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Special session on Multi-criteria Decision Analysis (MCDA) and its application opportunities in environmental planning and decision making

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Some issues discussed in the workshop

Trade-offs

Stakeholder involvement

Synthesis of information

Implemen-tation of IWRM

Identification of significant impacts

Incommen-surable impacts

What are the major research topics?

Evaluation of the sustainability of the projects

Capacity building

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Content

- MCDA
  - Why, what and how?
- Experiences from Finnish applications
  - Example: Hydro power project
- Benefits of MCDA
- Challenges of MCDA
- Demonstration of Web-HIPRE
- Questions to be discussed

Why MCDA?

- Need to compare systematically and comprehensively alternatives having ecological, social, cultural and economic dimensions
  - Critique towards cost-benefit analysis
  - MCDA and CBA can be used in a complementary way
- Need to improve the quality of stakeholder involvement
  - Incorporation of stakeholders' objectives and preferences into the planning process
- Need to justify decision transparently

What is MCDA?

- A collection of formal approaches which seek to take explicit account of multiple criteria in helping individuals or groups explore decisions that matters.

- MCDA methods aims at improving the quality of decisions by making choices more explicit, transparent, rational and efficient.

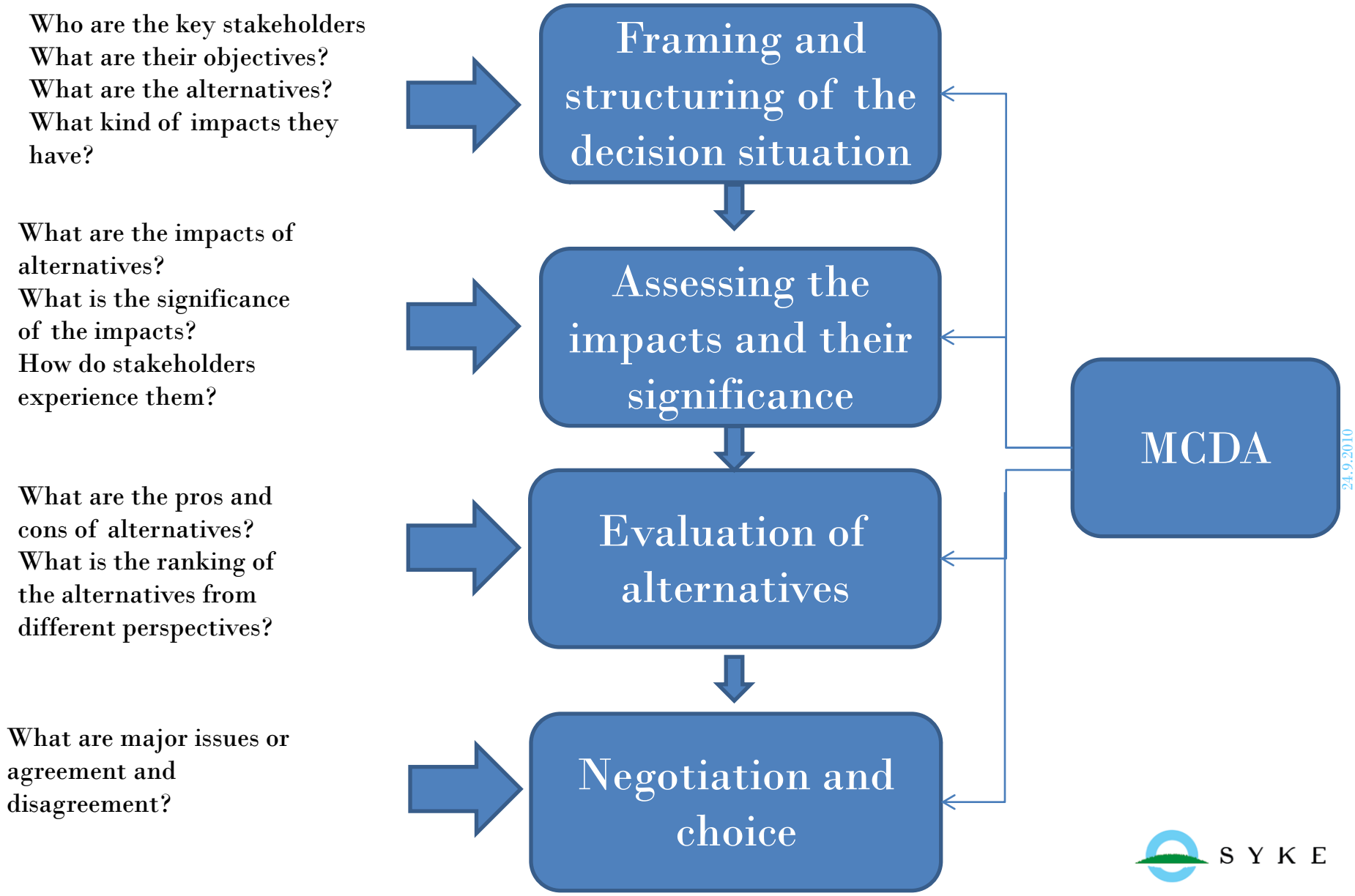
- The goal is to create a structured process to identify objectives, create alternatives and compare them from different perspectives.

