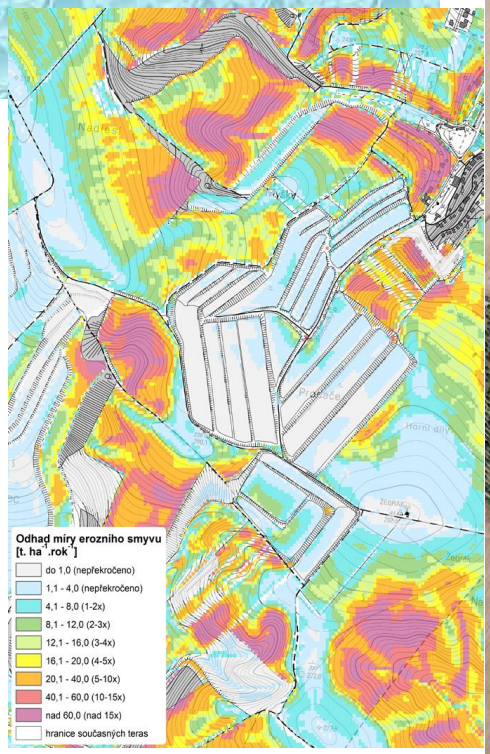
The economic context of climate change impacts and evaluate the impacts of the proposed adaptation measures in the South Moravian region



Budapest 2016

Marie Trantinová
IAEI

ÚZEI | ÚSTAV ZEMĚDĚLSKÉ EKONOMIKY A INFORMACÍ

EHP-CZ02-OV-1-039-2015
Complex planning, monitoring, information and educational tools for adaptation of territory to the climate change impacts with the main emphasis on agriculture and forestry management in the landscape.

Duration time: 3/2015 – 5/ 2016

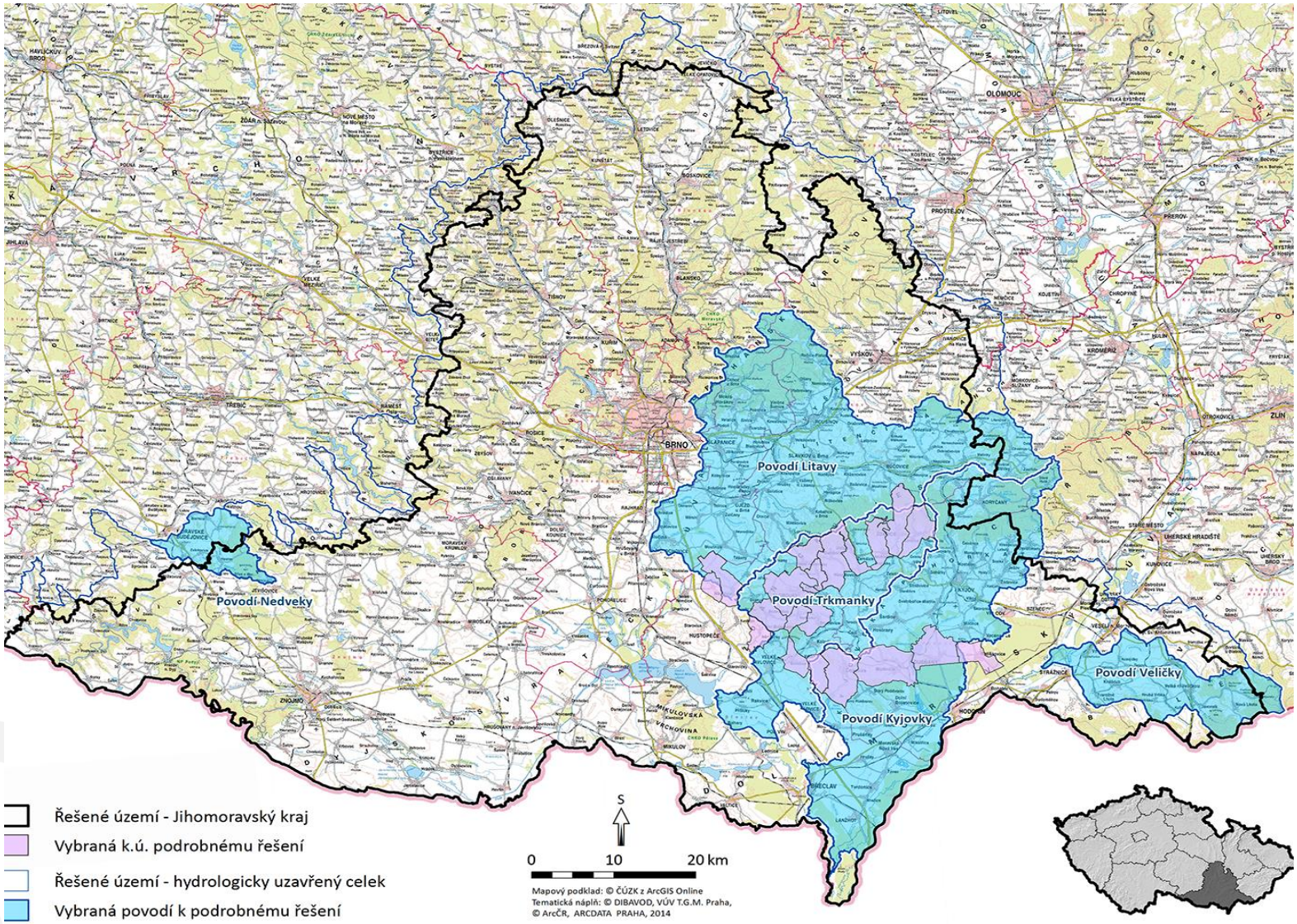
Head of project**:** University of technology - Institute of Landscape Water Management,

