Society for Benefit-Cost Analysis. [See more](#).

2015 January 22  
Massimo Florio has visited EC Research & Innovation and discussed the approach of CBA in the RDI Sector with staff members of the Evaluation Unit who have expressed their interest in future opportunities of contact and exchange of views.

2014 December 15  
The European Commission, DG Region, has released the new edition of the Guide to Cost-Benefit Analysis of Investable Projects for Cohesion Policy 2014-2020. [See PDF version](#).

[Inside more news](#)



[massimo.florio@unimi.it](mailto:massimo.florio@unimi.it)

**THANK YOU**

COMMENTS ARE WELCOME