

# Multi-Criteria Decision Analysis (MCDA) in the Participatory and Integrated Management of the Water Resources

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# Today's natural resource problems are complex !

## There is need:

- **to find balanced and widely acceptable solutions which reconcile many different objectives**
- **to gather, handle and discuss this information in an efficient and transparent way**
- **to compare systematically and comprehensively alternatives having ecological, social, cultural and economic dimensions**
- **to communicate and visualise results in a simple way**
- **to improve stakeholders involvement and to include stakeholders' objectives and preferences into the planning process in a structured way**

# What is Multi-Criteria Decision Analysis (MCDA)?

- MCDA methods have been developed to **improve the quality of decisions.**
- The goal is to create a **structured process in close collaboration** with the interest groups.

## **Structured process**

**Step 1** Construct a value tree



**Step 2** Assess the performance of alternatives



**Step 3** Elicit weights for the criteria

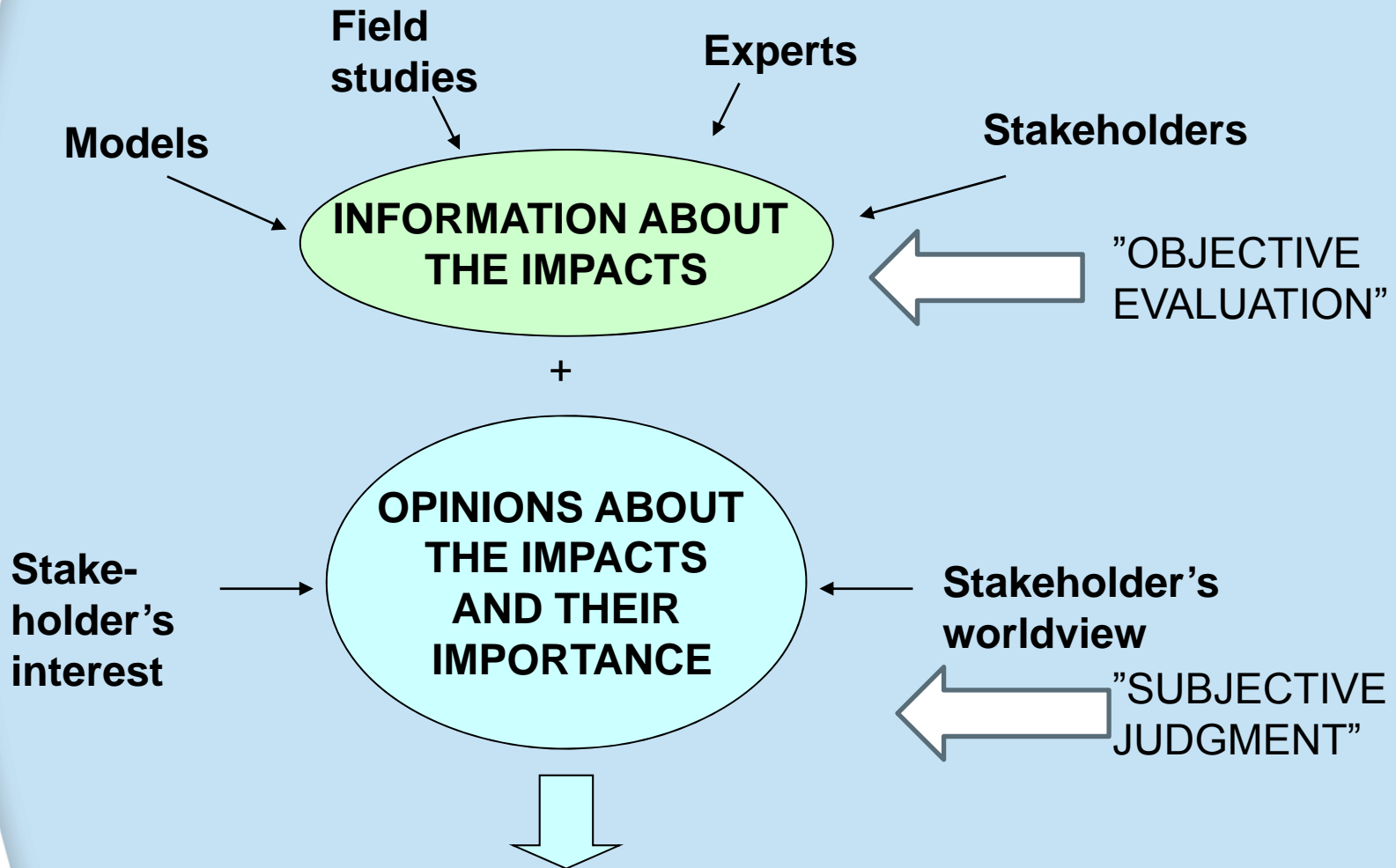


**Step 4** Calculate overall value of the alternatives



**Step 5** Analyse the results

# MCDA aggregates information of impacts and stakeholders' values

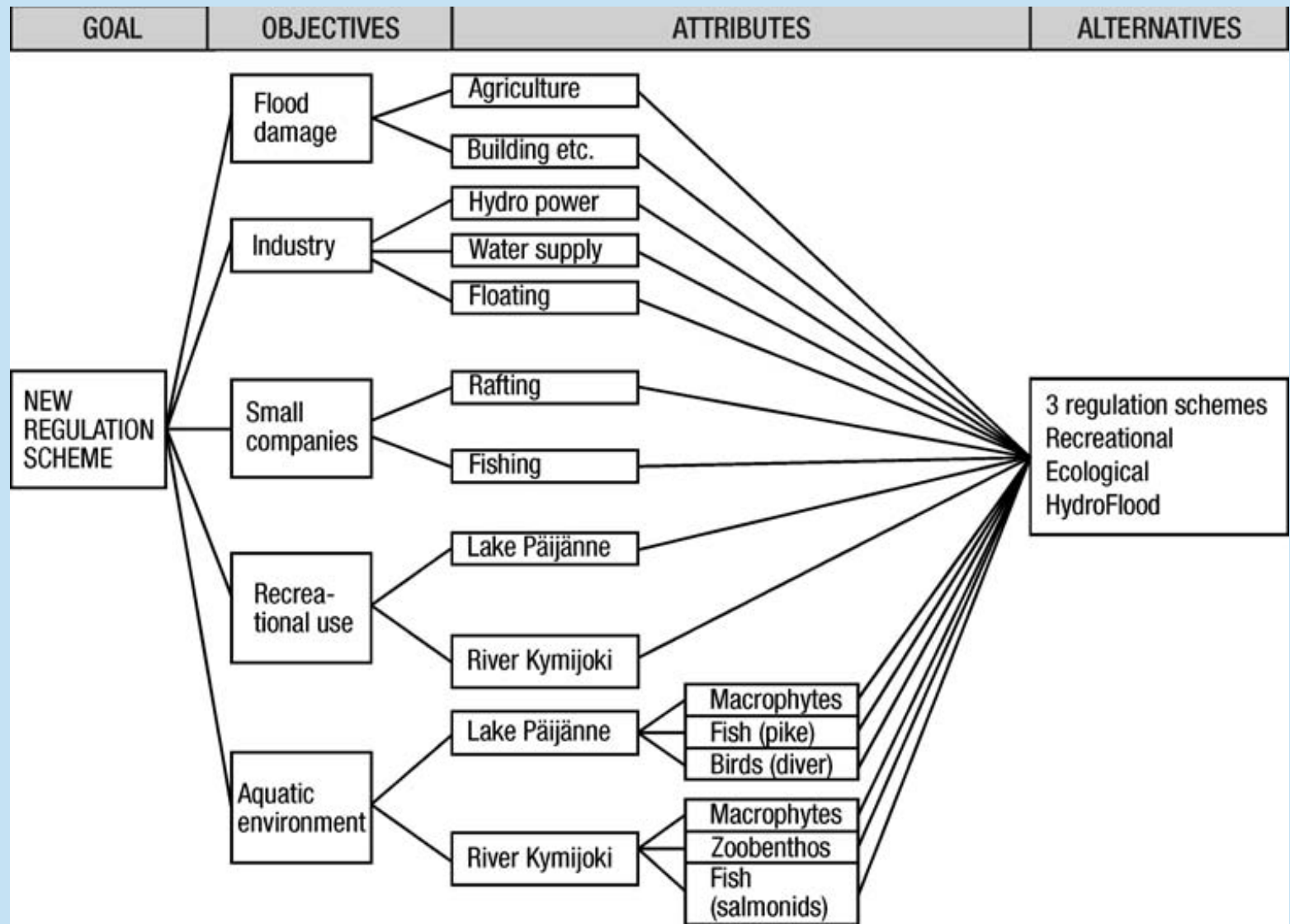