Other project designers: EKOTOXA, IAEI, T. G. Masaryk Water Research Institute, NIBIO (Bioforsk)

WP 1 Monitoring, information and evaluation systems.
WP 2 Identification of problems and risk
WP 3 Proposed solutions adaptation territory
WP 4 Economic context of climate change (CBA)
WP 5 Public education and development of training tools, demonstration projects

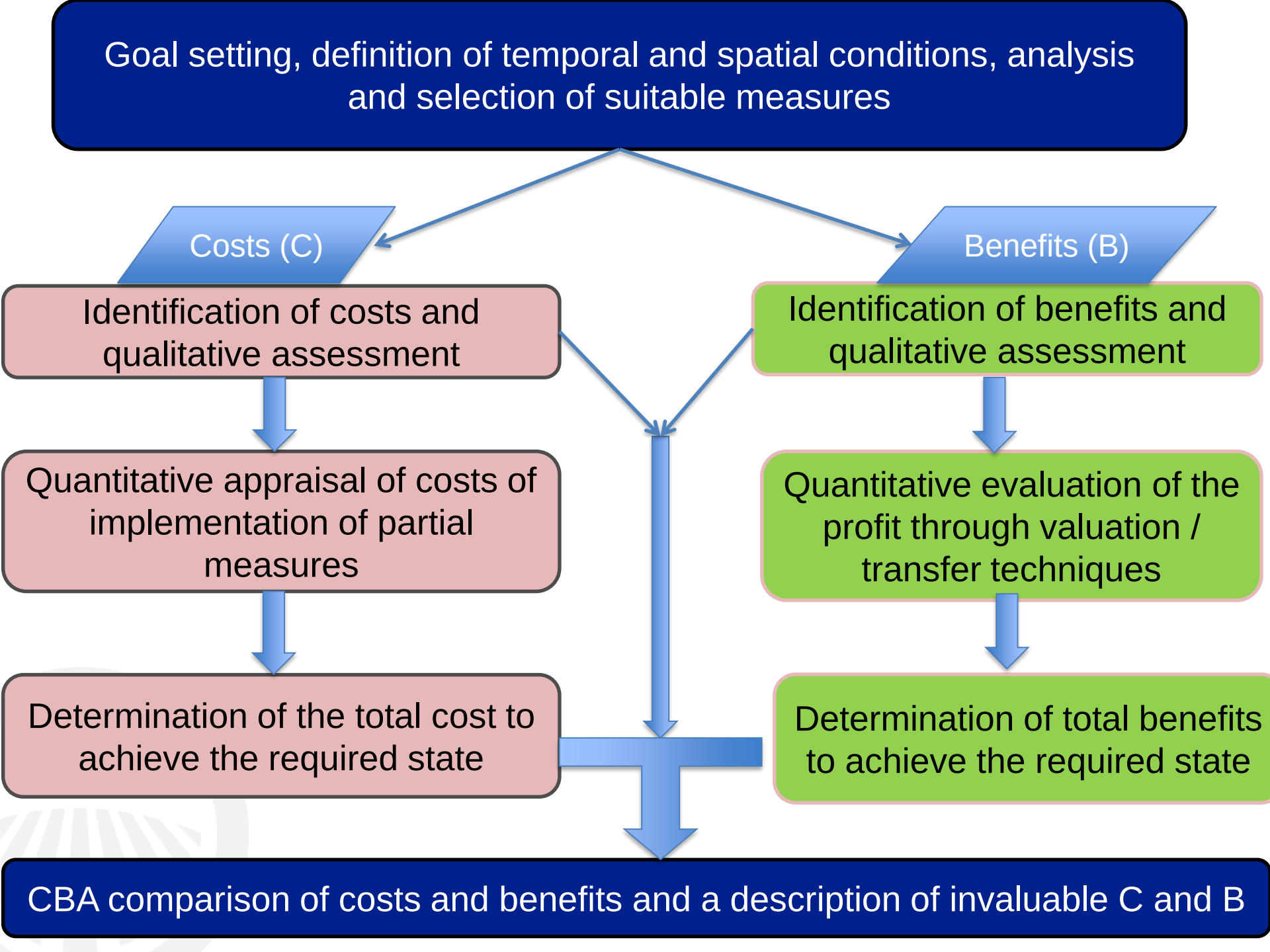
WP 6 **Integrated strategy** for implementing the system of instruments for adaptation to climate change area.

Economic analysis CBA case study



36 cadastral units Total 28 431 ha

9 415 ha with some measures


Goal setting, definition of temporal and spatial conditions, analysis and selection of suitable measures
Costs (C)
Benefits (B)
Identification of costs and qualitative assessment
Identification of benefits and qualitative assessment
Quantitative appraisal of costs of implementation of partial measures
Quantitative evaluation of the profit through valuation / transfer techniques
Determination of the total cost to achieve the required state
Determination of total benefits to achieve the required state
CBA comparison of costs and benefits and a description of invaluable C and B

Scenarios

1 - ignored the implementation of measures the status quo (the possible impacts of climate change involves only the current situation)

2 - ignored the implementation of measures calculated the impact of climate change by the year 2040

3 - considering the implementation of adaptation measures proposed in previous stages of the project AdaptaN, the status quo (the possible impacts of climate change involves only the current situation)

4 - considering the implementation of adaptation measures proposed in previous stages of the project AdaptaN, calculates the impact of climate change by the year 2040