MCDA approaches

- Many approaches and schools available
  - Multi-attribute value theory (MAVT), analytic hierarchy process (AHP), outranking methods (e.g. ELECTRE, PROMETHEE)

- MAVT has been used in our projects
  - Fairly simple and understandable
  - Easy to use software available (Web-HIPRE)
  - Illustrative way to compare and analyse alternatives
  - Studied extensively, the strengths and weaknesses are well-known
  - Successful real-life applications

MCDA supports different phases of planning process



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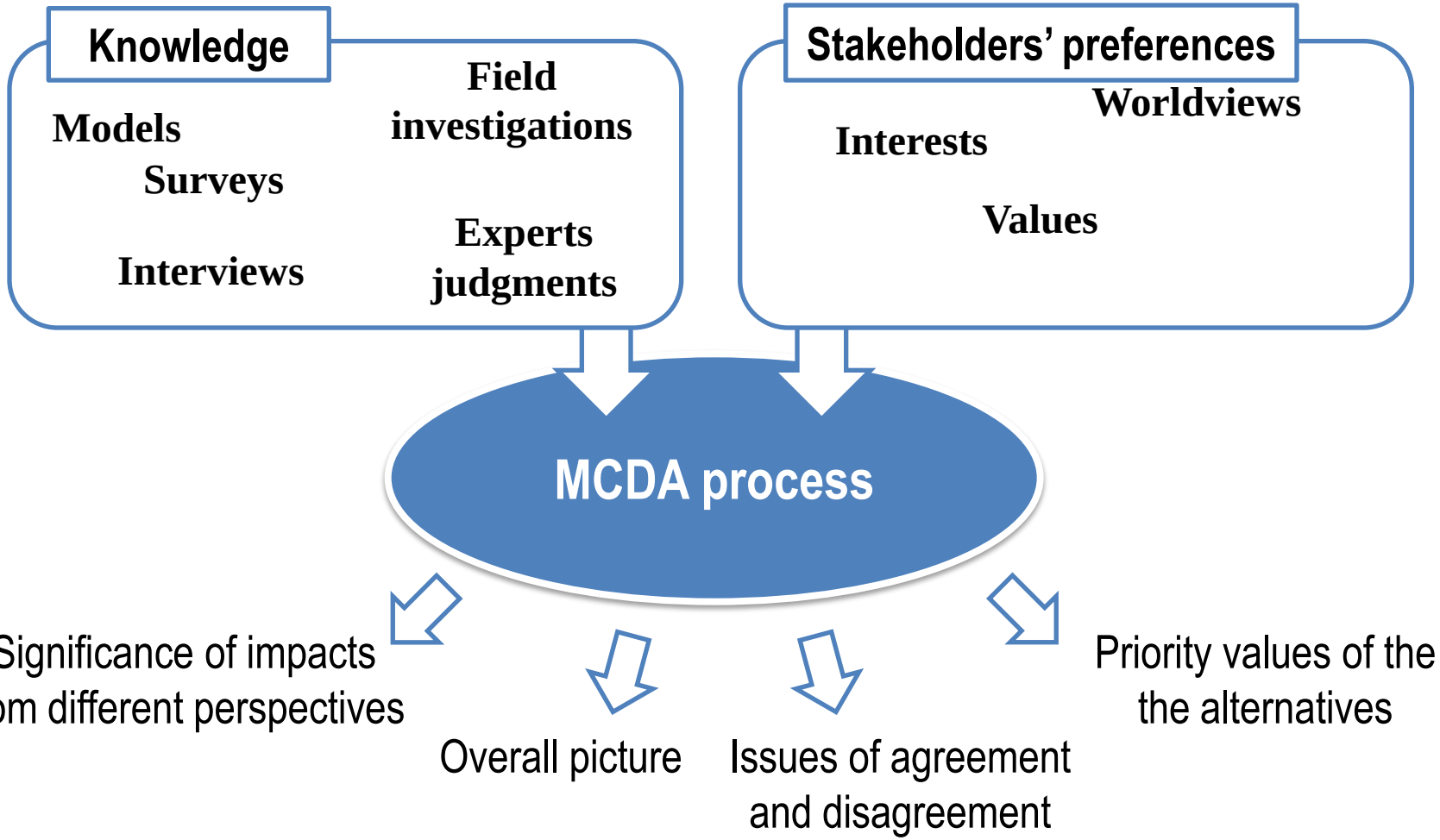
MCDA process: input and outcome



INDIVIDUAL AND SOCIAL LEARNING

Main steps in MCDA process

PROBLEM OWNERS, STAKEHOLDERS, EXPERTS, DECISION ANALYST

Step 1
- Construct a value tree

Step 2
- Assess the performance of alternatives

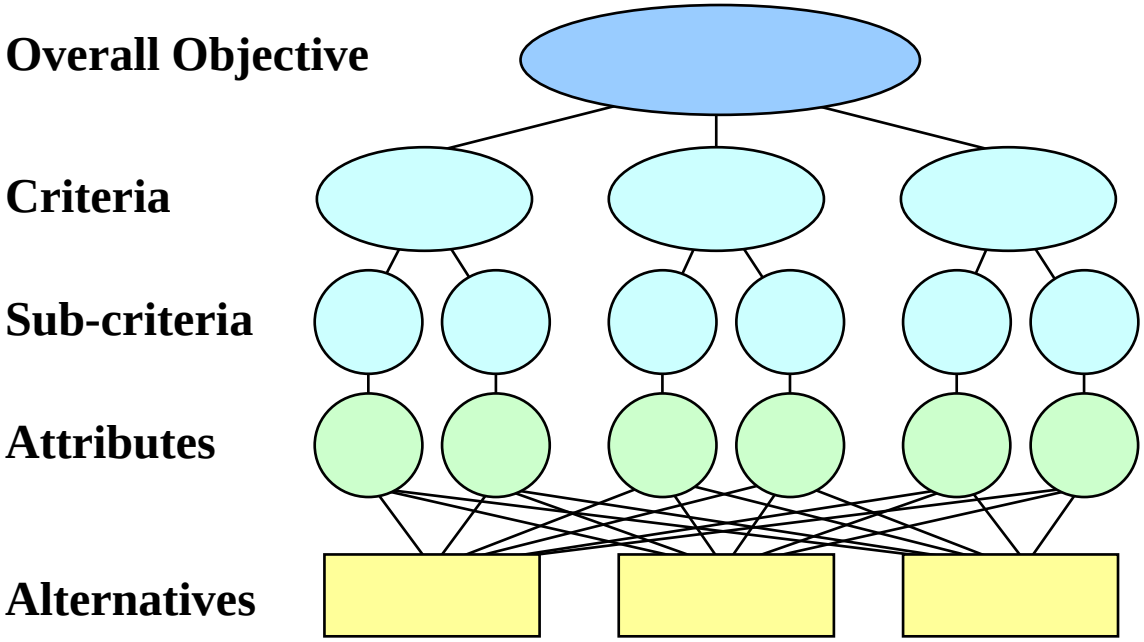
Step 3
- Elicit weights for the criteria