**RATING AND RANKING THE OPTIONS WITH THE HELP OF WEB-HIPRE SOFTWARE**

# The Lake Päijänne Regulation Development Project

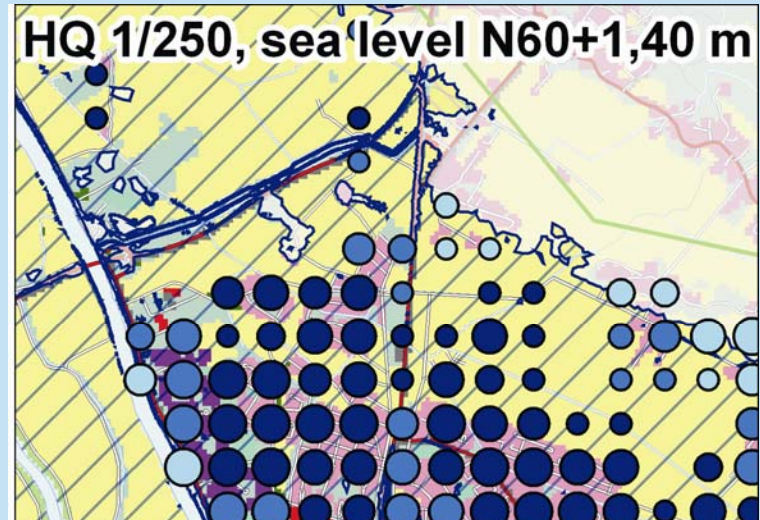
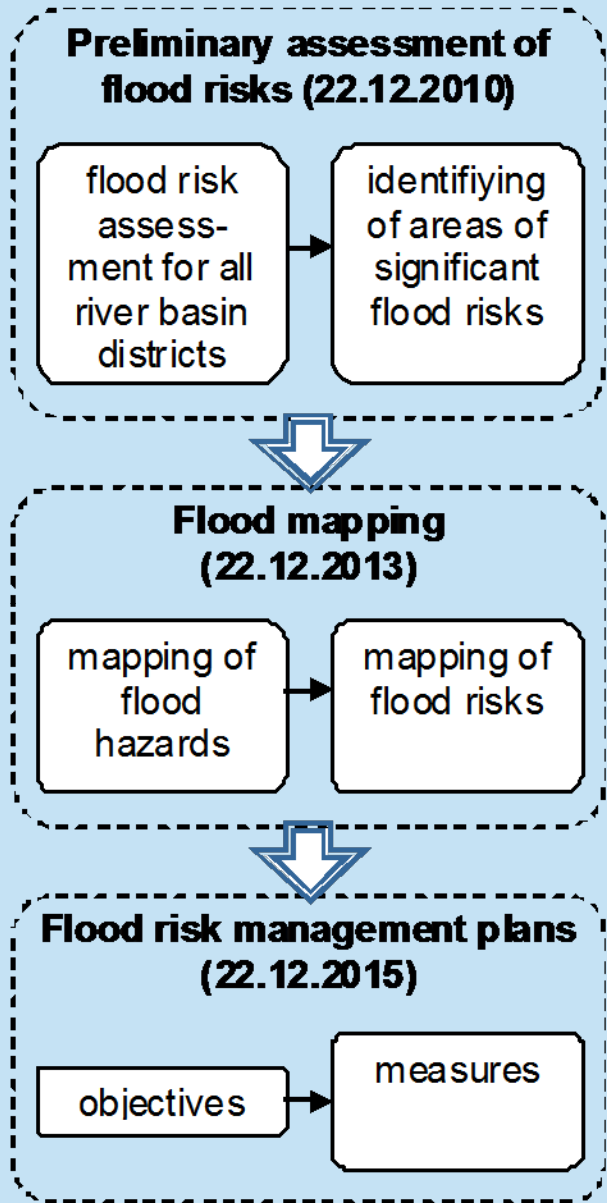
- The Lake Päijänne is the second largest lake in Finland, with a surface area of 1100 km<sup>2</sup>.
- The aim of the project was
  - to study ecological, social and economic impacts of regulation
  - to investigate the opportunities to revise old regulation scheme and
  - to find new ways to mitigate its adverse impacts
- In order to improve opportunities for finding a common understanding MCDA process was utilized.

