Concept of Integral Risk Management

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Risk is a construct.

Outline

1. How we define risk? Why do we use the construct „risk“?

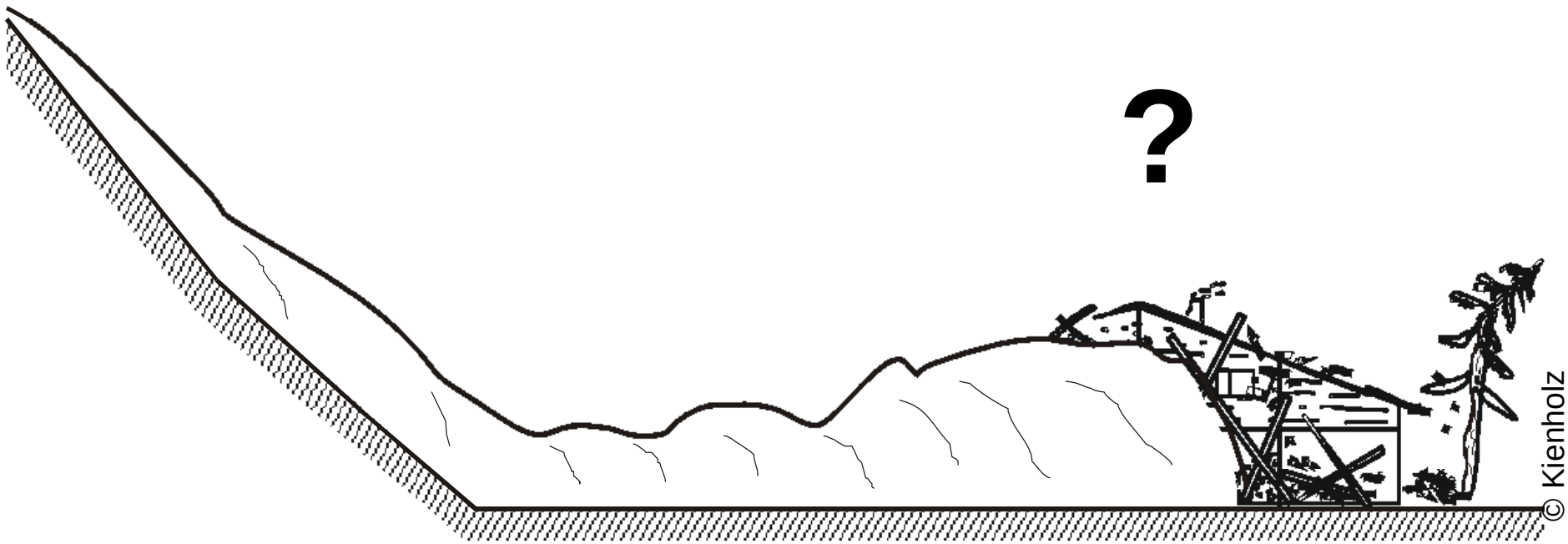
2. Components of risk-based dealing with natural hazards.
   a. Risk analysis
   b. Risk evaluation
   c. Risk mitigation

3. Chances and Risks in the application.

4. Putting the risk concept into practice.

5. Conclusions and Outlook

Disaster



Dangerous process
magnitude
probability of occurrence

Loss
value
probability of presence
vulnerability

Definition of risk

Risk depends on

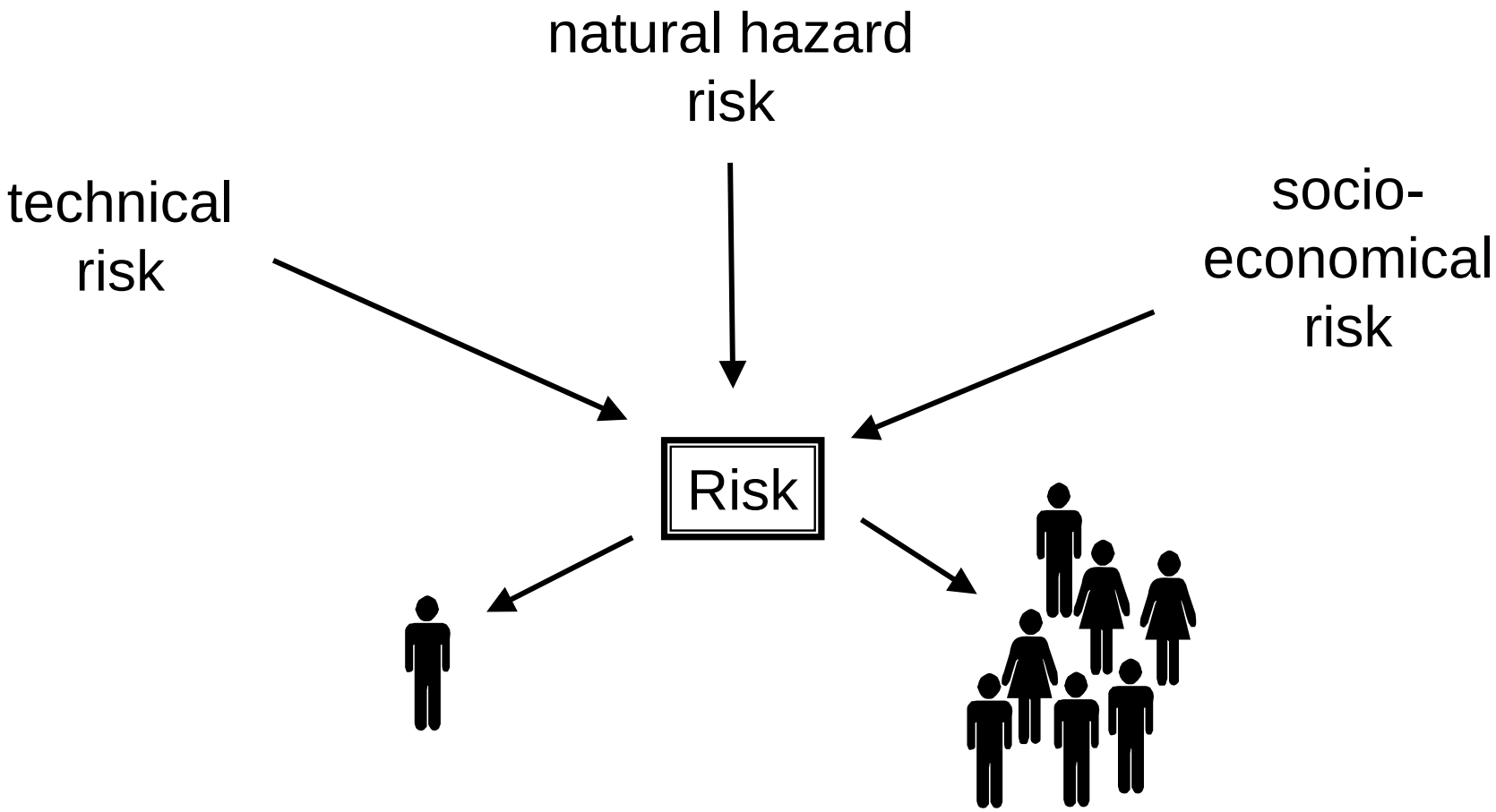
the **probability of occurrence** of a process, and

the **expected loss**

$$R_{i,j} = f\,(p_{Si},\ A_{Oj},\ v_{Oj,\,Si},\ p_{Oj,\,Si})$$

$R_{i,\,j}$	=	risk
p_{Si}	=	probability of occurrence of scenario *i*
A_{Oj}	=	value of object *j*
$v_{Oj,\,Si}$	=	vulnerabilty of object *j* responding to scenario *i*
$p_{Oj,\,Si}$	=	probability of presence of object *j* responding to scenario *i*

