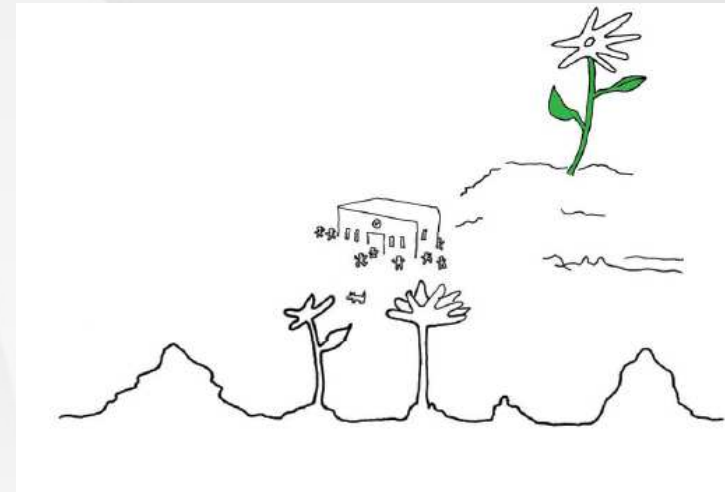
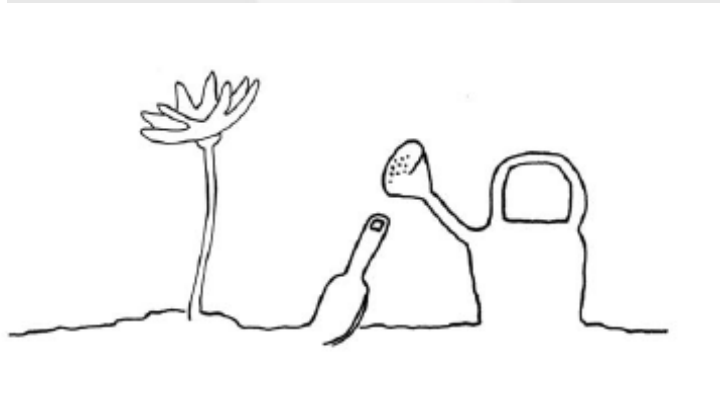




The economic context of climate change impacts and evaluate the impacts of the proposed adaptation measures in the South Moravian region.



24. 6. 2016, Jachranka, Poland, ÚZEI Trantinová, Peterková,
Extern: Pražan, Slavíková, Macháč



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

Chief project designer: University of technology - Institute of Landscape Water Management,

Other project designers: EKOTOXA, ÚZEI, T. G. Masaryk Water Research Institute,

NIBIO (Bioforsk)



Project schedule

WP 1 Monitoring, information and evaluation systems.

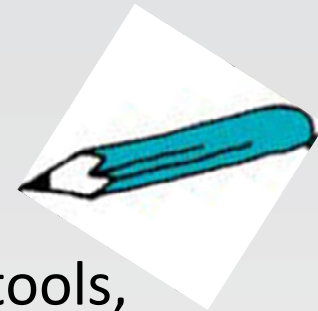
WP 2 Identification of problems and risk

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.

