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An Application of

Multi Criteria Decision Analysis

to support climate adaptation

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Contents

- What is Multi Criteria Decision Analysis (MCDA)?
- How did we develop the MCDA for science – stakeholder applications?
- Examples
- Further thoughts

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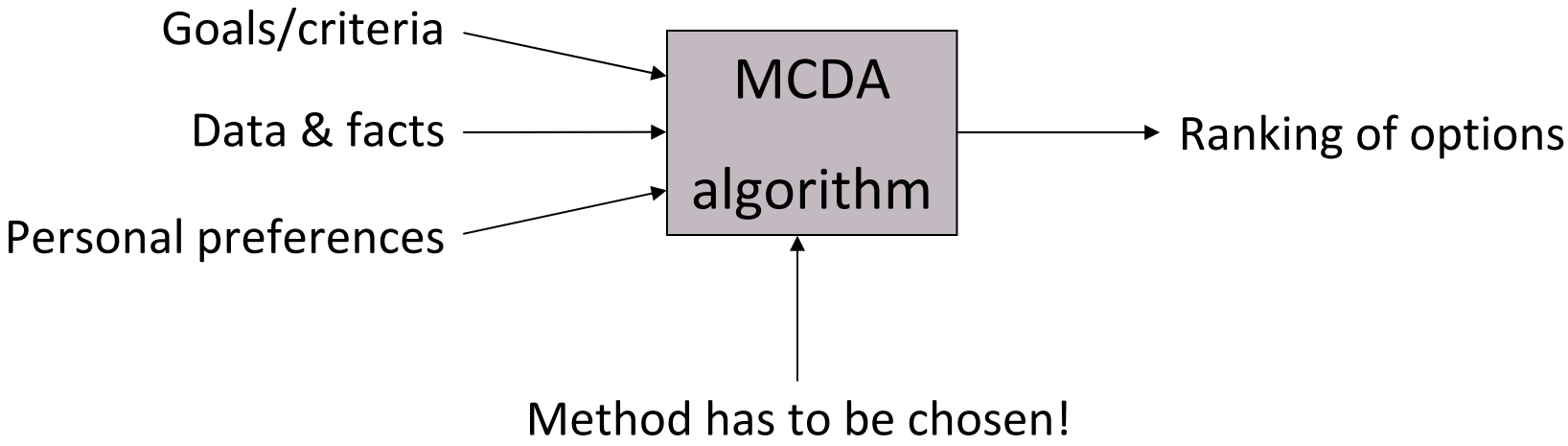
MCDA analyses decision problems and tries to identify the best option from the decision-maker's point of view



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- The aim was to test in a workshop if MCDA can be applied to support land-use planners in finding appropriate adaptation tools
- The methodology ensured that an understanding of the underlying mathematical processes are not necessary for planners
- If desired, details of algorithms and weightings can be seen by the user, but it is not necessary to enage with them
- Selected MCDA approaches were applied to highlight potential differences

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Multi Criteria Decision Analysis is everywhere…

Almost every decision is based on multiple criteria!

E.g. What to eat for lunch?

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healthy

tasty

cheap

There is no option, which is healthy, tasty and cheap!
How do you take a decision?

It depends on personal preferences which criterion is decisive: health, taste or price

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MCDA provides methods to formalize such decision problems...

- It helps to find your favoured option if you are undecided
- You can justify your decision to others (it is transparent!)
- You can involve others in the decision process

- We chose examples of recent coastal protection designs from North Eastern Germany to develop a methodology of applying MCDA in decision making processes on climate adaptation

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1. Case study: Markgrafenheide

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Nature area: should be protected!

MCDA Proceeding:

1. Description of **boundary conditions / framework**

2. Definition of **options** to be compared

3. Definition of **criteria** and **indicators**

4. **Weighting** of criteria: subjective preferences!

5. **MCDA algorithm** provides your individual scores for each option

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Legal framework provides boundary conditions:

E.g.

- Only natural materials shall be used (with some exceptions)
- The protection height is set by a design flood

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Legal framework provides boundary conditions:

E.g.

- Only natural materials shall be used (with some exceptions)
- The protection height is set by a design flood

→ No choice of protection level!