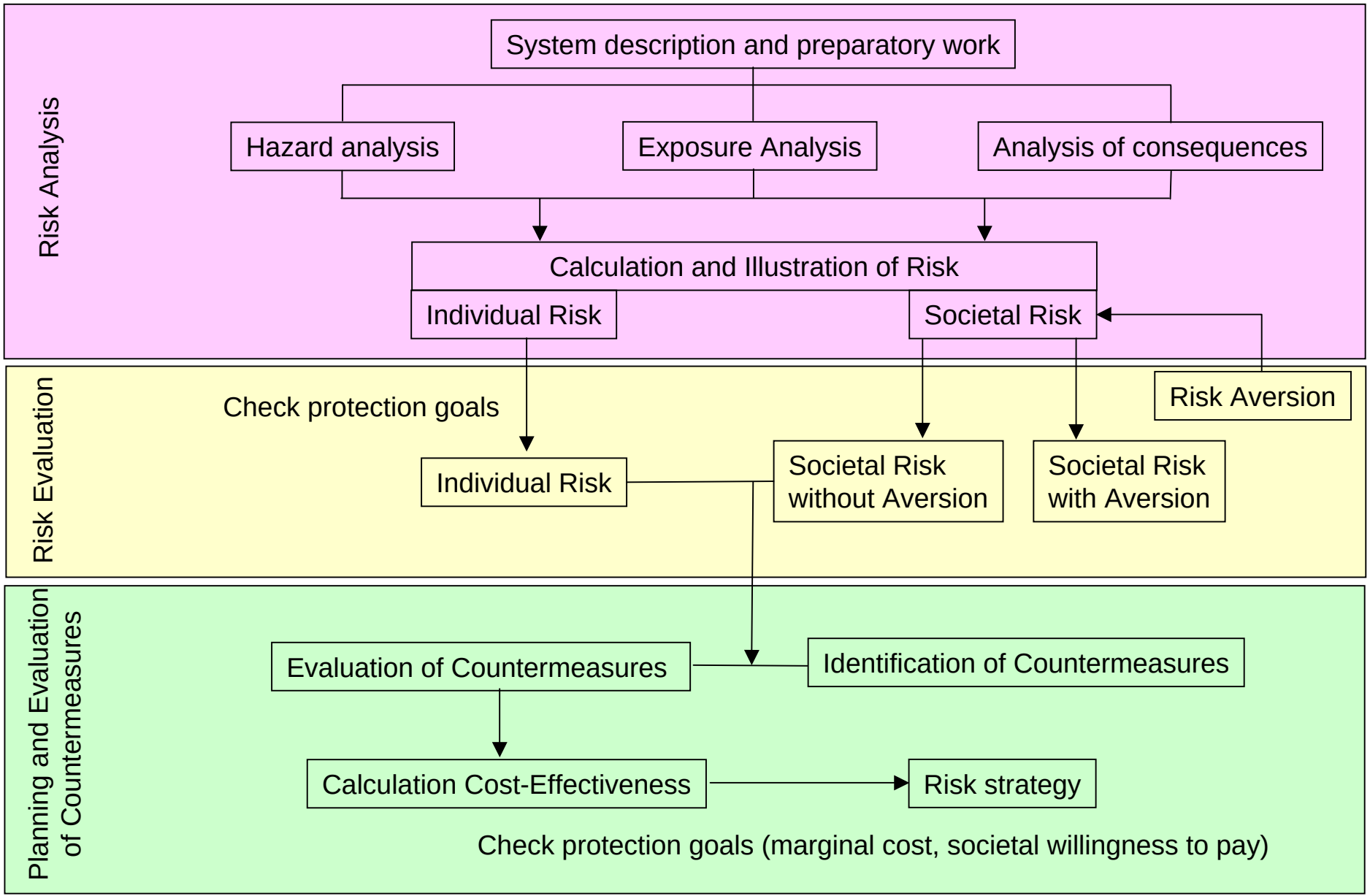
Comparison of risk from different sources