Step 4
- Calculate overall value of the alternatives

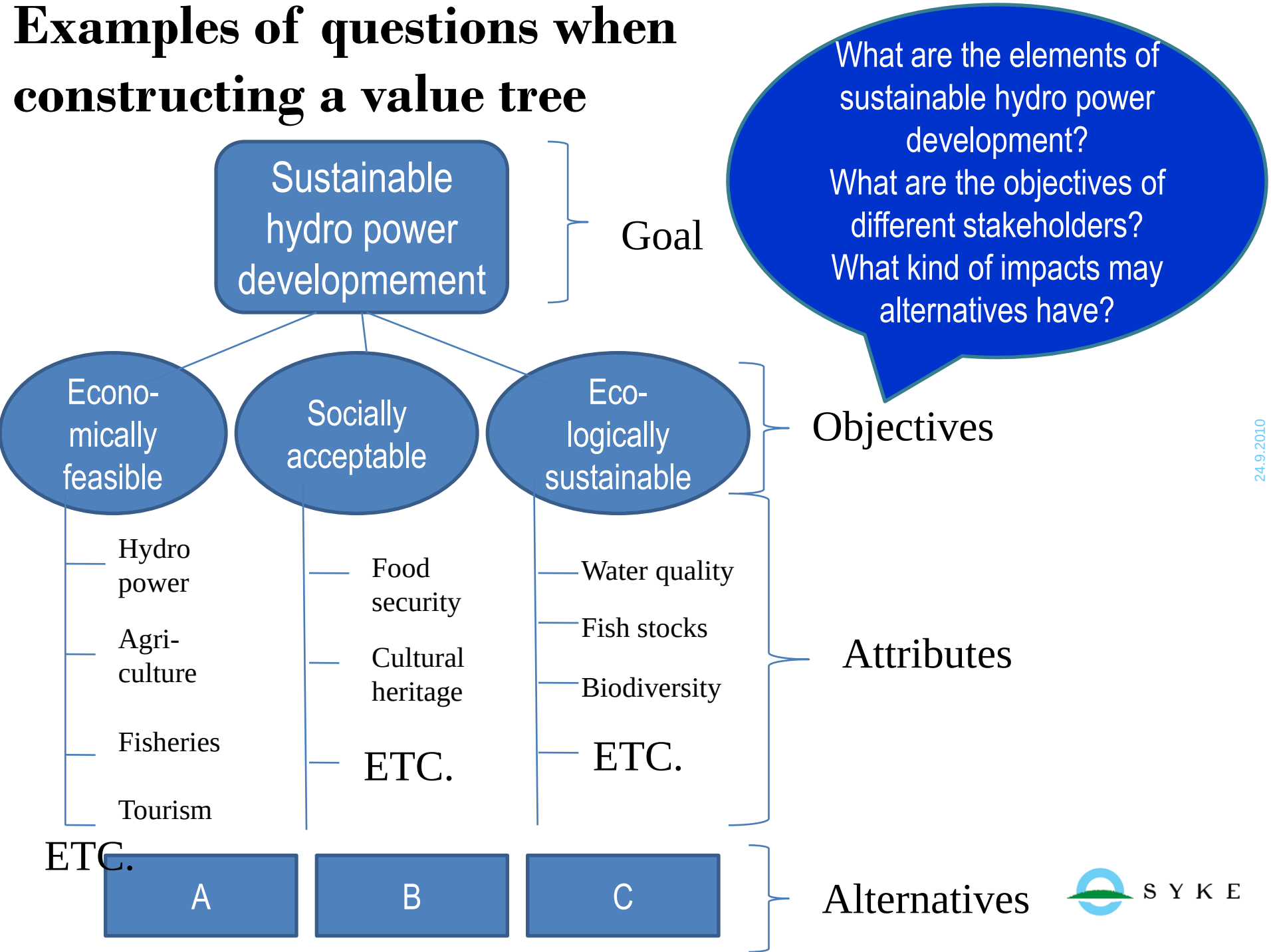
Step 5
- Analyse the results

Step1: Construct a value tree

- Value tree is a hierarchical structure of the objectives, criteria and alternatives
- Attributes are used to measure the performance of alternatives
- Very important phase because it forms the basis for later phases



Examples of questions when constructing a value tree



Step 2: Assess the performance of alternatives

- Alternatives' impacts with respect to each criterion are assessed (e.g. field studies, models, interviews, expert judgment)
- Natural scales (e.g. money, change in water quality) and constructed scales can be used

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Example of impact matrix

	Option A	Option B	Option C	Option D
Criterion 1	5	10	20	25
Criterion 2	10000	10000	5000	2000
Criterion 3	35	24	17	40
Criterion 4	12	17	12	65
Criterion 5	1	1	3	5
Criterion 6	0	-2	1	5

Step 3: Elicit weights for the criteria

The importance of the attribute depends on facts and values

How important is the objective /issue considered generally from the evaluator's point of view?

What is the impact range of alternatives?