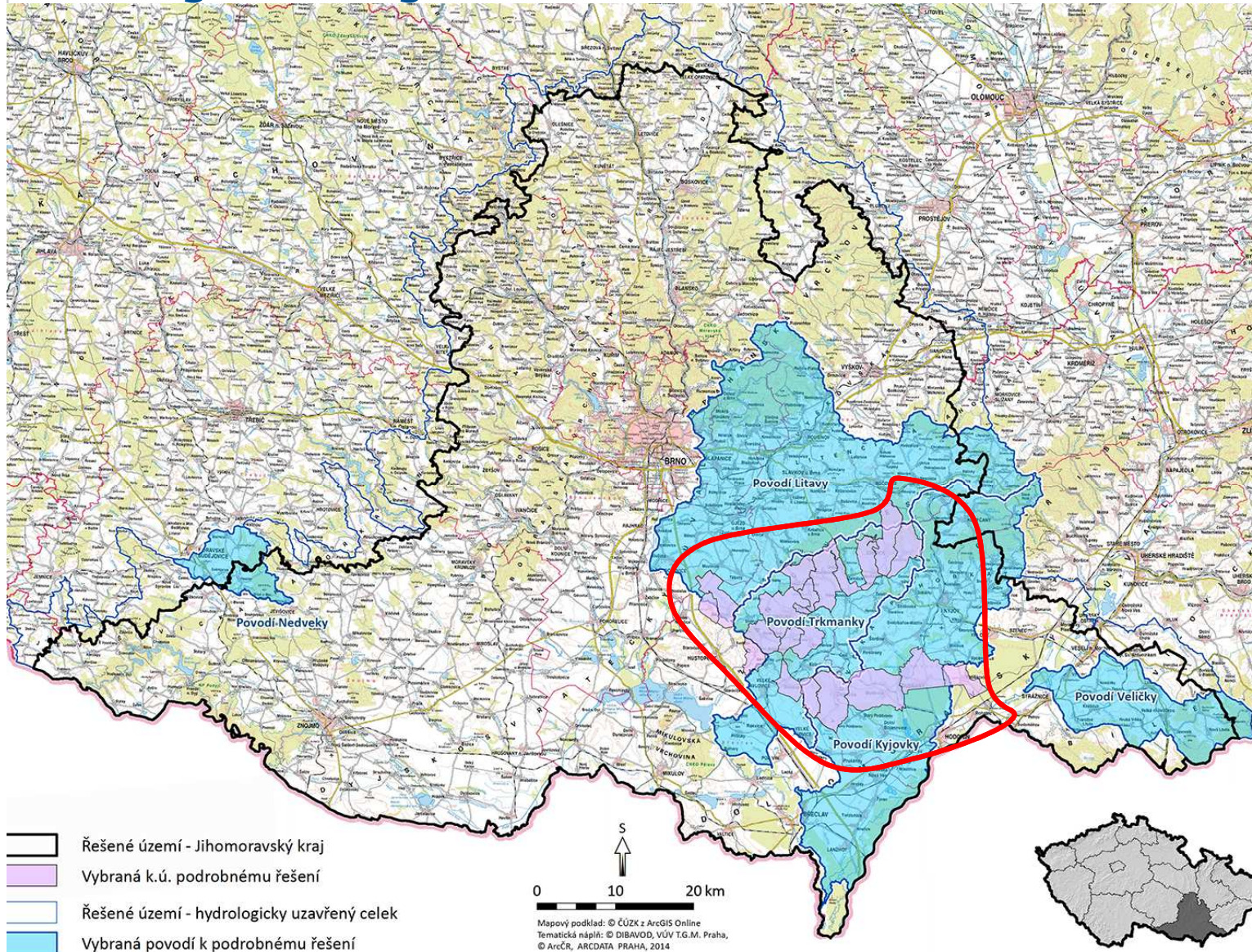


36 cadastral units
28 431 ha
(9 415 ha)

The worst situation in drought
average annual rainfall and temperatura

The most detailed measures

...



Goal setting, definition of temporal and spatial conditions, analysis and selection of suitable measures

Costs

Benefits

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

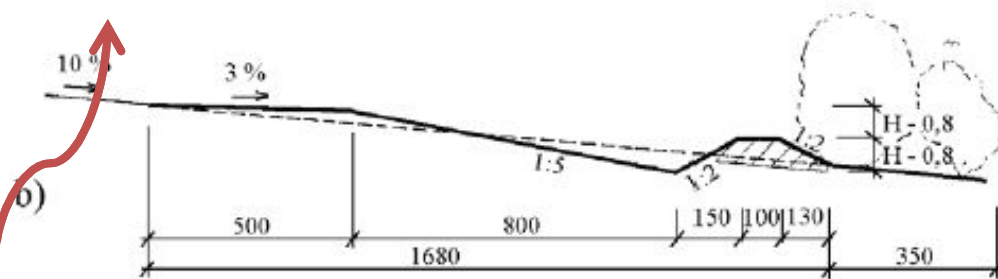
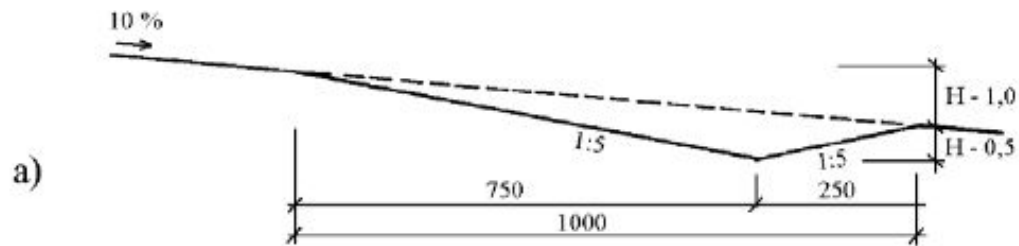
	climate change no	climate change yes
Measures no	Scenario 1	Scenario 2
Measures yes	Scenario 3	Scenario 4

On the cost side were listed and appreciated 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, ...