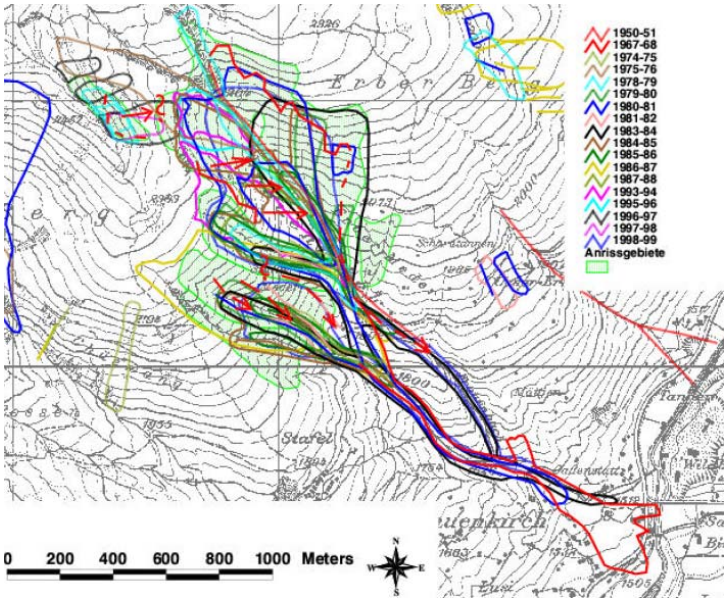
Risk assessment as decision tool

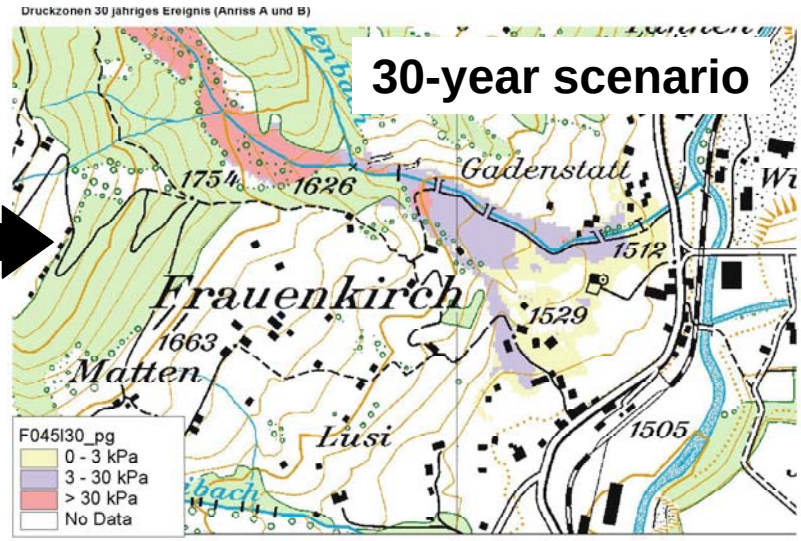
BUWAL, BABS und BWG, 2005

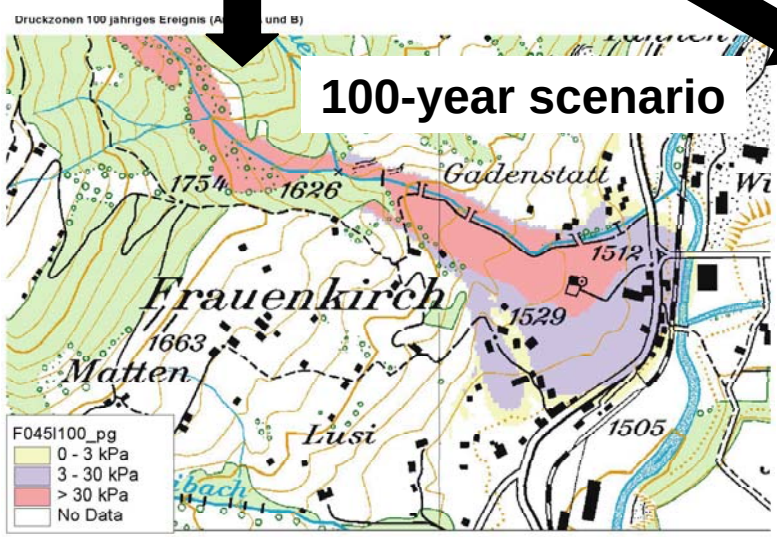
Risk concept

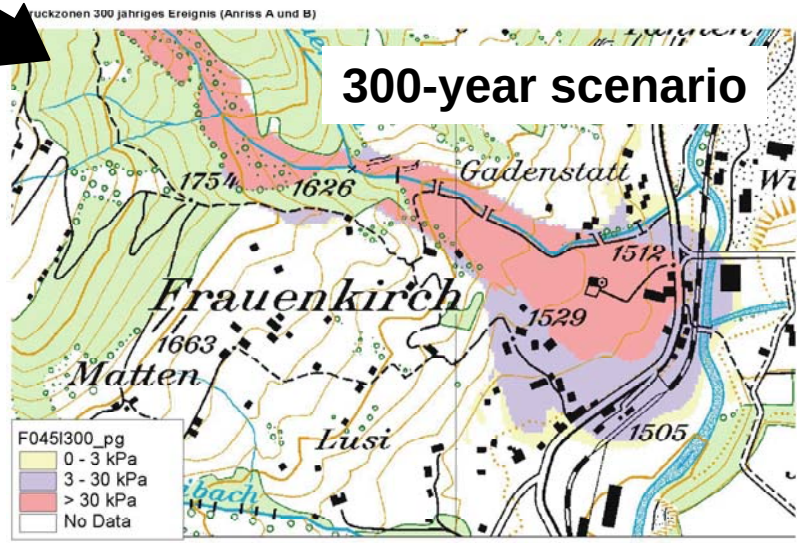


Risk Analysis: Hazard analysis

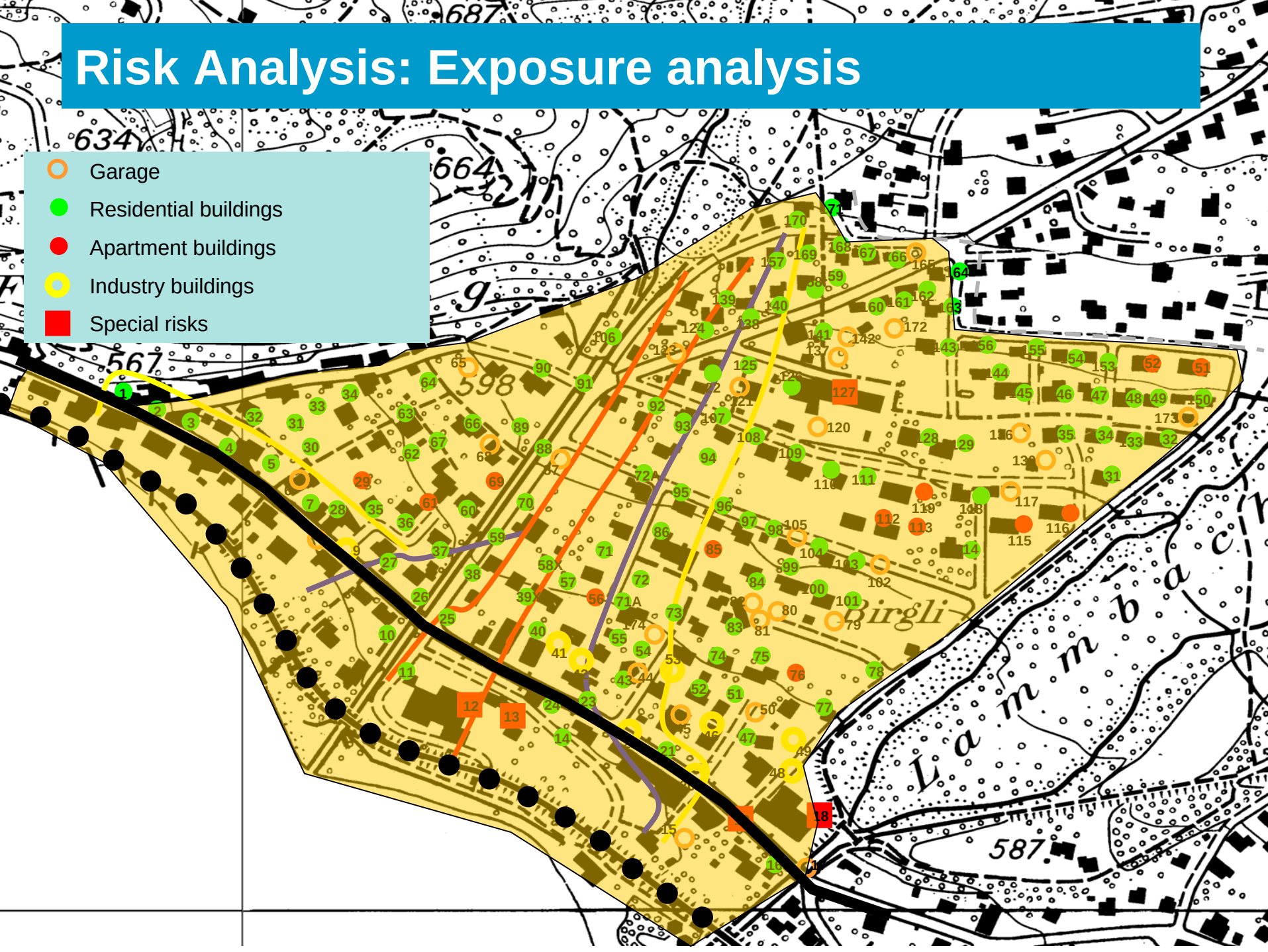






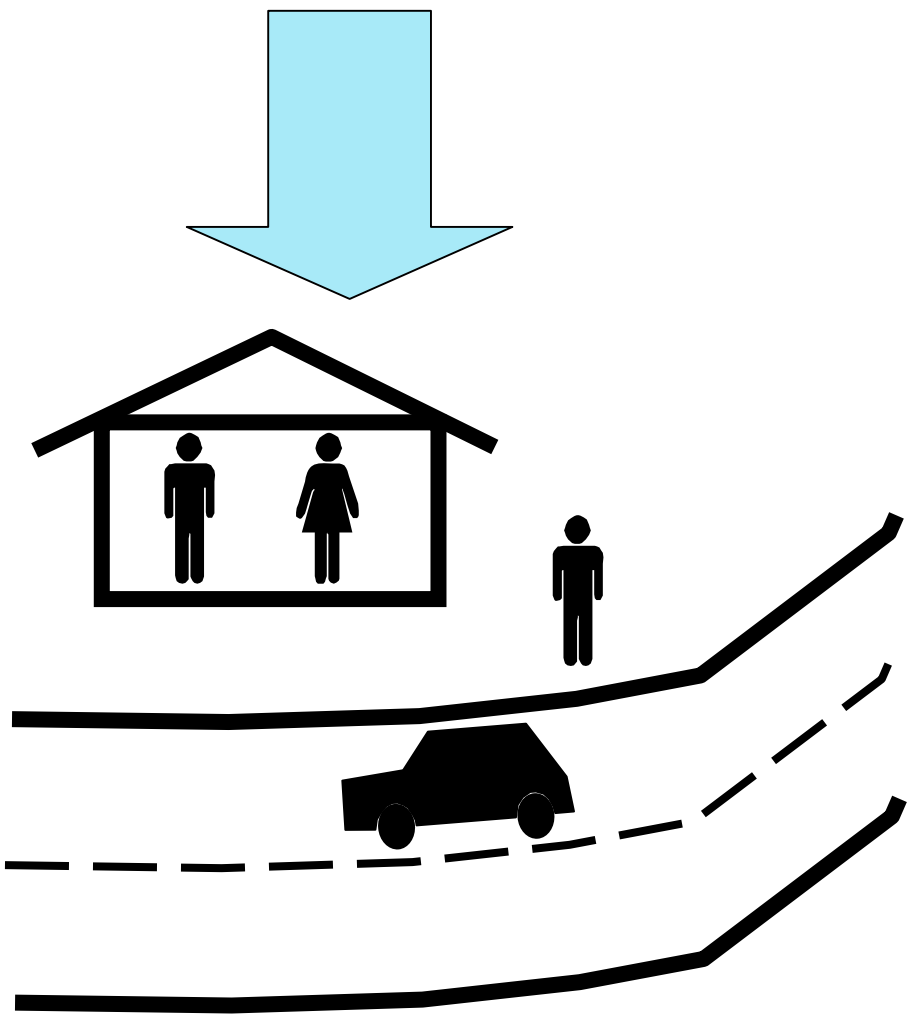