- Magnitude
- Spatial and temporal scale
- Reversibility of the impact
- Probability

Attribute weight

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Step 3: Elicit weights for the criteria

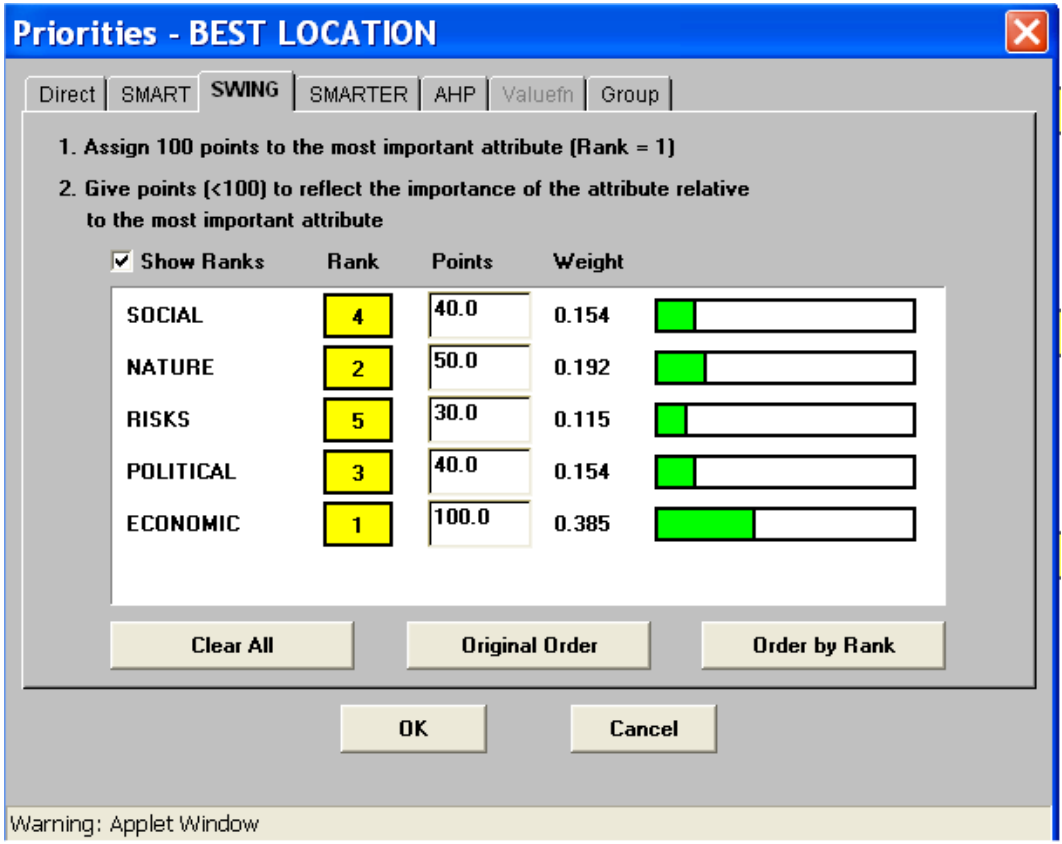
A simplified example of question:

Consider the impact ranges of alternative options in respect of each criterion.

Assign 100 points to the most important criterion and then….

The weights are context dependent.

It is senseless to ask which is more important economy or environment without defining impact ranges first.



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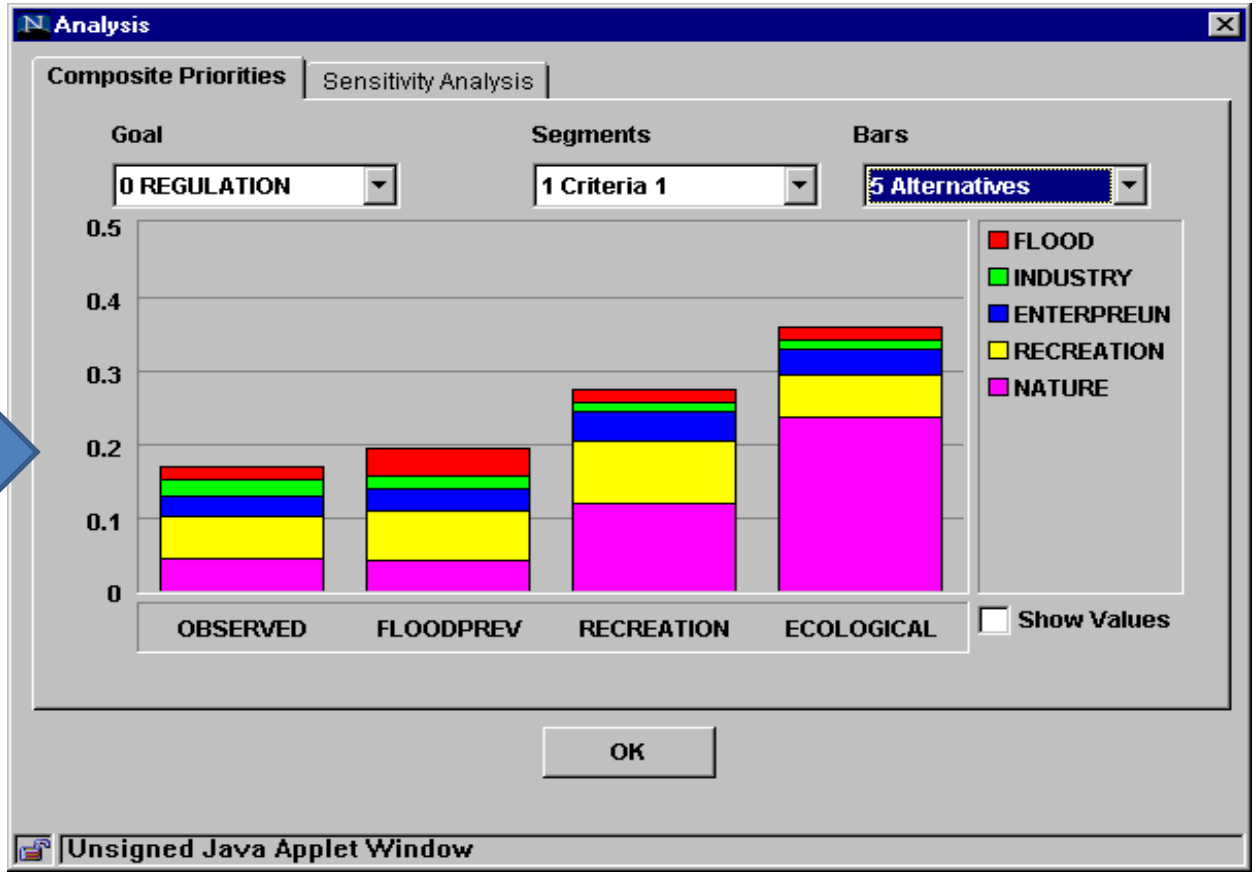
Step 4: Calculate overall value of the alternatives with MCDA software