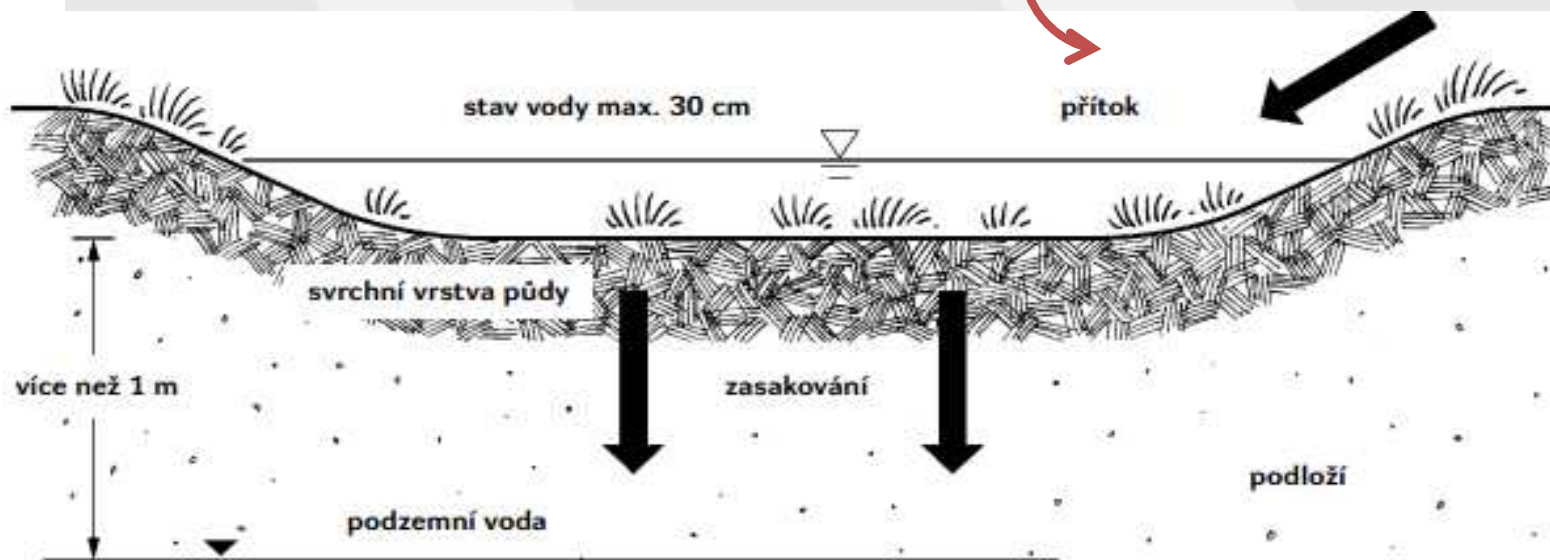


Costs side has been calculated as:

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

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

dikes infiltration belt





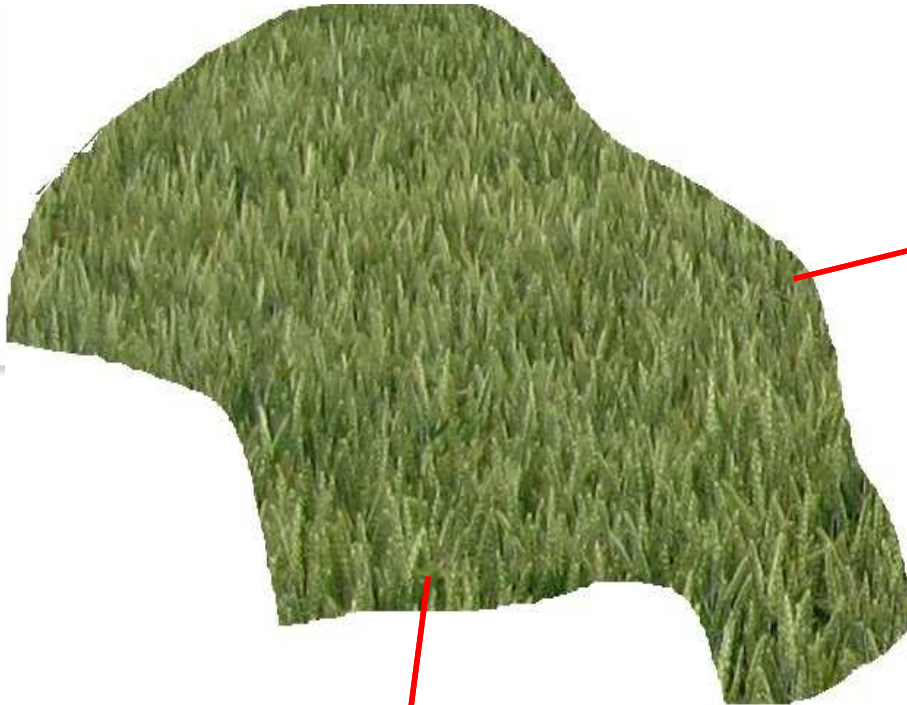
Benefits overview

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. (*soil moisture deficit*)

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

make amends for damage



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



Changing value of costs and benefits

- 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.