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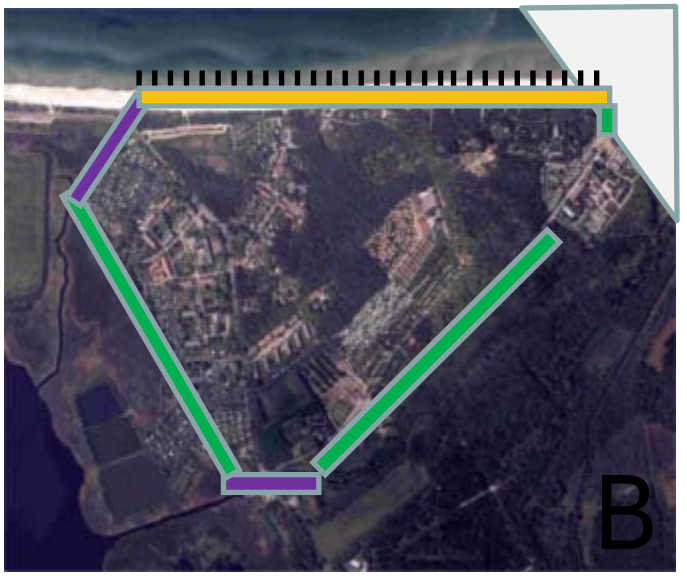
Within the legal framework 3 options have been proposed:

Favourite from coastal protection perspective

Mixture



Dune + groyne

Dune

Dyke

Wall

Tourism oriented option

Each option has advantages and disadvantages!

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The following criteria and indicators have been chosen:

- Building costs [€]
- Maintainance costs [€/a]
- Aesthetics ["expert"-rating]
- Decommission [€]
- Lost nature area [m^2]

The assessment of all options with respect to these criteria has been prepared in advance together with local Stakeholder experts.

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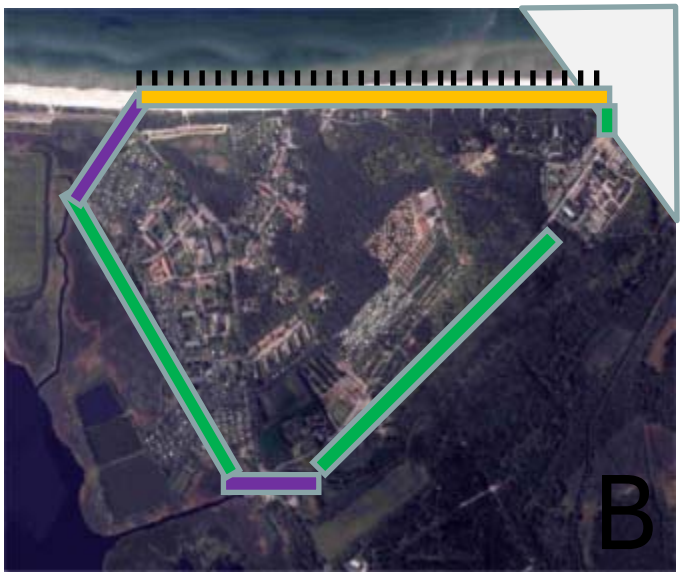
Once more: 3 options:

Favourite from coastal protection perspective

Mixture



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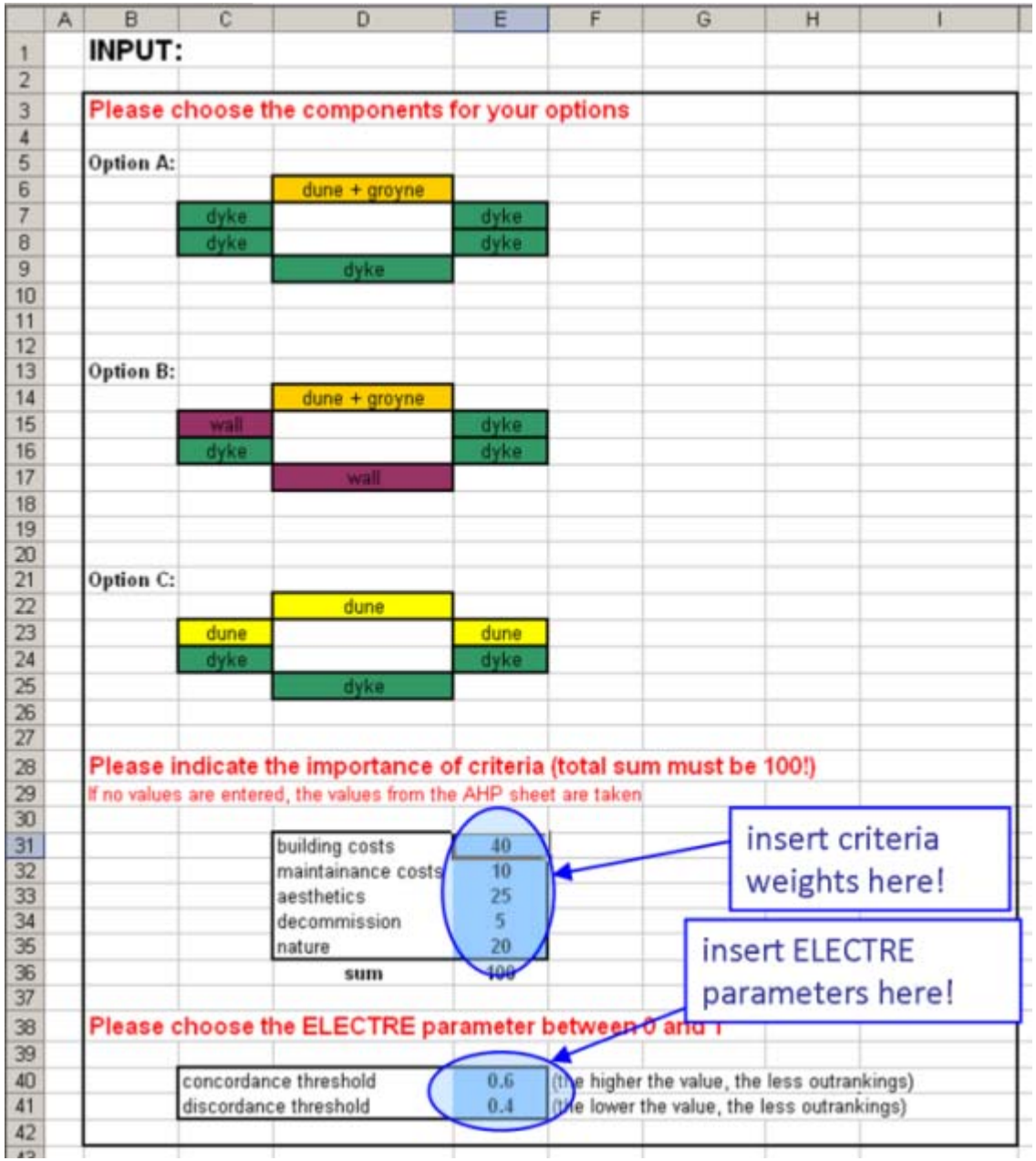
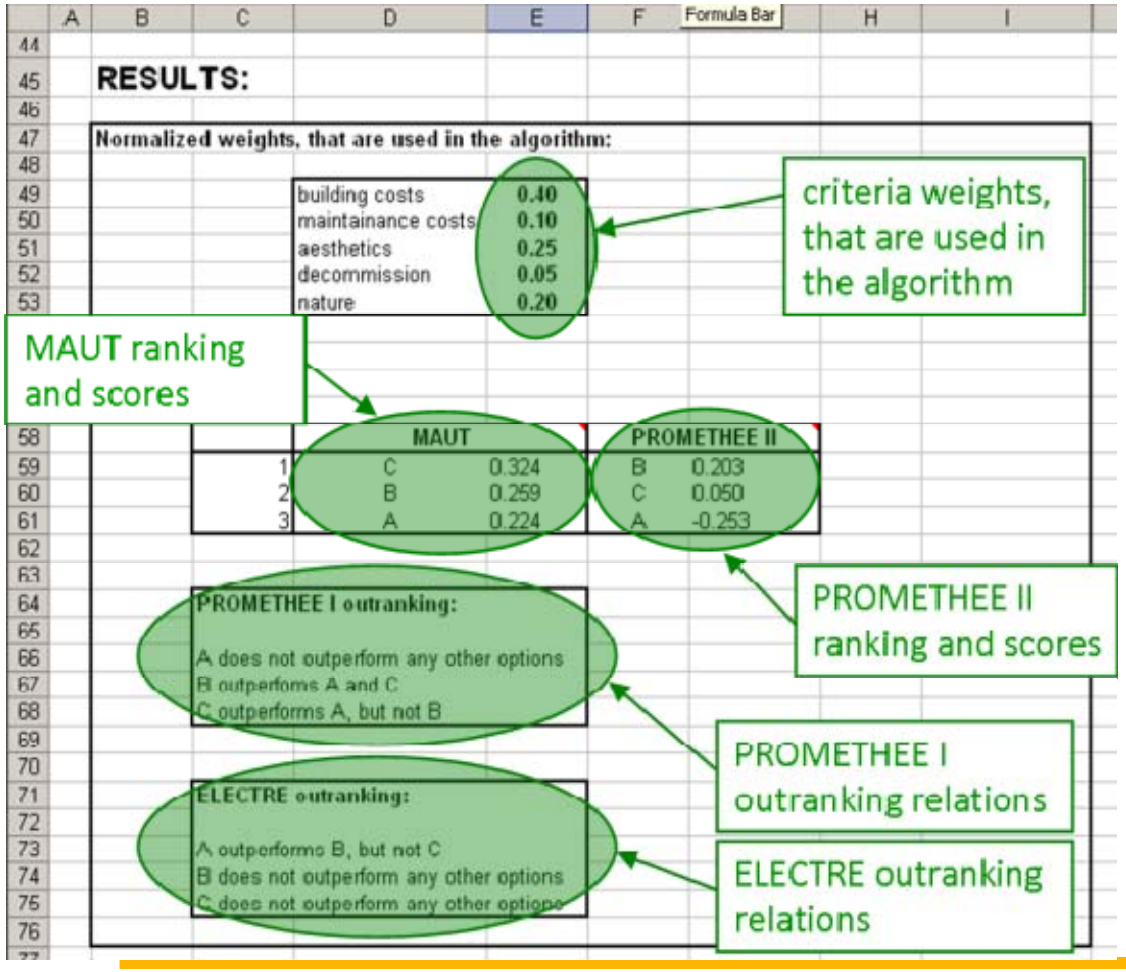
Tourism oriented option