Measurement value for the alternative

AND

Weights for the criteria



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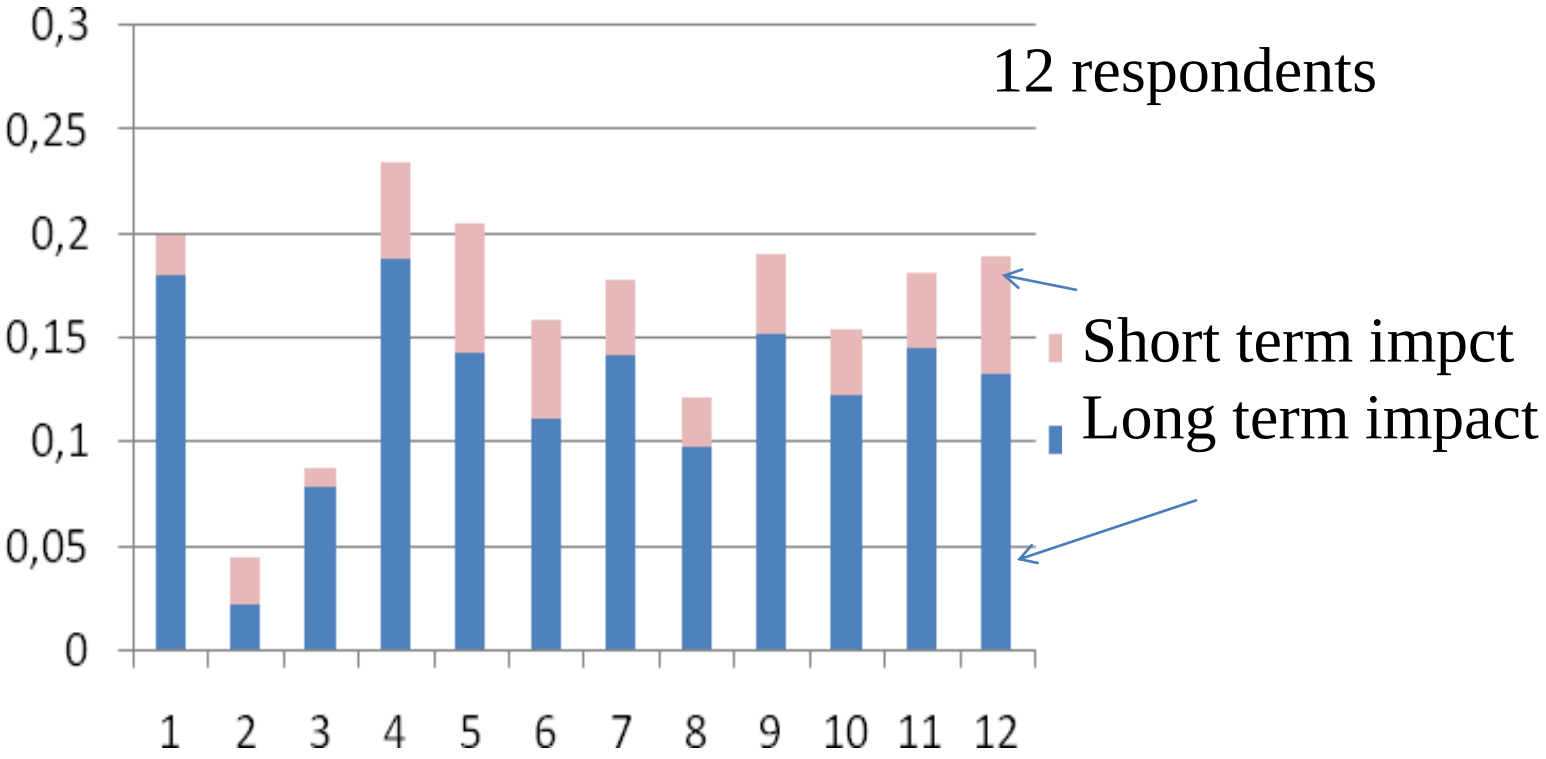
Step 5: Analysis of the results

- Multi-criteria process does not give a straight answer for which is the best alternative
  - Overall values indicate the 'desirability' of the alternatives with respect to the preference information given by the actor
  - Typically, there are great differences between the overall values of different actors

- Numbers encourage thinking and help to understand the ranges of impacts

Example: How important different actors considered the positive and negative impacts on river pearl mussel



The higher the bar, the more important the impact was considered

Important to remember!

- Final decision should not be left to the model. The purpose is to help decision makers to make more informed and better judgments.

- The outcome of MCDA is as versatile or onesided as are the opinions of those who are involved into the process.

- It is not possible to engage all people into the process. Wide spectrum of different opinions should be covered.

MCDA applications in SYKE

- >10 applications since 1991
  - Water course regulation
  - Hydro power (spillway alternatives)
  - River basin management
  - Lake and river restoration
  - Forest management

