



Measuring the experts' perception on the suitability of natural disaster risk mitigation solutions based on minimal risk assessment information, in the presence of severe uncertainty, a Multi-Criteria Decision Analysis approach

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#### Disaster Risk Assessment and Risk Management Solutions

- The result of disaster risk assessment provides the estimated impact under different conditions.
- Conditions include the severity of disaster as well as preventive or risk management measures.
- Main Challenges:
  - Tailoring to Local Characteristics
  - Uncertainty caused by probabilistic estimation.







### **Disaster risk Management: Taking into Account Experts' Opinion**

- The uncertainty can be addressed by probabilistic methods:
  - Second Order belief distribution (e.g. Dirichlet Distribution)
- Tailoring the adopted risk management solution to local characteristics, needs experts' opinion:
  - Suitability of solutions (based on outcome);
    - High level of subjectivity in choosing the solution.
    - Lower complexity
  - Priorities to be addressed based on Scenario Impact mapping;
    - Subjectivity is in choosing pressing issue.
    - · Needs to be translated to solution







### **Natural Hazard Risk Management Solution: MCDA approach**

- Present Scenario–Impact map to the Expert;
- Discuss the criteria representing the severity of each of the social, physical, economic dimensions of the impact.
- Elicit experts opinion as cardinal ranking of the criteria.
- Convert the Cardinal rankings to weights e.g., see CAR method (Danielson & Ekenberg; 2016)
- Calculate cardinal ranking of all alternatives based on the probability distribution of Gamma evaluations.



Cr5

Cr2

Cr6

Cr4

Cr7





#### Natural Hazard Risk Management: The decision model





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### **Practical use: MEDiate project**

- MEDiate is a Horizon Europe project aimed to codesign and develop a platform for multi hazard disaster risk management. it is being implemented in 4 testbeds (Oslo, Nice, Essex and Múlaþing).
- MEDiate provides a DSS with advanced MCDA layer.
- This MCDA is works on Scenario–Impact data and experts' opinion on local important issue.
- The DSS platform has been successfully tested in different test sties.



https://mediate-project.eu/





# MCDA approach to measure Expert's opinion:

Show

 Cardinal ranking of alternatives, based on Gamma distribution shows the expert's estimated level of belief in suitability of each alternative.



B) Relations Between Alternatives



Confident (90+% support)
Rather confident (75-90% support)
Not confident (50-75% support)





# MCDA approach to measure Expert's opinion:

 The structure of this method creates a opportunity to have multiple opinion from experts and stakeholders and community representatives, combined into one collective ranking.











## Thank you.

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