# The value tree used in interviews



# The Assessment and Management of Flood Risk

From Identification to management of flood risks



- inundated area
- flood protected area

**Inhabitants in 250x250 m cells**

- 1-10 inhabitants
- 11-20 inhabitants
- 21-40 inhabitants
- 41-60 inhabitants
- 61-120 inhabitants
- 121-500 inhabitants
- 500-2500 inhabitants

**Max. water depth in the cell**

- 0 - 0.5 m
- 0.5 - 1 m
- > 1 m
- flood protected area



# Two areas of potential significant flood risk

## 1. The City of Pori

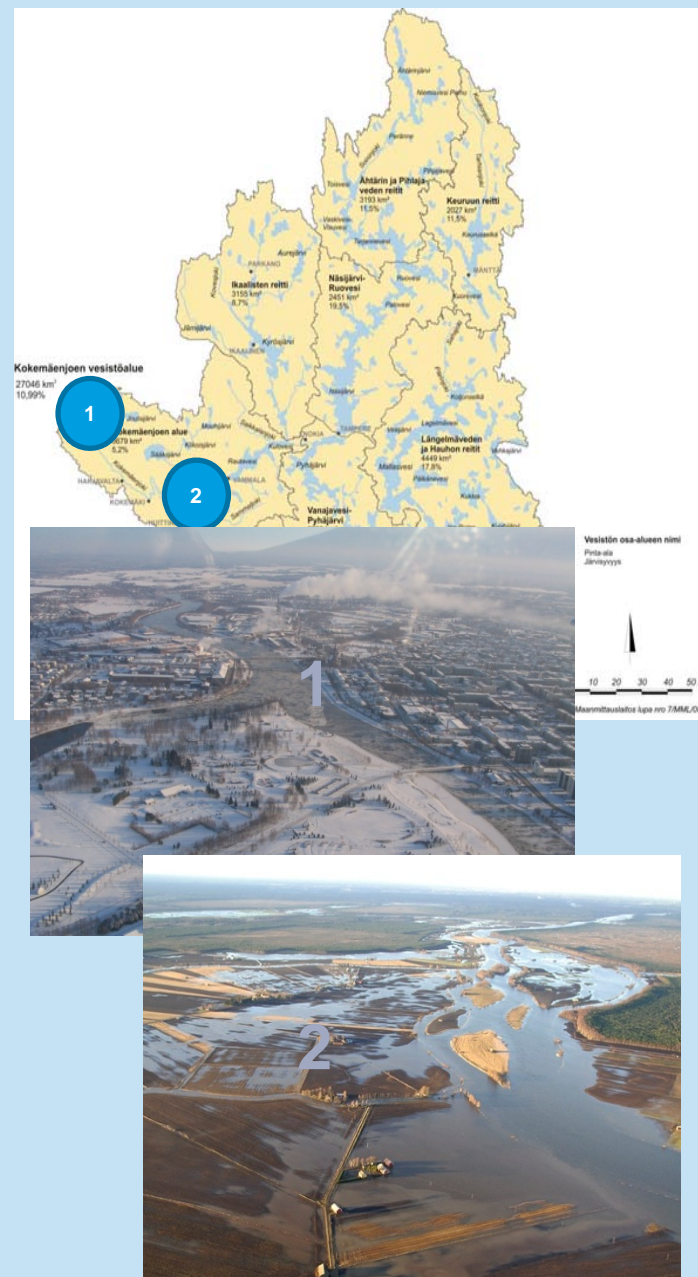
**Direct damages 200-300 million € in serious ice jam flood, estimated probability 0,5 – 1 %**