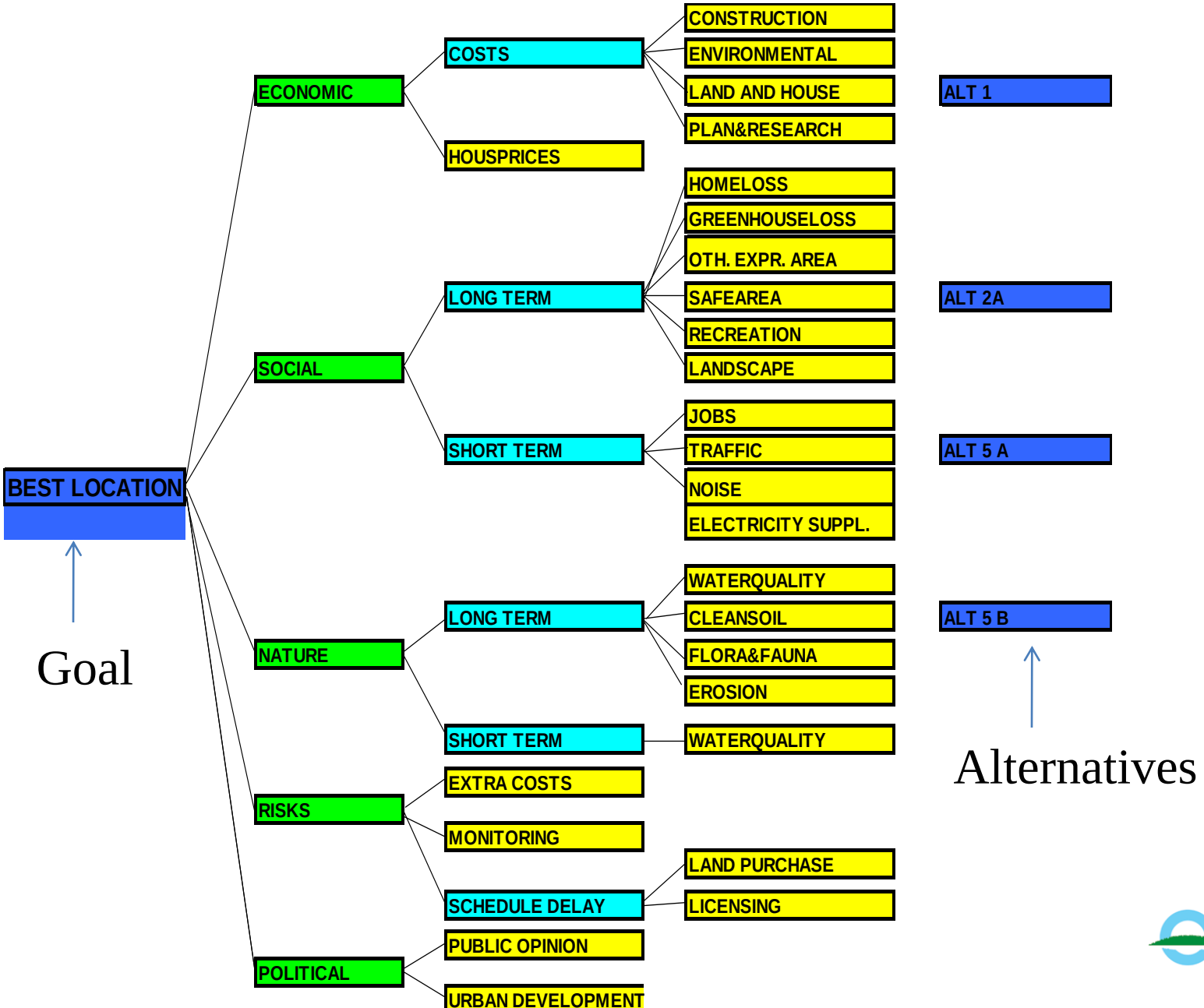
- Positive experiences from integrating MCDA into the planning processes of large and controversial projects

- Interactive use of MCDA with stakeholders have worked well

Case Plavinas (Latvia)

- Plavinas is the biggest hydro power plant (865 MW) in the River Daugava
  - Overflow capacity in the flood situations did not fullfill all international requirements
- Four different alternatives for locating spillway channels were evaluated
- Value tree analysis and Web-HIPRE –software were applied to structure the wide material gathererd in the EIA process

Value tree in Plavinas case



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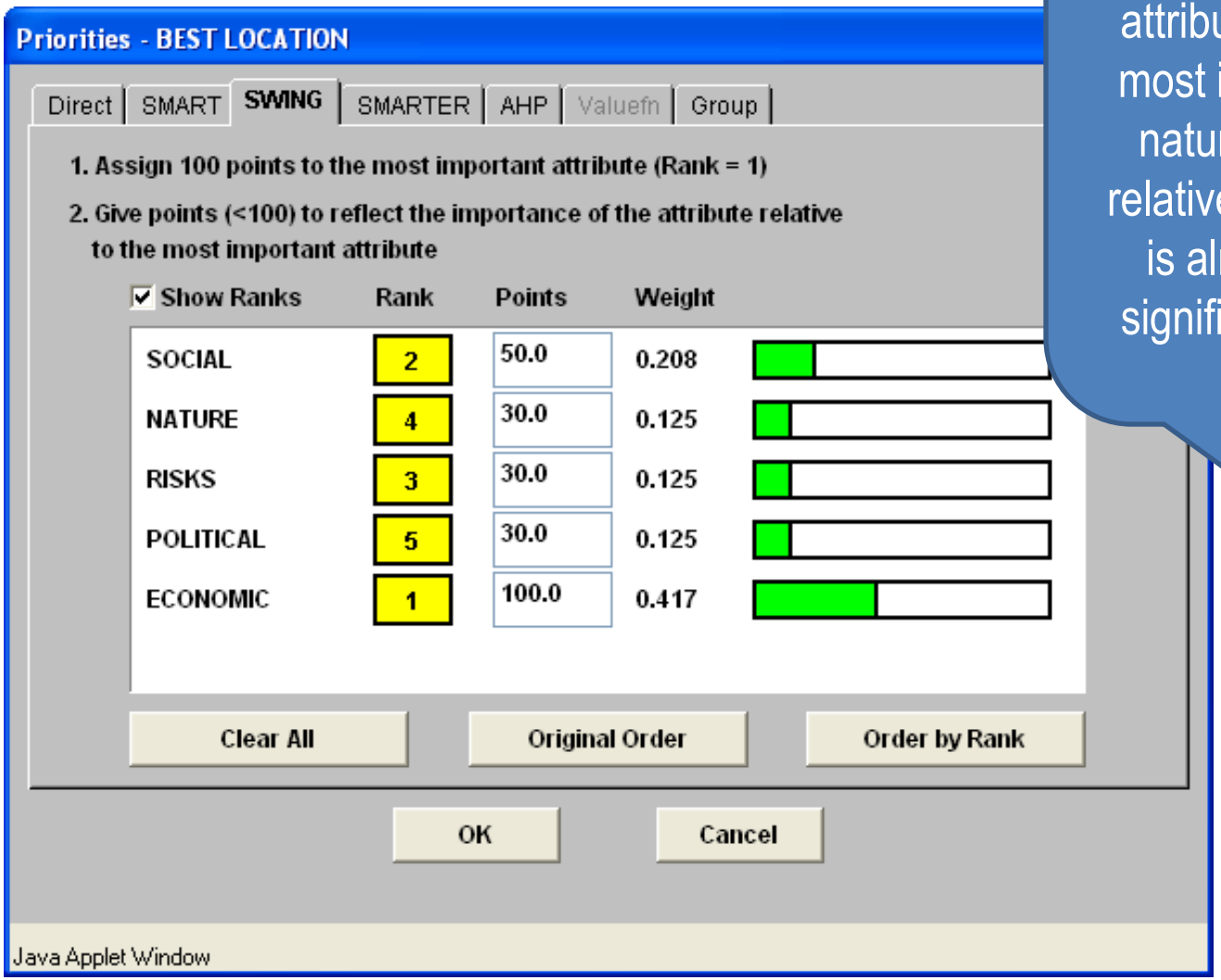
The relative weights of the objectives