Each option has advantages and disadvantages!

Excel-sheets did all the work...

only personal weights and MCDA parameters had to be inserted by the participants





Results for several MCDA methods were calculated

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Comparison with the implemented solution...

Example from Klaipeda / Lithaunia

- In a scenario workshop for flood prone area proteatcion stakeholders developed and proposed four adaptation measures

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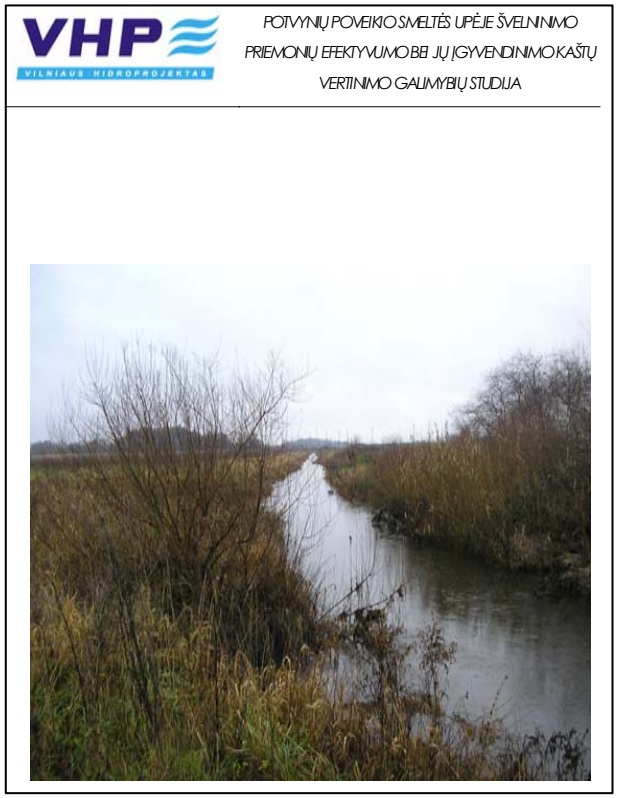
Feasibility study:

- Adaptation measures and adaptation costs were evaluated in the feasibility study (30 pp).
- The feasibility of two additional measures was analyzed on authors own initiative.
- Feasibility study was send to local stakeholders before second scenario workshop.