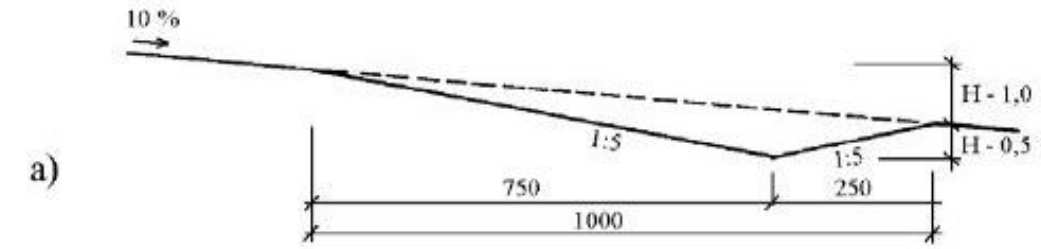
	climate change no	climate change yes
Measures no	Scenario 1	Scenario 2
Measures yes	Scenario 3	Scenario 4

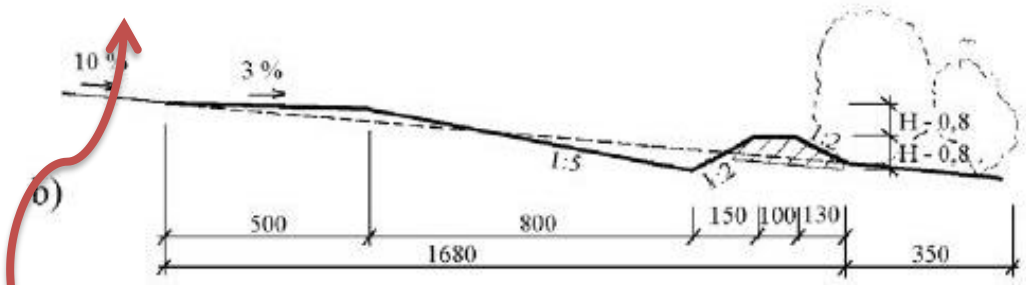
Costs overview

On the cost side were listed and appreciated 10 measures:

- restriction of cultivation of crops wide-space (version1, version 2)
- agro-technology (version1, version 2),
- grassing,
- afforestation,
- stabilization paths of concentration runoff,
- dikes,
- infiltration belts,
- retention area.

