

# Possibilities of Economic Evaluation of Rivers Ecosystem Functions

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# Economics / Economy

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**Economy** = empirical results.

**Economics** = science

Tries to find the „rules“ of society functioning to be able to **increase welfare.**

*Actors behave so as to maximize their benefits.*

# Economic Evaluation of Environment

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***„ I think that a large part of humanity's misery is caused by improper estimate of the value of things.“***  
*Benjamin Franklin*



- ... knowing the value = making proper actions
- ... the same thing = different values (different people)
- ... problem: to set the „right“ value
- ... sources are limited
- ... ecosystem functions = „public goods“

# Public Projects Evaluation

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„normal“ projects evaluation rule:

revenues – costs

incomes – expenditures

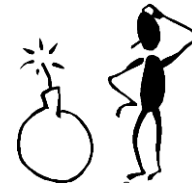


as high as possible



Problems:

- **Benefits** are rather non-monetary
- **Beneficiary** is not investor
- Time value



# Cost – Benefit Analysis

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*„To whom and how will be the project beneficent and hurt?“*

1. Definition of the project; financial plan
2. Identification of the actors
3. Defining Costs a Benefits (useful: compare before - after).
4. **Transformation to money**
5. Social Discount Rate (time value)
6. Evaluation (proper method)
7. Final decision

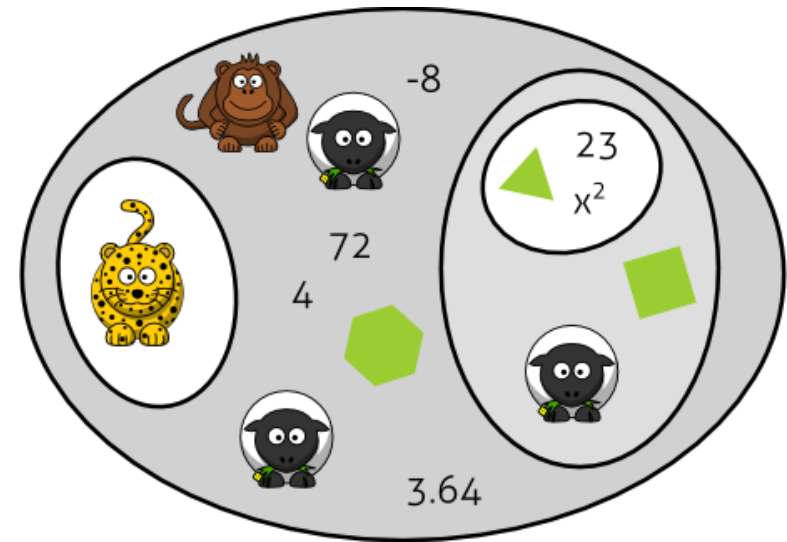
# Identification of Actors

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Potential Beneficiaries:

- State
- Households
- Companies

Choice in these groups



# Setting of C&B

## 1. Who?

- a) State
- b) Municipalities
- c) Entrepreneurs
- d) Inhabitant



## 2. When?

- a) Construction
- b) Running
- c) Post-operational



## 3. What?

- a) Tangible
- b) Intangible
- c) Financial



## 4. How connected?

- a) Directly
- b) Indirectly



# Setting of C&B for null and implementation

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1. benefit of one = hurt of other

2. avoid duplication

(sales increase – wages increase – tax yield increase)

3. Consistent assumption for both states.





# The Costs and Benefits Evaluation

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## Quantified C&B

- acc. to realizationally prices (something has been produced destroyed)

## Non-quantified c&B

- shadow prices
  - there is an efficient market
  - there is a market, but inefficient
  - no market:
    - **WTP, WTA**



# Social Discount Rate

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- Time factor
- Methods:

Marginal Rate of Time Preference (to save or to consume?)

Marginal Rate of private investment return

- set by European Commission (comparison of projects)



# Evaluation Methods

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comparison of yields and costs

the later obtained (payed) the lower the value

Benefit/Costs Ratio

Methods for company investment evaluation:

- NPV, IRR, PB, Profitability Index



# Evaluation Methods

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comparison of yields and costs

the later obtained (payed) the lower the value

$$\text{Benefits/} \text{Costs} = \frac{\sum_{t=0}^n \frac{\text{Yield}_t}{(1+i)^t}}{\sum_{t=0}^n \frac{\text{Costs}_t}{(1+i)^t}}$$

$$\text{NPV} = \sum_{t=0}^n \frac{\text{Yield}_t}{(1+i)^t} - \sum_{t=0}^n \frac{\text{Costs}_t}{(1+i)^t}$$

$$0 = \sum_{t=1}^n \frac{(\text{Yields} - \text{Costs})_t}{(1+i)^t}$$



# Case Study

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In the town of Brod should be build industry area.

Facts:

Total costs would be 50 mil. CZK (10 % municipality, 90 % CzechInvest).

The contract is for 10 year.

Investor is willing to pay a rent of 2 mil CZK annually.

100 new jobs will be created (80 workers out of Brod, 20 surrounding villages).

Increase of noise and dust around 200 flats.

Subject	Benefits	Costs
<b>Brod</b>	Rent	financing of the project by 10 %
	Unemployment decrease	
	Increase of tax yield (employees, self-entrepreneurs)	
<b>Households in Brod</b>	Increase incomes (wages)	Increase of noise and dust
	Wider range of services	
<b>Entrepreneurs in Brod</b>	Increase of sales	
<b>State</b>	Increase of tax yield	financing of the project by 90 %
	Decrease of social benefits	
<b>Surrounding municipalities</b>	Decrease of unemployment	
<b>Households in surrounding municipalities</b>	Increase of wages	

Subject	Benefits (annual)	Costs
<b>Brod</b>	2 mil. CZK	5 mil. CZK
	17,6 mil. CZK	
	3,4 mil CZK	
<b>Households in Brod</b>	4,8 mil CZK	60 mil. CZK
	0,2 mil CZK	
<b>Entrepreneurs in Brod</b>	0,48 mil CZK	
<b>State</b>	5 mil CZK	45 mil. CZK
	10 mil CZK	
<b>Surrounding municipalities</b>	4,4 mil CZK	
<b>Households in surrounding municipalities</b>	1,2 mil CZK	

# Evaluation

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annual yields = 44,2 mil CZK

sum of discounted yields = 325 mil CZK

costs = 110 mil. CZK

$$\text{NPV} = \sum_{t=0}^n \frac{\text{Yield}_t}{(1+i)^t} - \sum_{t=0}^n \frac{\text{Costs}_t}{(1+i)^t}$$

NPV = 215 mil. CZK



# Some Numbers..

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costs connected with rivers:

... floods prevention

2007 – 2014: Ministry of Environment

**costs:** 11,5 billions CZK (379 actions, 30,6 mil CZK for one project in average)

**benefits:** 100 000 lives, property: 37 billions CZK

NPV = 25,5 mil CZK + ??

Thank you for your attention

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