**Objective is to avoid damages in the City center and industrial sites in these situations**

## 2. The City of Huittinen

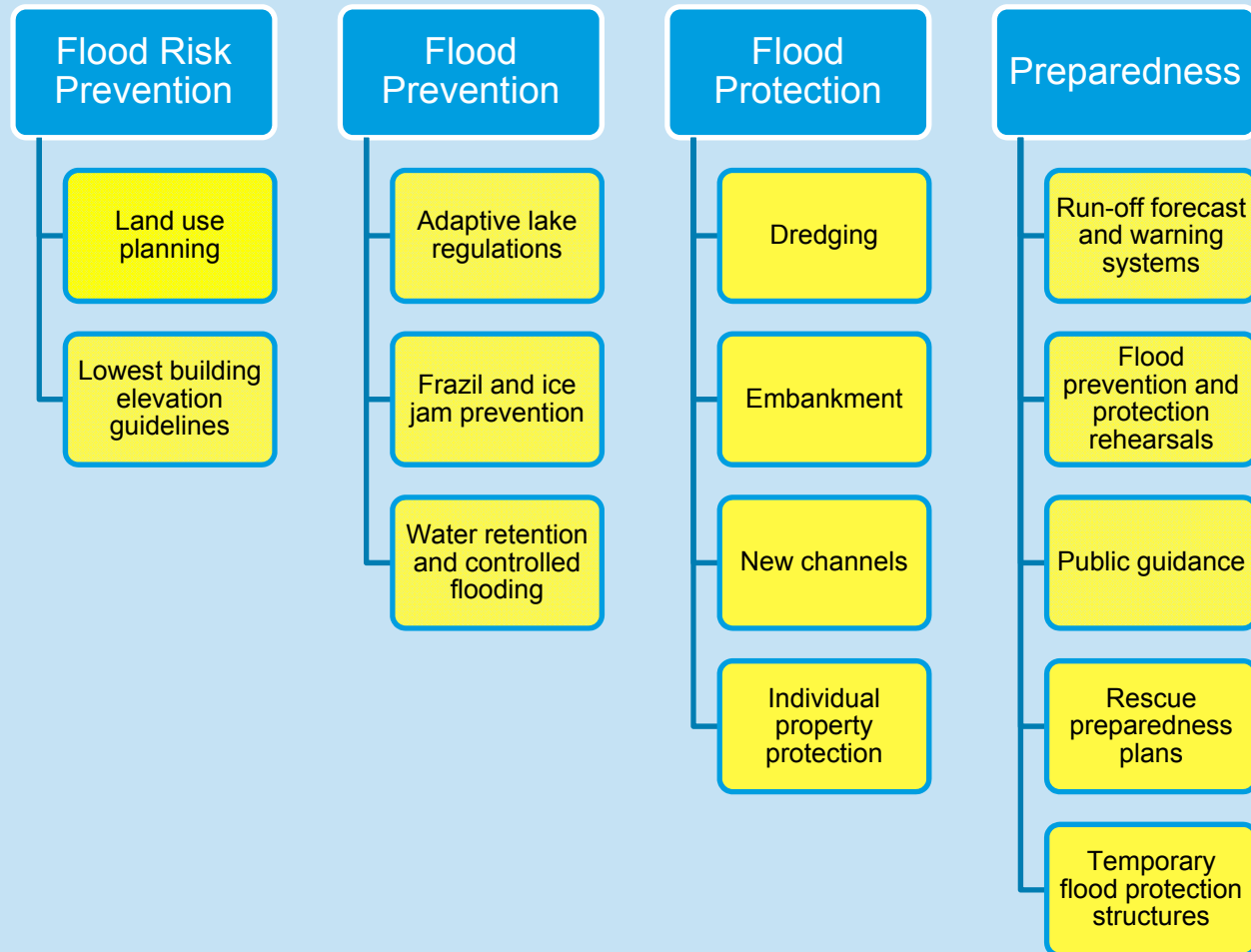
**Direct damages 5-10 million € in 1 % probability open water flood and ice jam flood**

**Objective is to avoid damages for residential buildings and wastewater treatment plant in these situations**





# Flood Risk Management Measures - Case Study of the River Kokemäenjoki



# The Multi-Criteria Decision application to flood risk management

**The main objectives of MCDA application in Kokemäenjoki River:**

- **to support systematic and transparent evaluation of alternatives**
- **to facilitate discussion in multi-stakeholder group**
- **to find balanced and widely acceptable solutions**

**The main outcomes of the MCDA application are:**

- **evaluation framework (value tree)**
- **impact matrix describing consequences of measures**
- **weight profiles for criteria (floods, economy, ecology, social)**
- **priority values and ranking of the measures**

**Provides a meaningful and logical framework for the planning**

**Supports finding balanced and widely acceptable solutions**

**Supports synthesis of information and helps to identify data gaps and uncertainties**

**BENEFITS OF MCDA**

**Clarifies issues of agreement and disagreement**

**Supports participants' comprehensive understanding of the planning situation**

**Facilitates discussion in multi-stakeholder group and helps to find a common language**

**Supports systematic and transparent evaluation of alternatives**