Risk Analysis: Exposure analysis

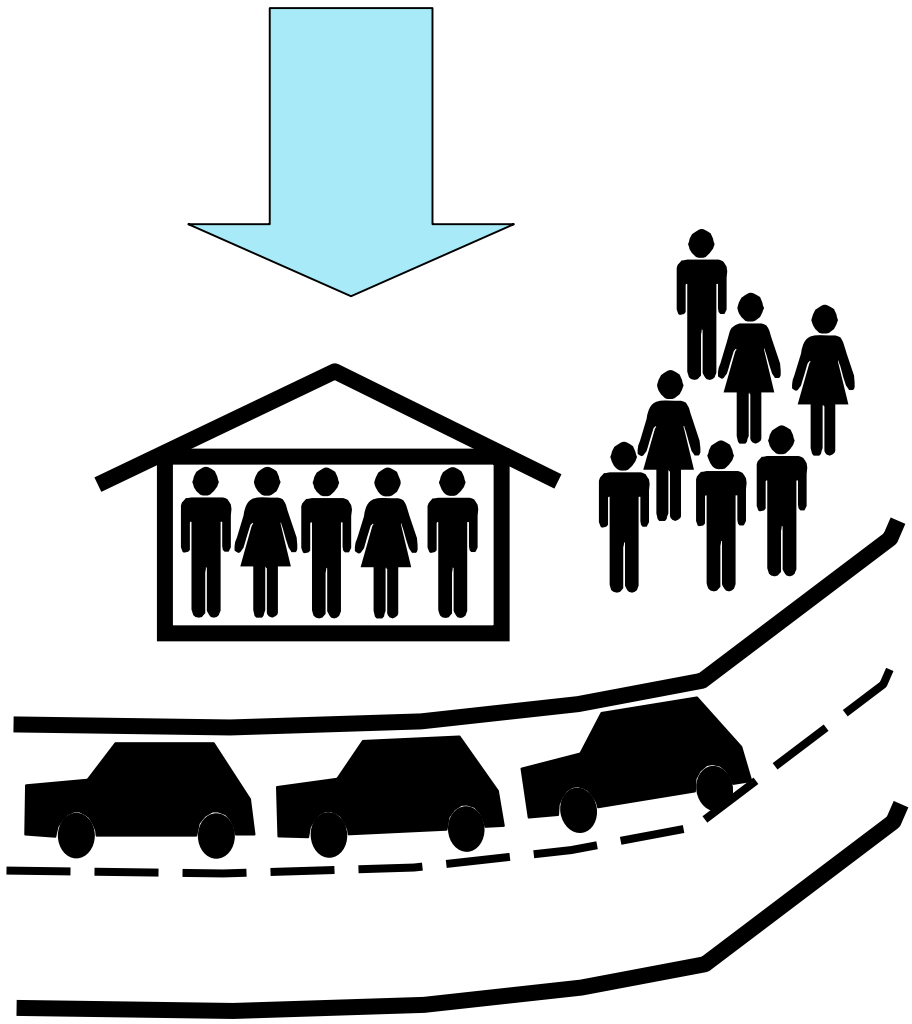


Exposure analysis: varying number of persons

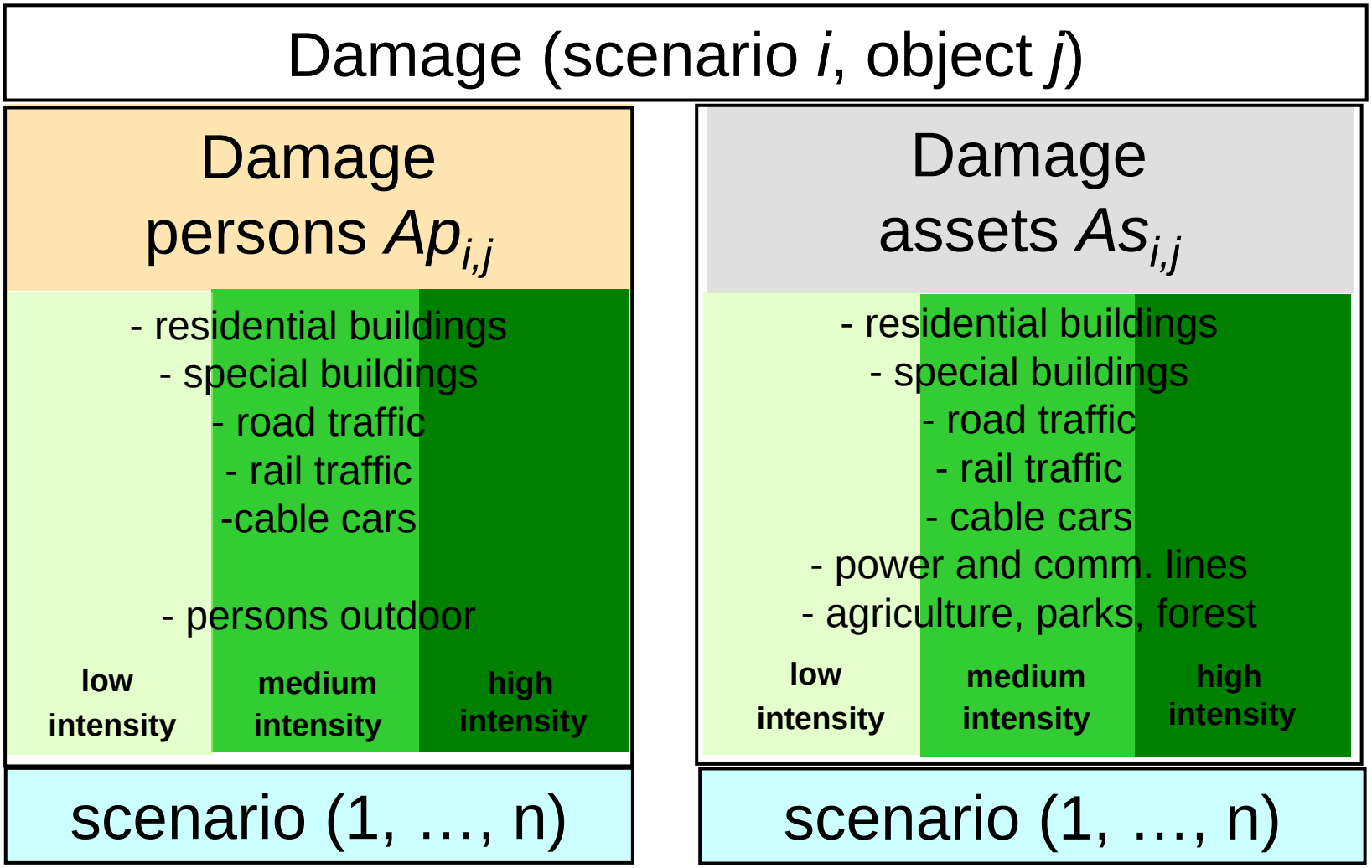
Situation 1



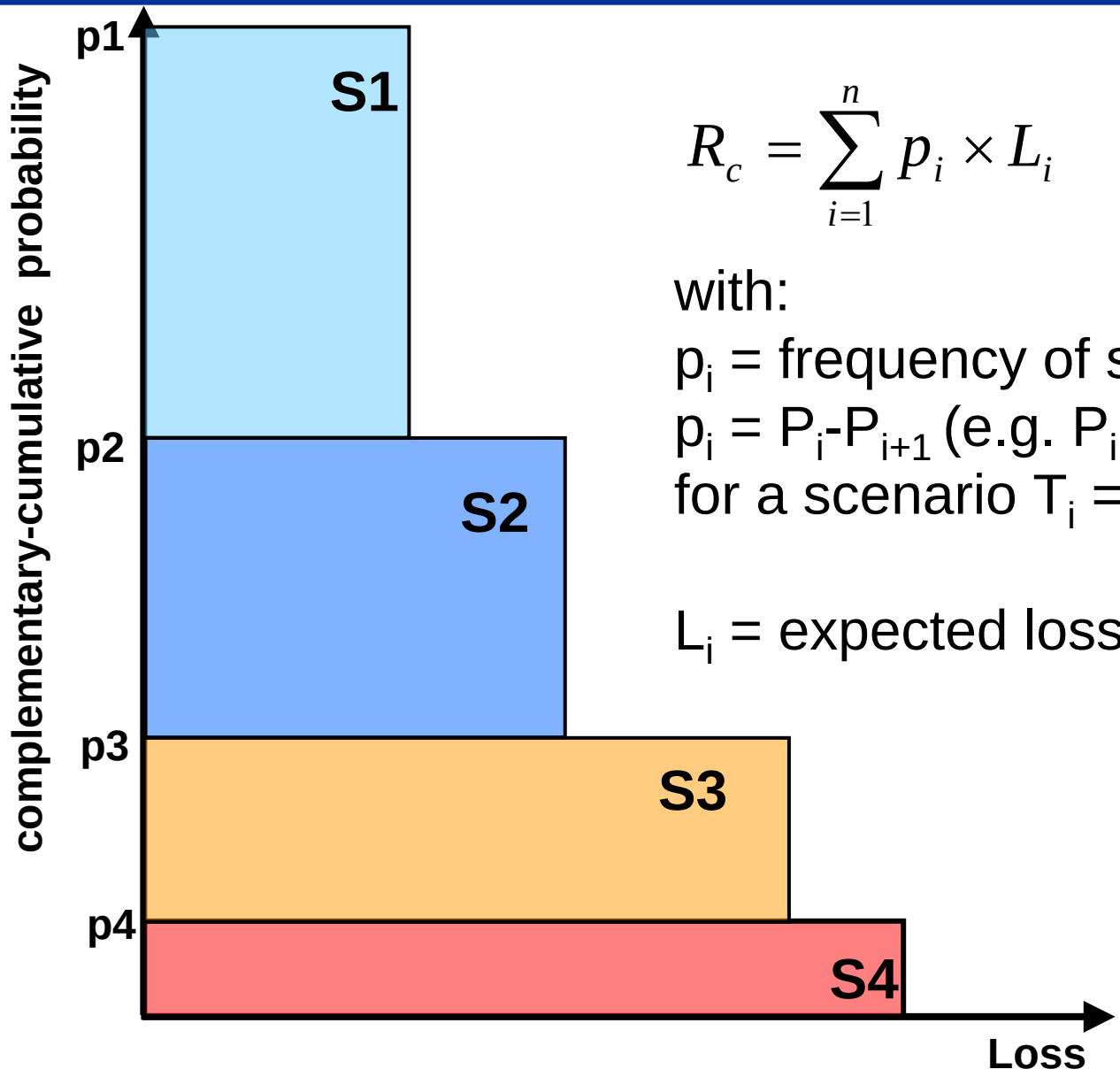
Situation 2



Consequence analysis: calculation of damage



Calculation of societal risk



$$R_c = \sum_{i=1}^{n} p_i \times L_i$$

[# fatalities/a]
[Euro/a]

with:

p_i = frequency of scenario i

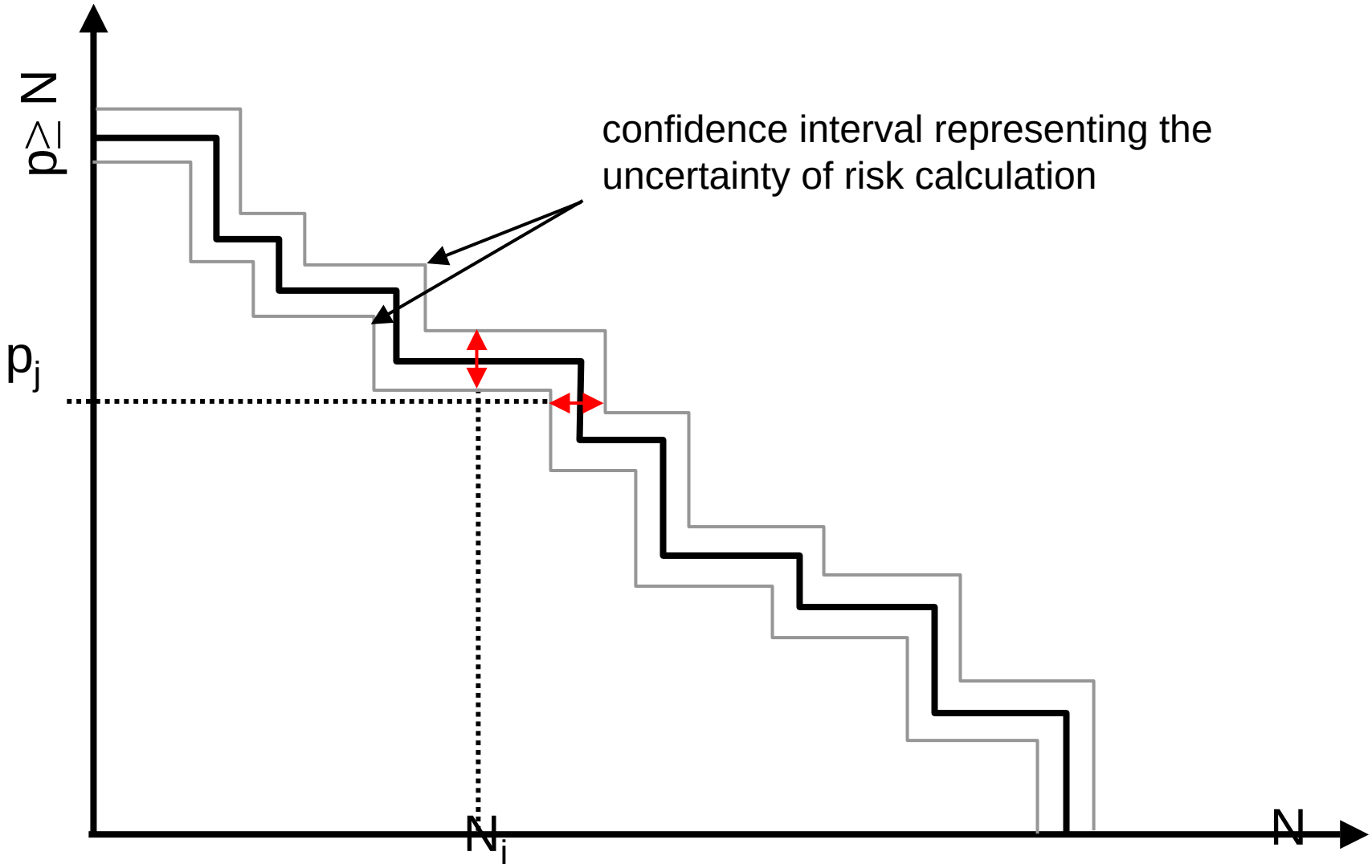
$p_i = P_i - P_{i+1}$ (e.g. $P_i = 0.1$; $P_{i+1} = 0.033$, for a scenario $T_i = 10$ years)

L_i = expected loss of scenario i

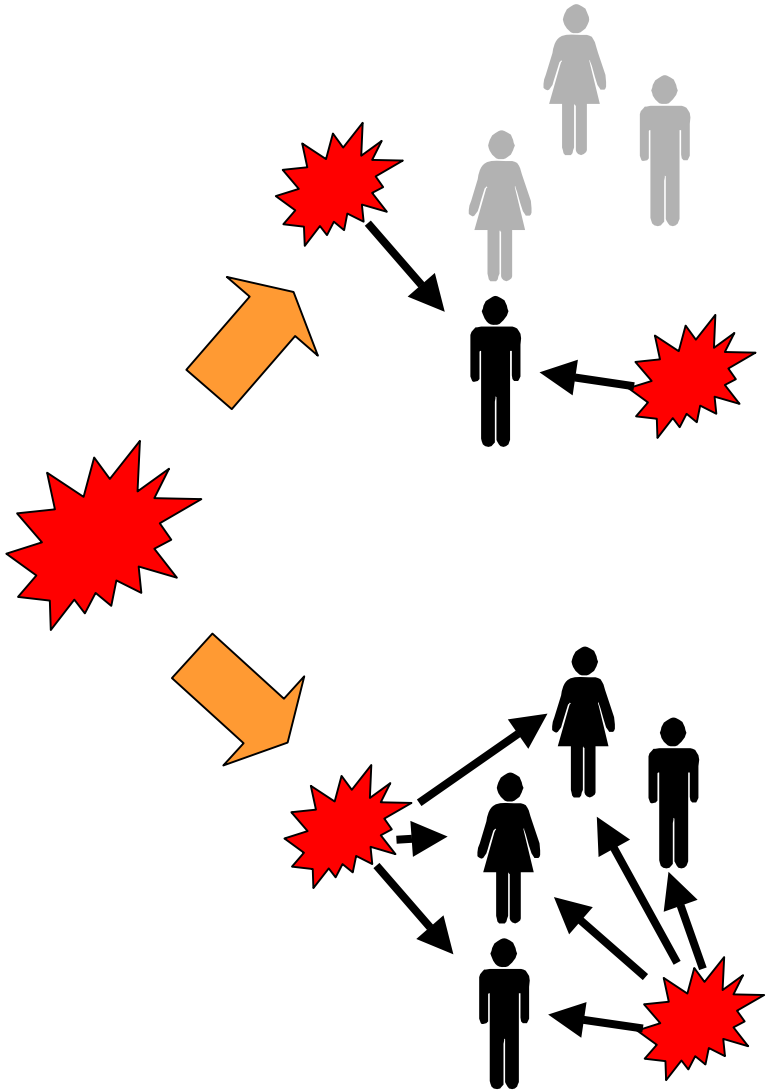
Risk analysis: presentation of societal risk

„A single number is not a big enough concept to communicate the idea of risk. It takes a whole curve.“ (Kaplan and Garrick, 1981)

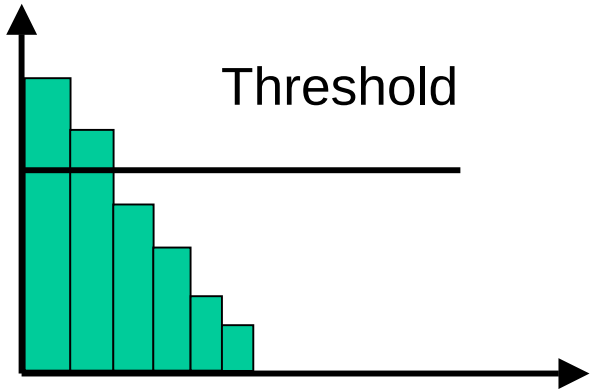
Risk analysis: presentation of societal risk