This mismatch 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 and reservoirs (lake, ...	24 euro per ton
buying the lost ground	7,6 euro per ton
replacement of nutrients	192 euro per ton
water retention in the landscape	0,3 euro per m ³

	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
measures	no		no		yes		yes	
climate change	no		yes		no		yes	
Costs/Benefits	C	B	C	B	C	B	C	B
implemented measures	0	0	0	0	164 695	0	164 695	0
return of topsoil washed down back on land blocks	39 495	0	57 105	0	6 556	32 939	9 174	47 931
return of topsoil washed down from treams and reservoirs	37 439	0	54 225	0	6 031	31 408	8 473	45 752
buying the lost ground	11 808	0	17 102	0	1 902	9 906	2 672	14 429
replacement of nutrients	150 928	0	218 222	0	25 054	125 874	35 057	183 165
water retention in the landscape	6 139	0	6 139	0	0	6 139	0	6 139



Benefits

In scenarios 1 and 2 are zero benefits.

Tab: Net social benefits of each scenario (euro) and the ratio, which is embedded in the back cargo benefits.

	costs	benefits	Net social benefit	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 (eg. *Loss of income from production*).



Aerial ph
Source: G

area.



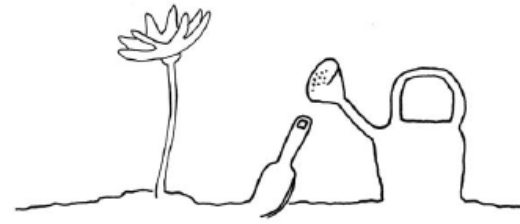
stabilization paths of concentration runoff





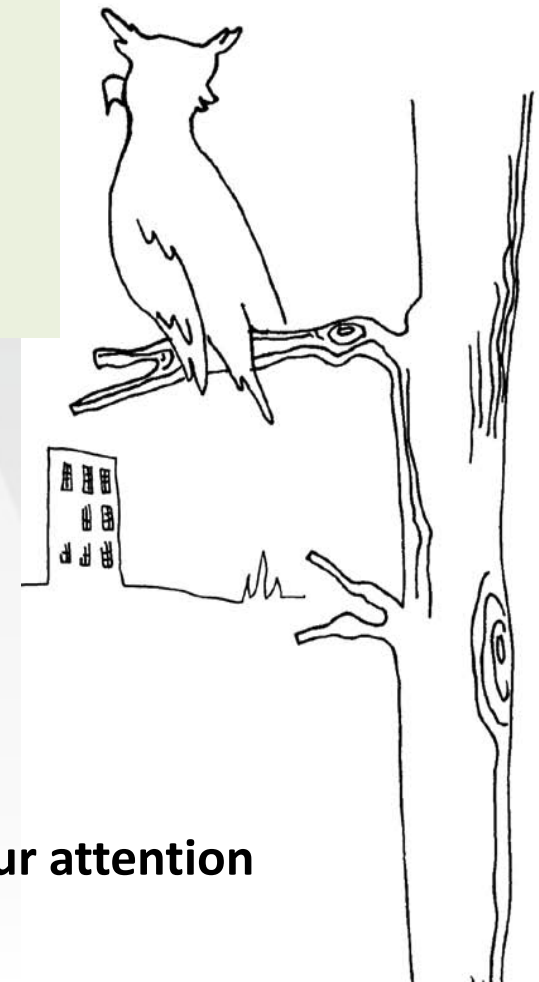
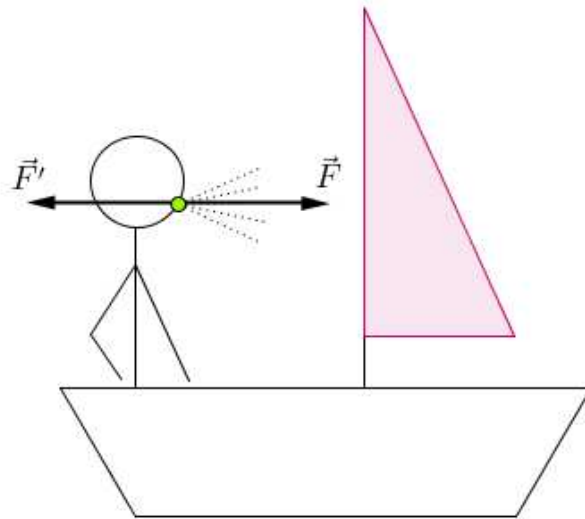
Conclusion

- 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 nutrients = 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.



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

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



Thank you for your attention