Underseed,
Intercrop, …





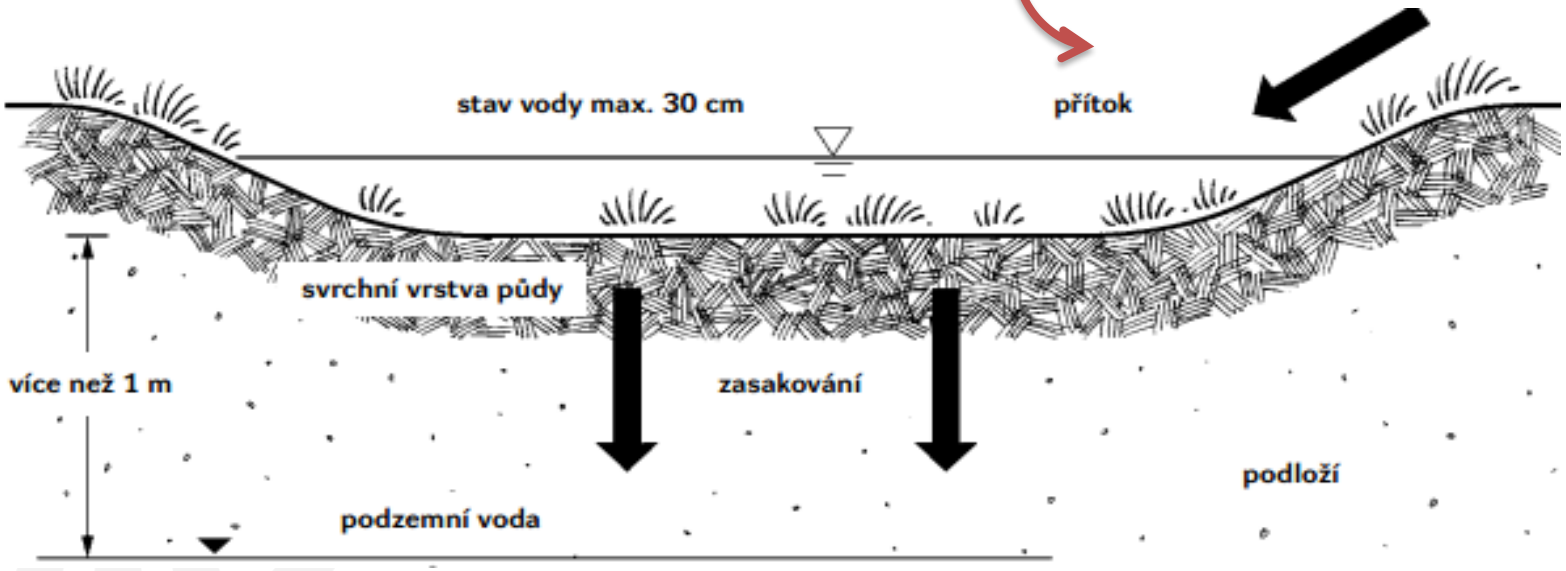
dikes

infiltration belt

Costs side has been calculated as:

- investment for measures,
- operating expenses
- loss of profit.

For each measures were created scheme temporal distribution of costs between the years 2017-2040.



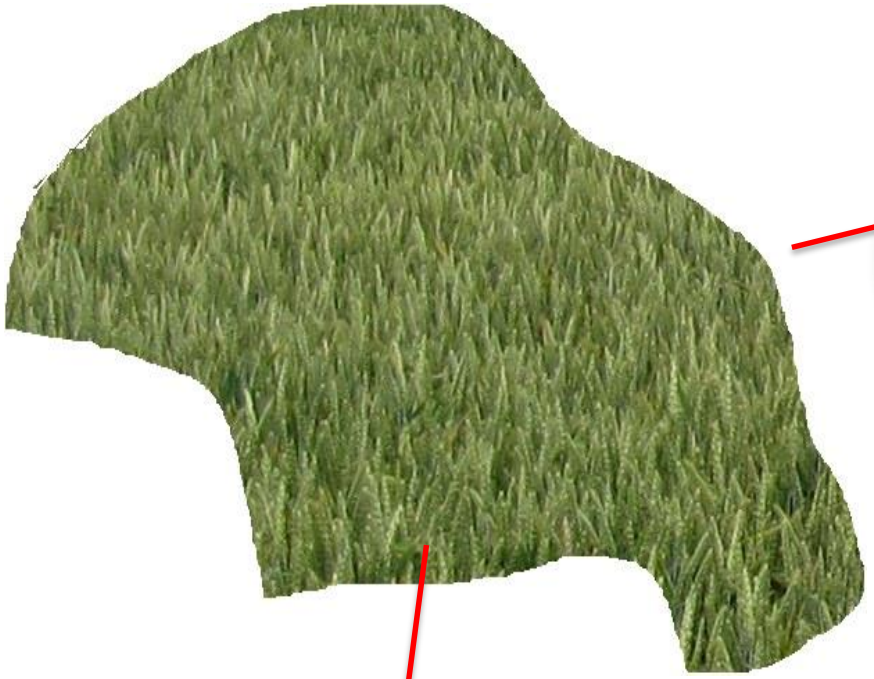
Benefits overview

CBA used these 5 financial valuable benefits:

- **cost savings** to recover the topsoil washed **down back on land blocks**,
- **cost savings** for the removal of topsoil washed down **to streams and reservoirs**,
- **buying of soil**
- **saving the cost of lost soil nutrients compensation**
- **savings water for irrigation** through increased water retention in the landscape.

The remaining benefits **could not be quantified**, but there were mentioned in the study.

Monetary value of costs and benefits were then calculated for **individual years** and expressed in present value as at 1.7. 2016.



7,6 euro per ton

24 euro per ton

Area of river basin (km^2)	topsoil washed off site (%)
0,1	53
0,5	39
1	35
5	27
10	24
50	15
100	13
200	11
500	8,5

A timing mismatch

Costs and benefits not always arise at the same time.