The impact range in economic attribute was considered as the most important. The impacts on nature were considered to be relatively small because the river is already harnessed and no significant harmful impacts was expected.

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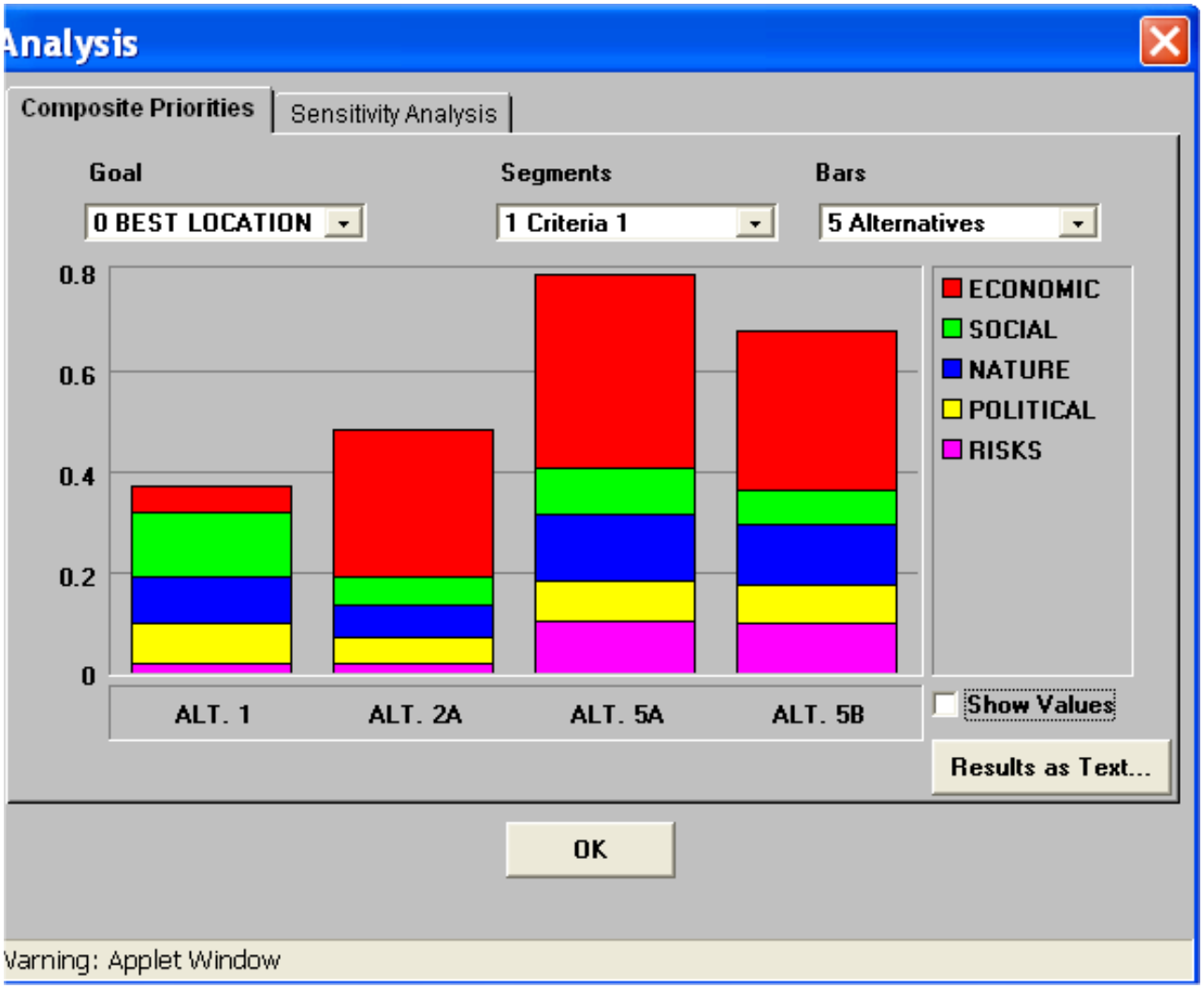
Priority values of the alternatives



The higher the column, the better the alternative is from evaluators' point of view

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Plavinas – Experiences from MCDA