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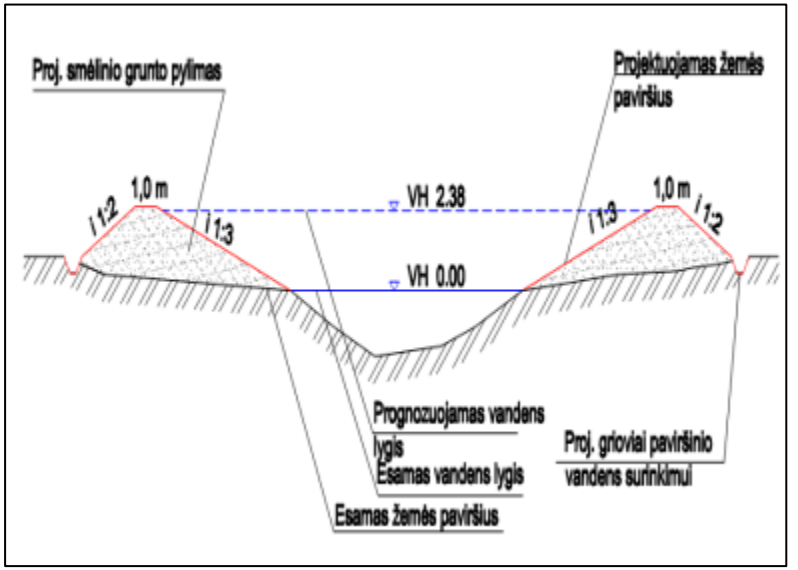
2nd scenario workshop

- Feasibility study of possible solutions and adaptation measures was discussed and evaluated.
- The stakeholders chose the most expensive but most effective adaptation measure: complex embankment and dyke system on both watersides of the river.
- Measure chosen by stakeholders was passed for Klaipeda city municipality for future development.



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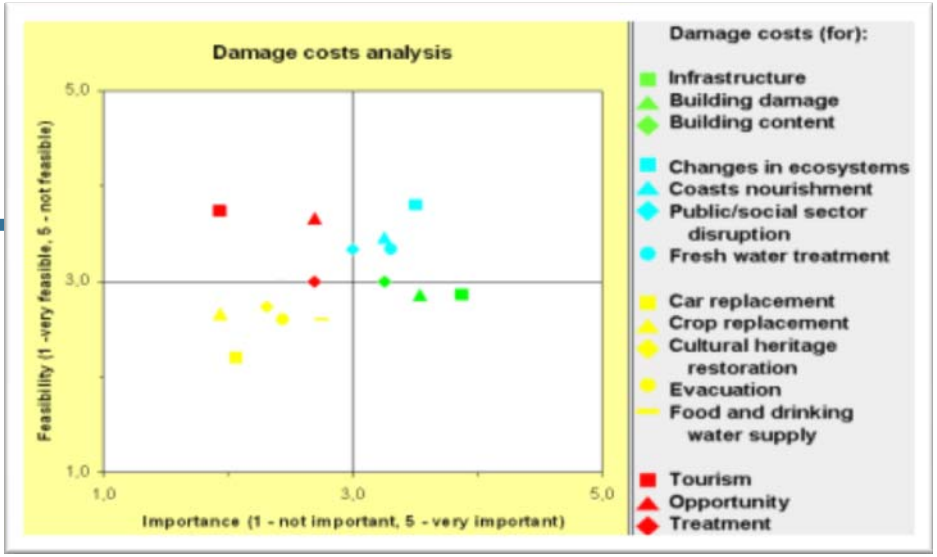
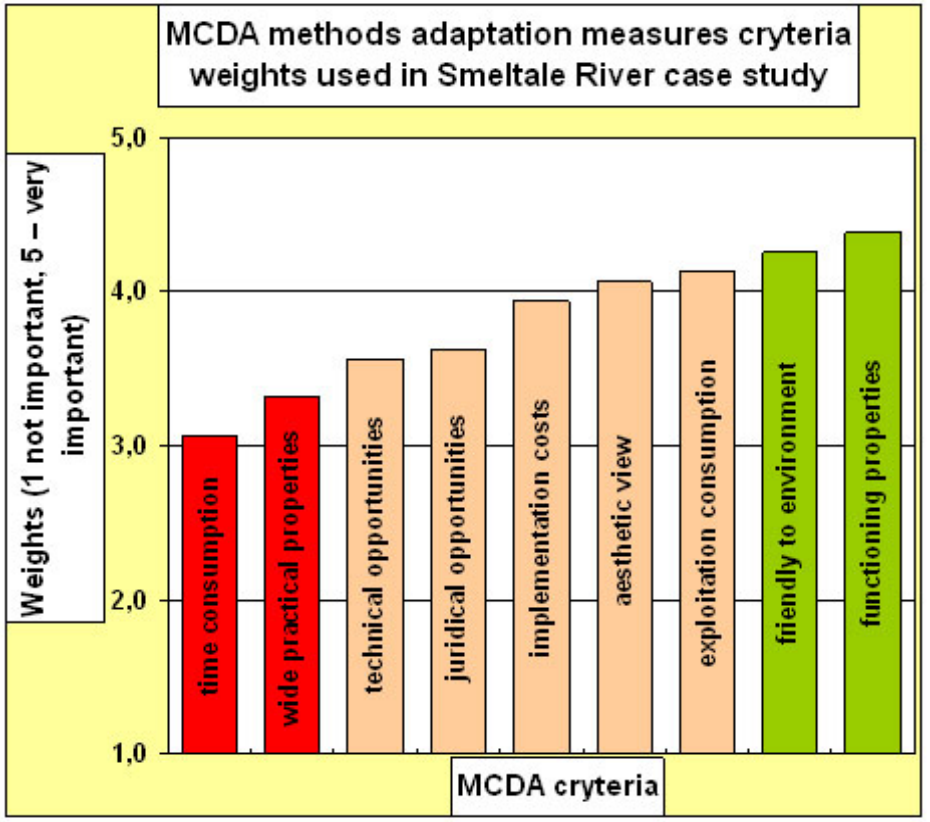
- *The Cost-Benefit Analysis* (CBA) and *Multiple-Criteria Decision Analysis* were used.
- The local stakeholders were asked to weight the indicators of the feasibility of adaptation measures.
- The quantitative analysis results supported the decision made in the 2nd scenario workshop.