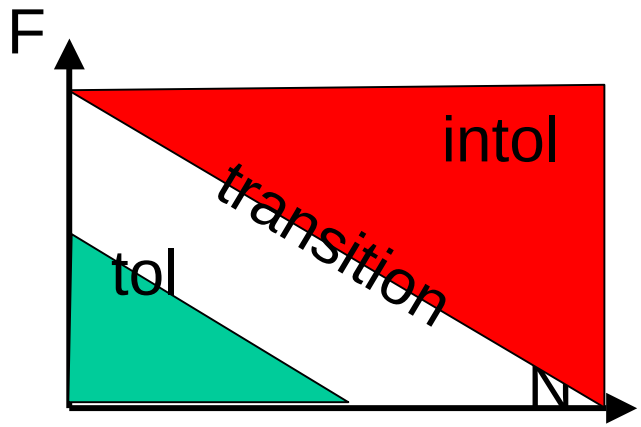
Risk Evaluation



Individual risk

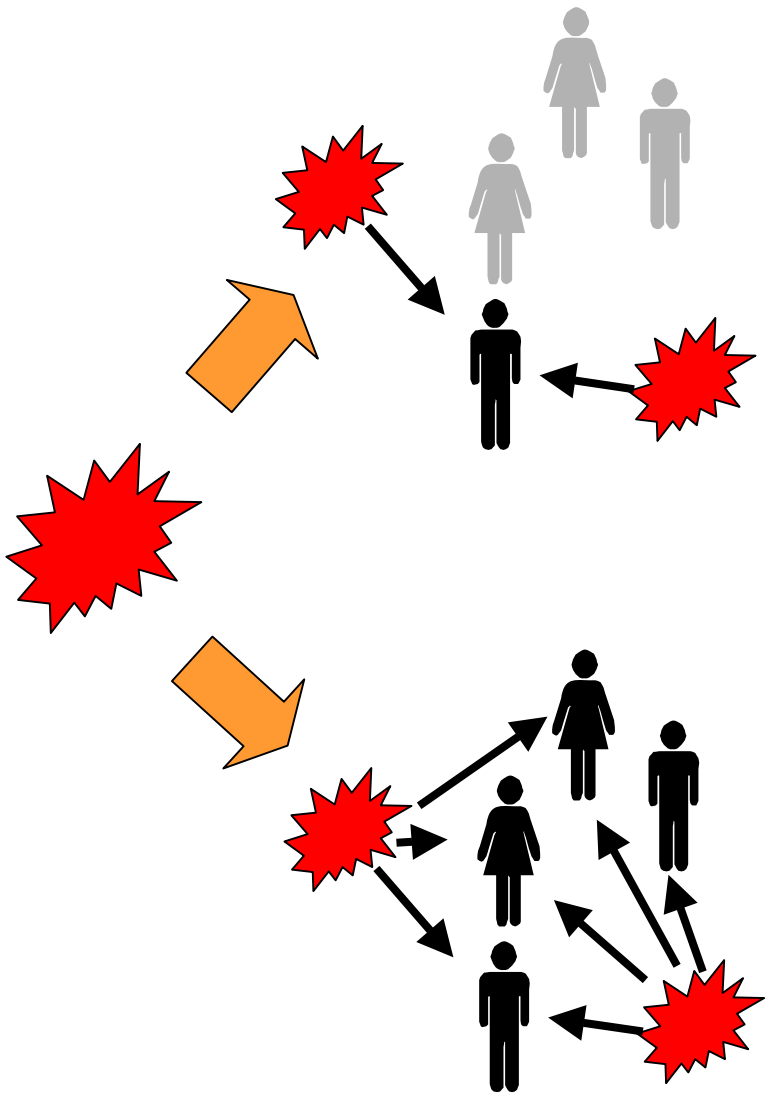


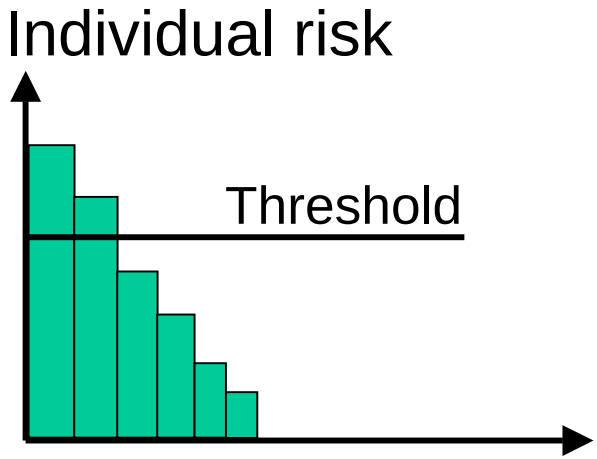
Societal risk

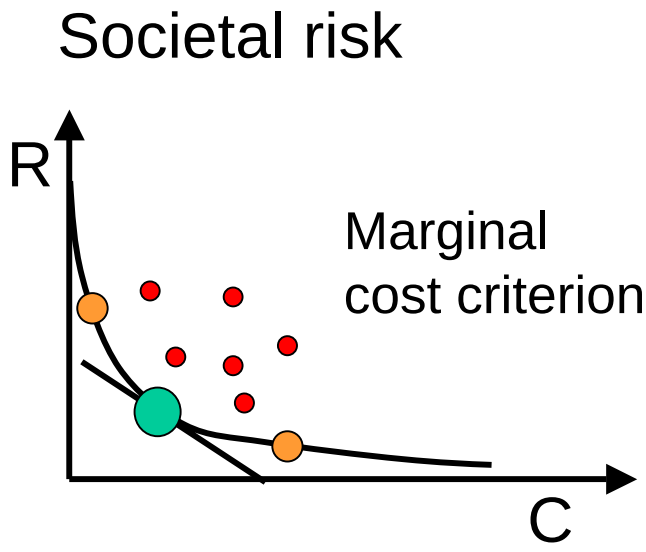


based on Schneider, 1984

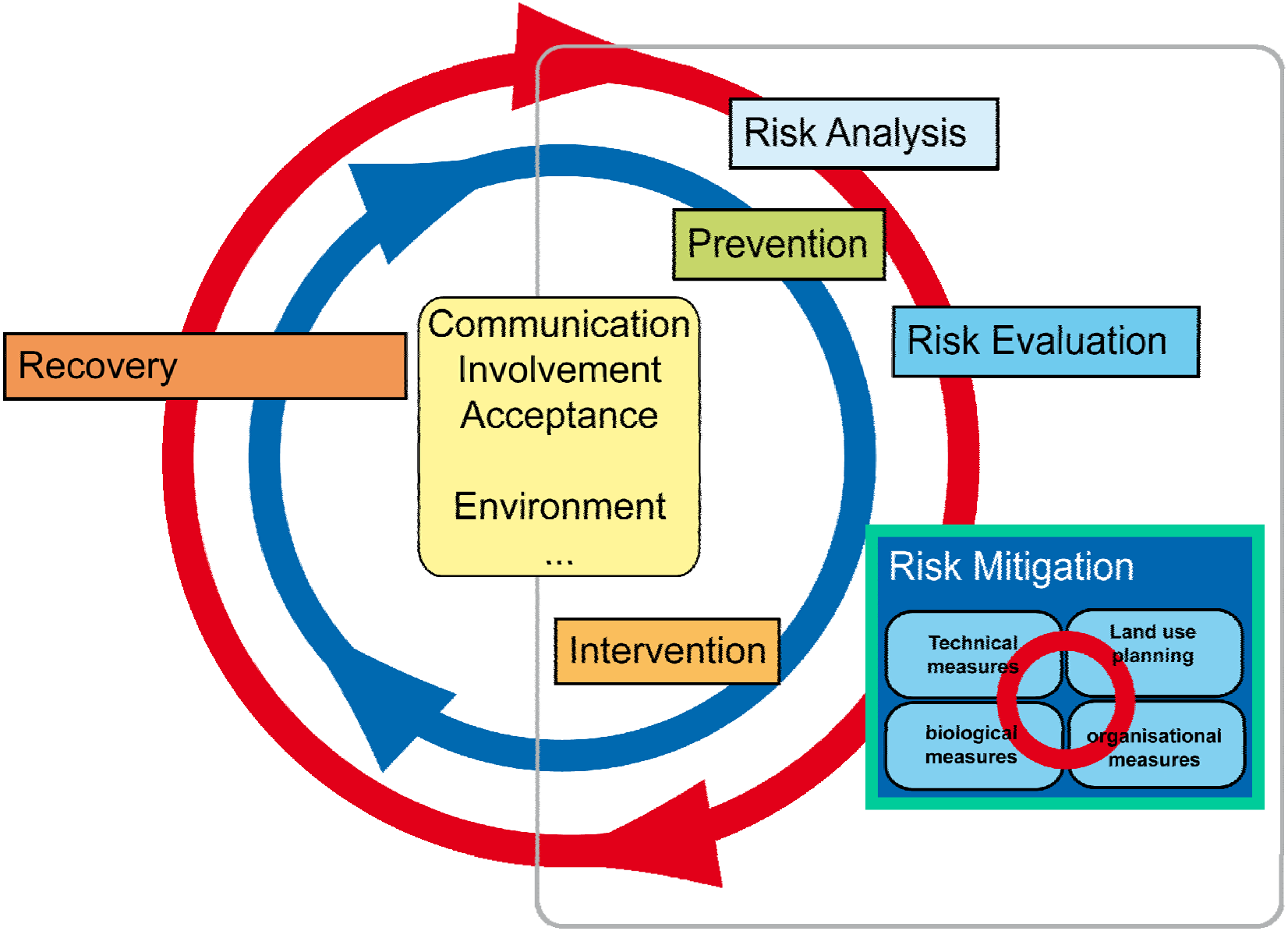
Risk Evaluation



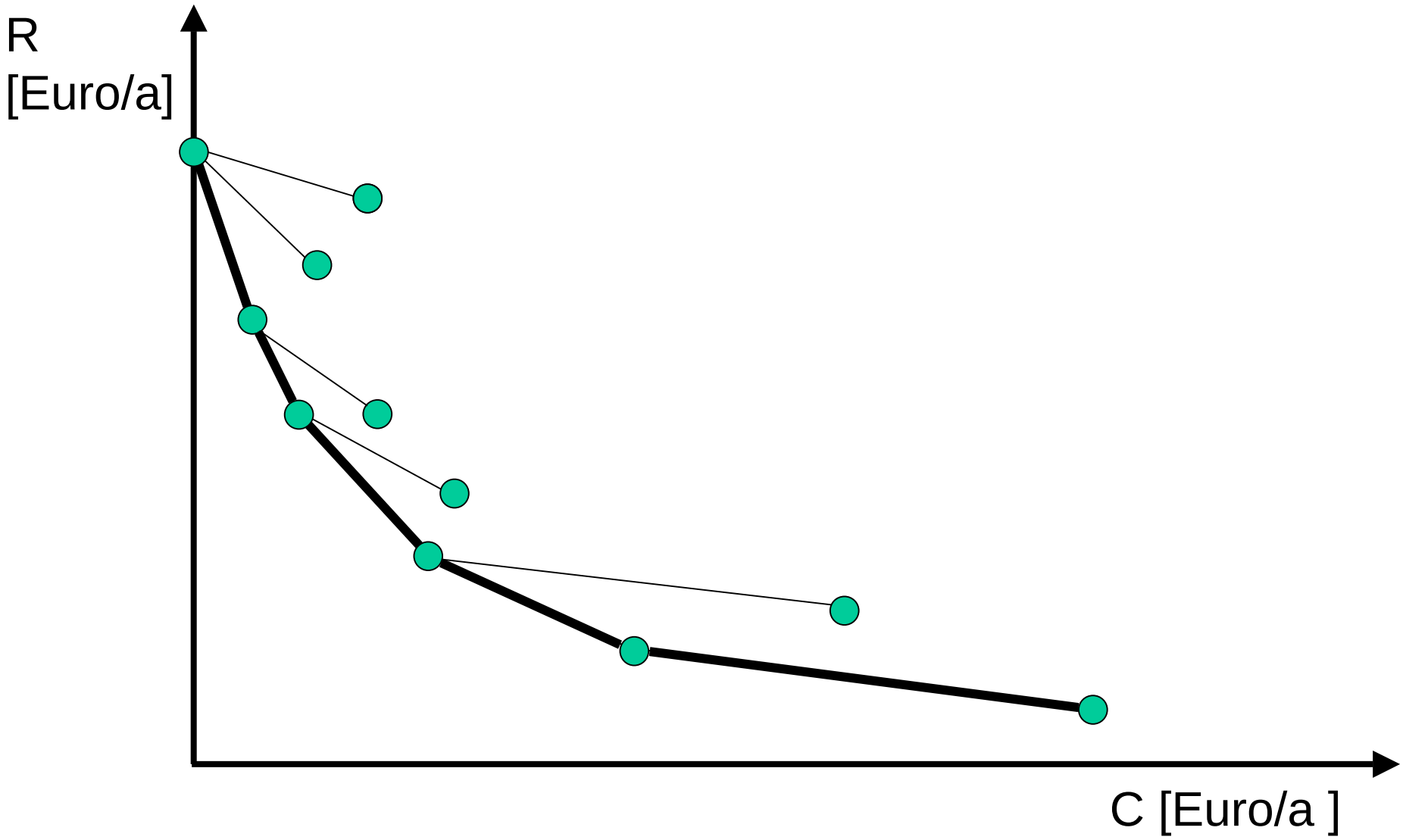




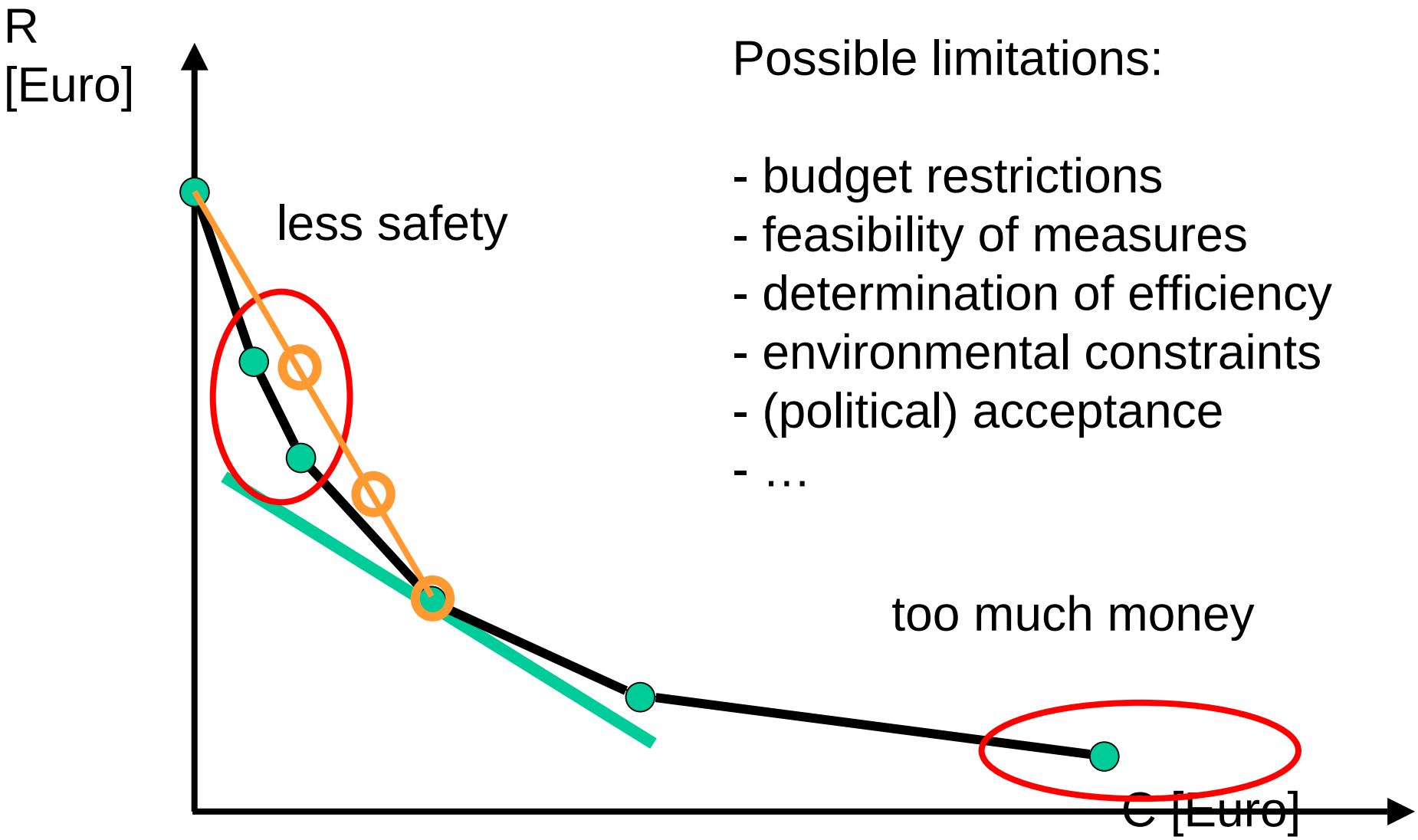