Implementation of measures was counted first year = high investment costs and then ongoing operating costs.

Benefits are increasing later and gradually.

This leads to significant the time mismatch which is associated with a change in the value of money over time.

Solution of the timing difference is possible due to discount rate and transferring the data to present value of costs and the present value of benefits and then net present value.

We used discount rate of 4% (time duration = 25 years).

The above partial benefits (expenses) in 2015 prices

C/B deal with:	A price 2015
return of topsoil washed down back on land blocks	7,6 euro per ton
Return of topsoil washed down from streams or water reservoirs	24 euro per ton
buying the lost ground	7,6 euro per ton
replacement of nutrients (25%)	192 euro per ton
water retention in the landscape	0,3 euro per m^3

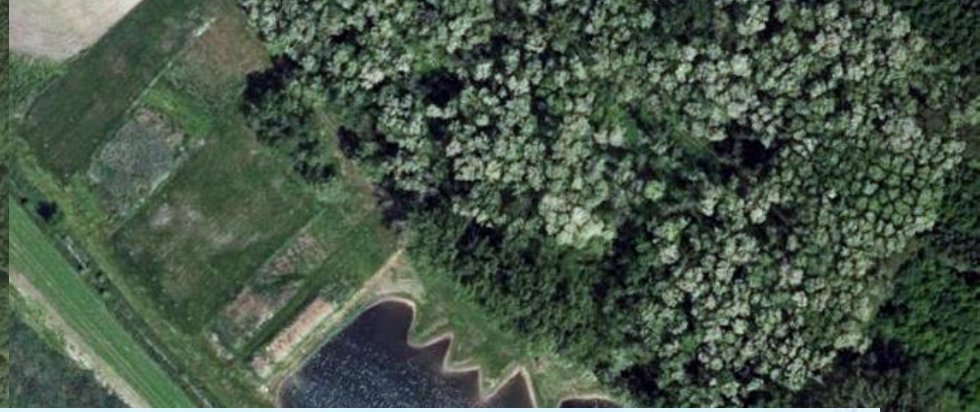
Conclusion

- Implemented measures are **socially beneficial** in the case of the status quo and also in case of negative impacts due to climate change.
- **Discount rate** and the replacement rate of nutrients is important to quantify the costs and benefits (according analysis of sensibility d = 4%, loss nutriens = 15%). But order of scenarios was the same and scenario 3 and 4 with measured brought clearly socially benefits.
- **Net social benefits** - Scenario 3 are € 2.04 million and net social benefits - Scenario 4, amounting to € 77.8 million, for 2017-2040 and 36 cat. Units *72 – 2736 per ha for 25 years*
- Failing to achieve societal benefits, there is at least minimize societal losses

	C	B	NPV	The ratio
Scenario 1	245 810 004	0	-245 810 004	0
Scenario 2	352 793 324	0	-352 793 324	0
Scenario 3	204 238 297	206 266 677	2 028 380	1,01
Scenario 4	220 071 268	297 417 025	77 345 757	1,35

C/B not converted to cash flows

- Application of adaptation measures will lead to increase the **aesthetic value of agricultural landscape.**
- Another benefit is the increase in **biodiversity**, which supports the ability of **ecosystems to provide a number of ecosystem services**. It was counted in another projects where value was about **€18 per** year per economically active person.
- Implementation of adaptation measures will also have a positive **impact of reducing water eutrophication**
- Improved water quality is reflected both in the form of **recreational benefits,** reduce treatment costs in the production of **drinking water**.
- On the contrary, the analysis **has not identified any negative impact** associated with the implementation of measures beyond mentioned (*except for loss of income from production*).



Aeria
Sourc

stabilization paths of concentration runoff

Climate is what you expect; weather is what we get.

We can not direct the wind but we can adjust the sails.