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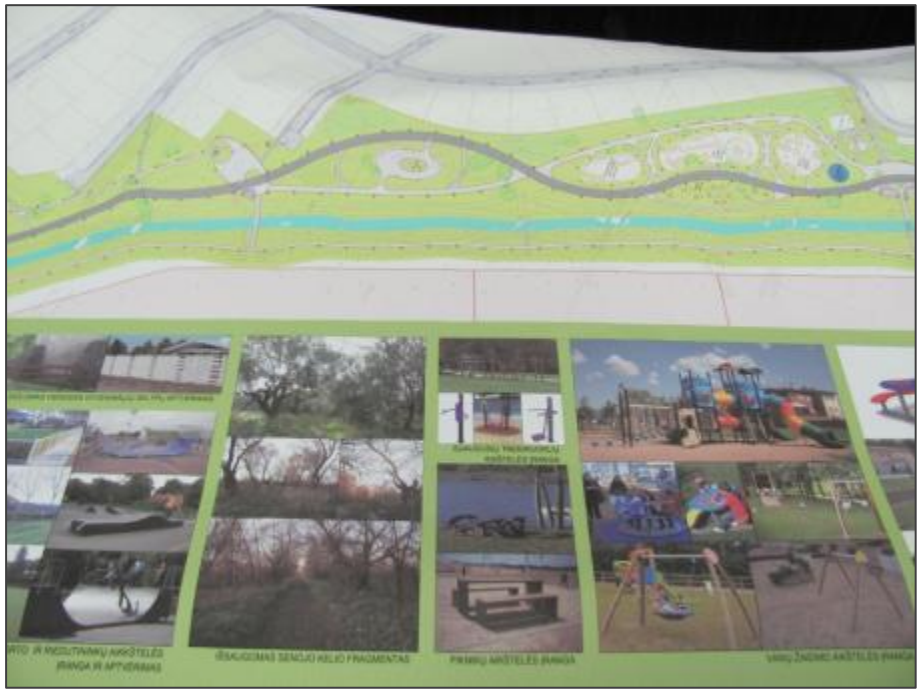
Implementation of adaptation measures

- Preparation of technical project of adaptation measures have been initiated by the Klaipeda City municipality.
- Adaptation measures were incorporated in the technical plan of recreational park “Smeltales parkas”.
- If the park will be developed in stages, the embankments will be built in the first stage.



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Lessons learned:

- Application in theory easier than in the real world
- Application needs careful definition of the problem
- Results depend strongly on preferences
- Several stakeholders have expressed interest in applying the methodology as an additional tool in current land use planning practices!

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Further thoughts / conclusions:

- There are potentials in MCDA to support land use planning
- Use the MCDA as a tool to support discussions and possibly decision-making
- Observe and respect cultural and legal aspects of each planning phase
- Engage towards the selection of options (to be built) phase

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Acknowledgements

- I would like to thank the University of Latvia for their excellent cooperation in this and earlier projects. It was the initiative of the University of Latvia to incorporate the City Council into the BaltCICA project.
- I would like to especially thank Andris Locmanis for the good cooperation in developing MCDA for Riga

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Thank you very much for your attention!

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