Risk Mitigation as part of an integral approach



Economic optimisation of protection strategy



Economic optimisation of protection strategy



Possible limitations:

- budget restrictions
- feasibility of measures
- determination of efficiency
- environmental constraints
- (political) acceptance
- …

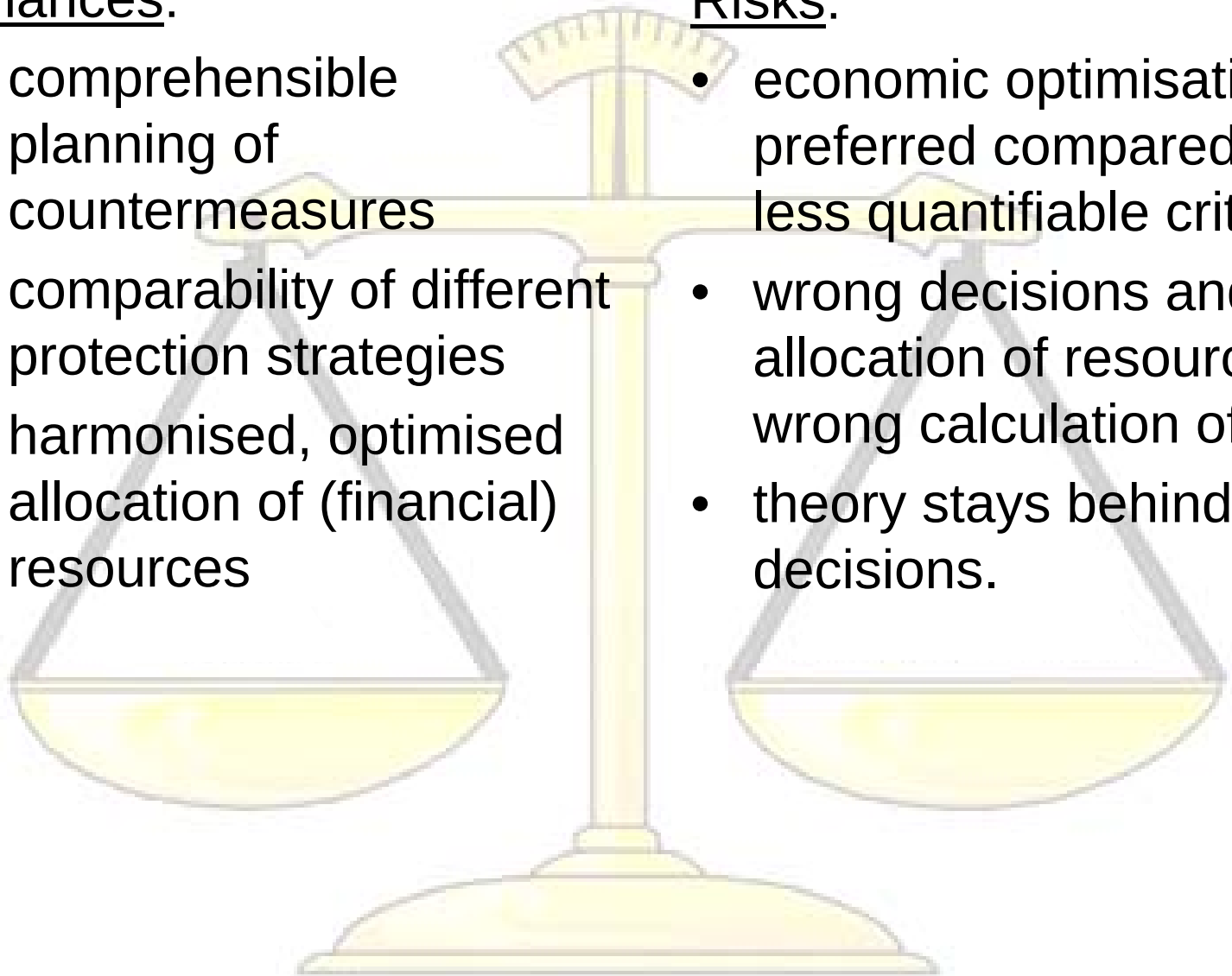
Chances and risks

Chances:

- comprehensible planning of countermeasures
- comparability of different protection strategies
- harmonised, optimised allocation of (financial) resources

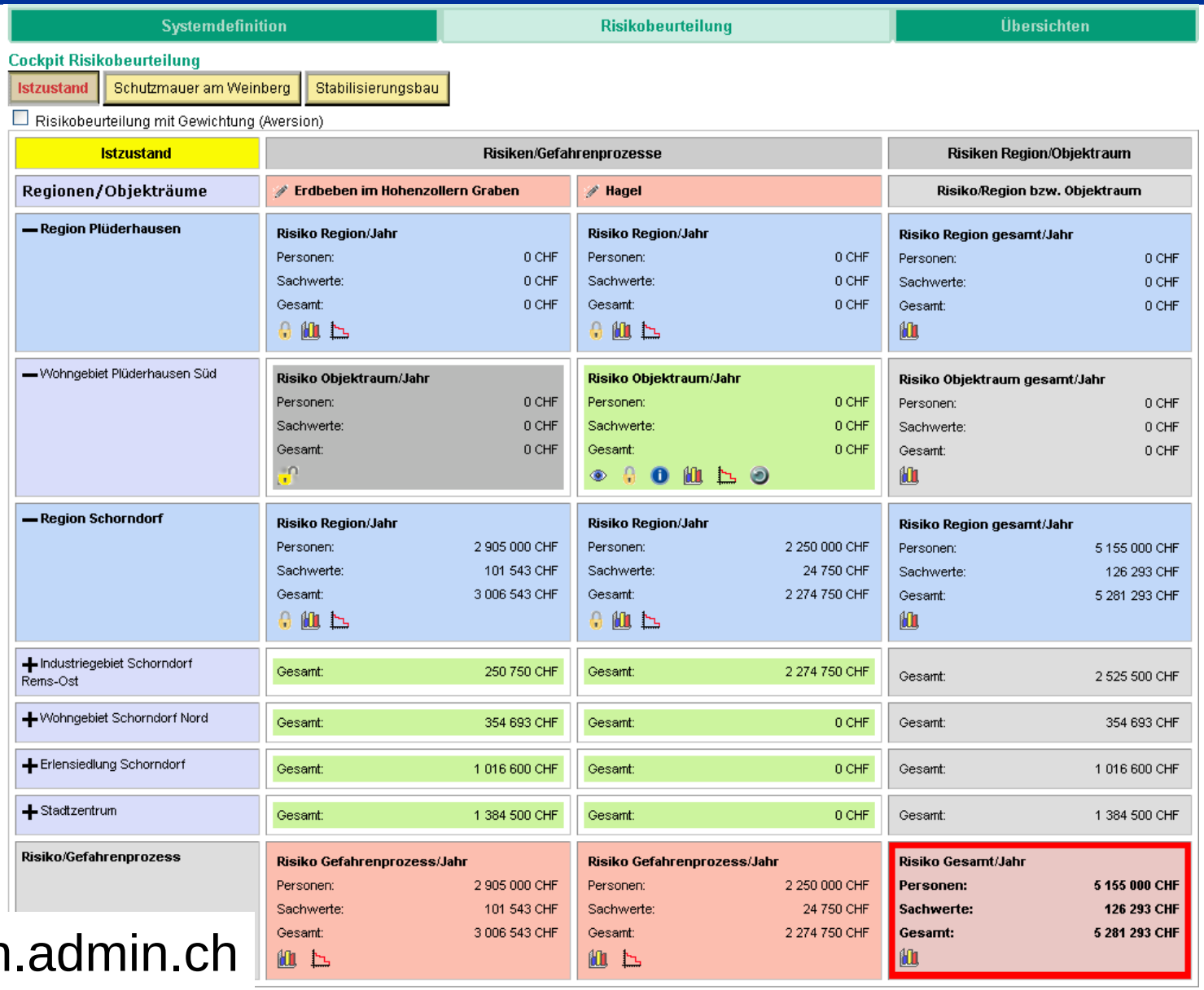
Risks:

- economic optimisation is preferred compared to other less quantifiable criteria
- wrong decisions and allocation of resources by wrong calculation of risks
- theory stays behind political decisions.



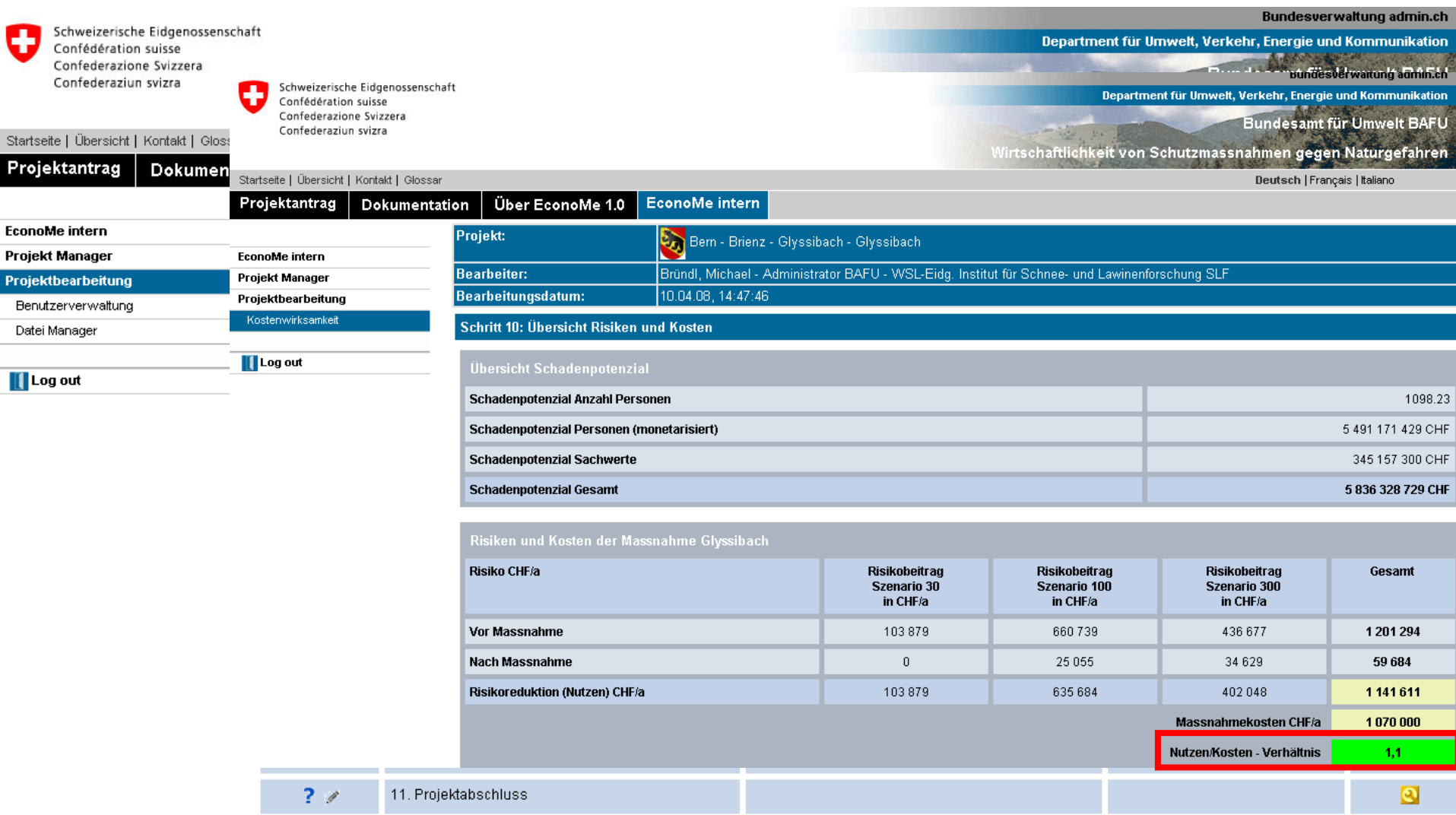
Putting the risk concept into practice and education.

RiskPlan as a tool for overview and sensitisation



www.riskplan.admin.ch

EconoMe as tool for the practice



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Conclusions and outlook

- The risk concept is a reasonable basis for decision making.
- Better knowledge on processes and behaviour of buildings and infrastructure will help to reduce uncertainties.
- Communication, education and the development of modern tools will help to make risk-based decision making an integrating part of dealing with natural hazards.
- Practical application of the risk concept demands software that enable the consultants a quick calculation.
- Integral risk management means not only to consider several natural hazard processes but to take all sources of risk into consideration.
- Integrated multi-risk management will become an important issue in future.

Thank you for your attention!

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