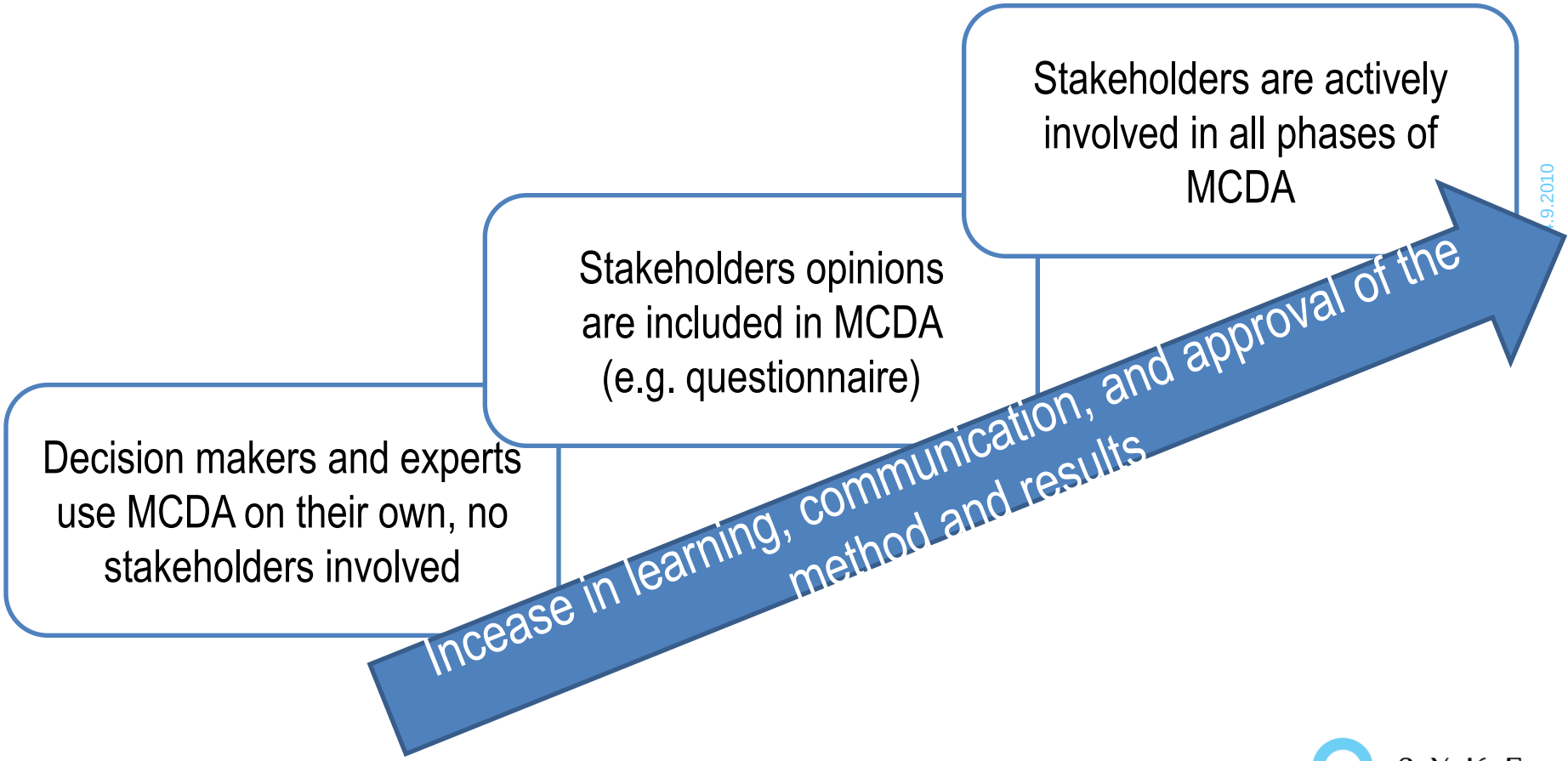
- Better overall understanding of the decision situation.
- The strenthgs and weaknesses of the alternatives was possible to analyse and illustrate.
- The analysis confirmed experts' preconception that alternative 5a is the most feasible one.
- MCDA helped in discussions between Finnish consultant and Latvian experts.

Benefits of MCDA in our projects

Logical framework for planning
Supports value-based planning
Common language in multidisciplinary groups
Synthesis of information and knowledge
Comparison of incommensurable impacts
Tool for stakeholder involvement
Individual and social learning
Helps to develop balanced and widely acceptable solitions

In our projects MCDA has been realised in many ways with respect to stakeholder involvement

The more open the process, the larger the benefits



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Challanges in the use of MCDA

- Facilitator must know well the method and its traps
  - Easy to use software can mislead
- Getting weights that reflect stakeholders opinions is difficult and prone to behavioral biases
  - Careful process design and realization important
- Process which actively engages stakeholders takes time
  - MCDA has to be introduced in the early phase

Examples of decision making and policy evaluation settings in hydro power development

- Comparison of long-term strategies and scenarios
- Evaluation of the sustainability of different projects
- Comparison of alternative project options
- Evaluation of different mitigation and compensation measures
- Definition of the scope and requirements of EIA

One way to learn the philosophy and use of MCDA:

Retrospective analysis of a completed project

Could your organization or LMB benefit from MCDA?

- Your ideas for future research
  - Possibilities regarding the use of MCDA
  - Possibilities regarding capacity building (education etc.) among experts, researchers etc.

Please write your comments on the evaluation form

Thank You!

Reflections on workshop discussions from the MCDA perspective

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Research needs?

- Basic
  - General understanding

- Policy related
  - Before planning impact studies and information needs it is important to identify the decision making or policy evaluations situation that they would relate to
  - MCDA often reveals lack of understanding of cause and effect chains and new information needs

Participation

- General hearing of stakeholders
  - Exposes general concerns and interests
  - Can be difficult to use in specific decision situations

- MCDA supported policy related participation
  - Identify the decision making or policy evaluation situation
  - Before participation we must have impact studies to show the range of alternatives' impacts – some social impacts elicited by partipatory processes
  - Stakeholders preferences should reflect ranges of impacts

Sustainability issue in decision making

- **Strong sustainability**: subjectivity (trade-offs) not allowed => planning constraints

- **Weak sustainability**: allows trade-offs e.g. based on stakeholders preferences => compromises possible => MCDA helps in the evaluation