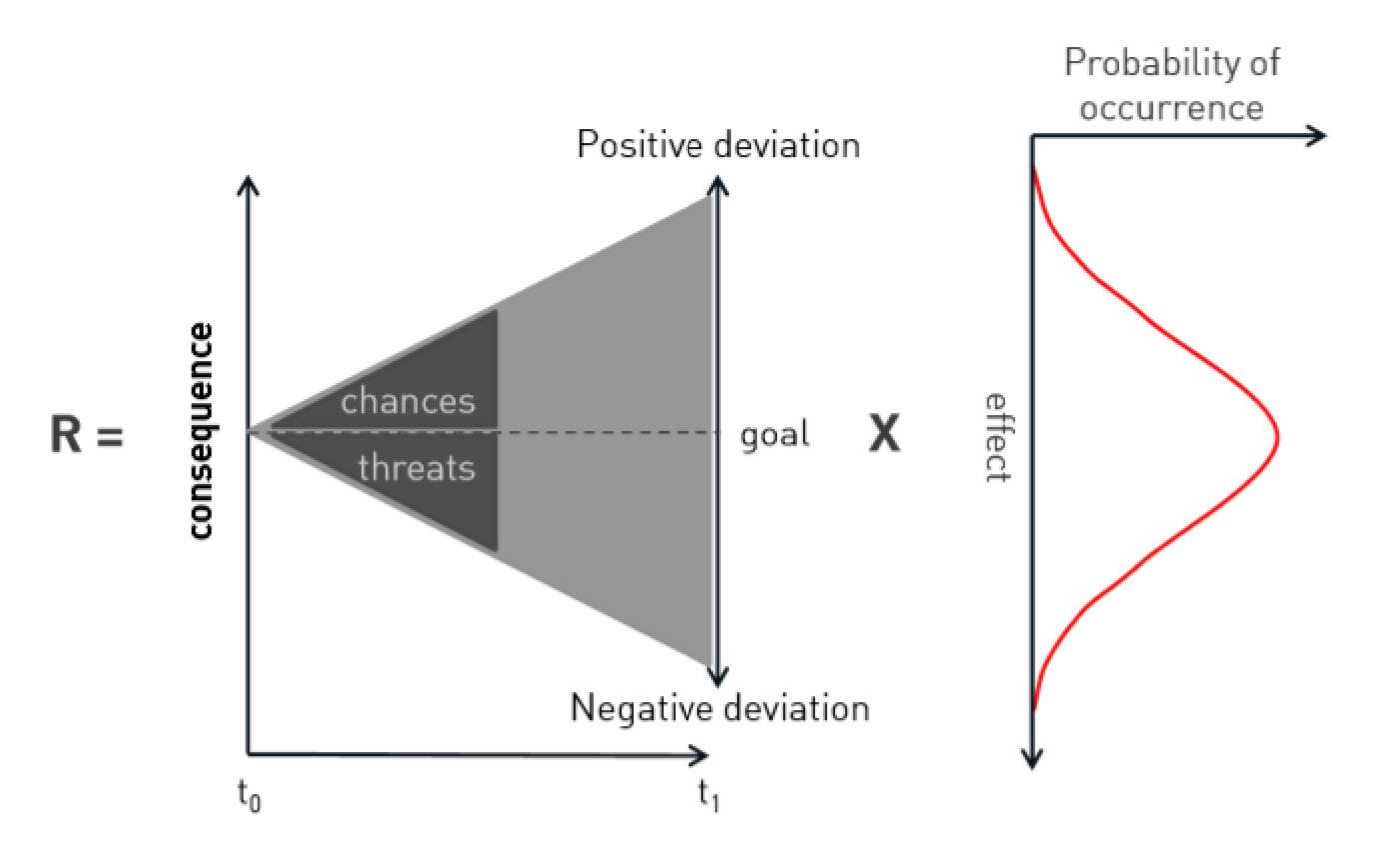


# Task 2.2 Risk Mitigation Assessment

### Dr. Sören Welter<sup>1</sup>, Maren Brehme<sup>2</sup>, Kerstin Nowak<sup>3</sup>, Elif Kaymakci<sup>1</sup>, Dr. Thomas Kölbel<sup>1</sup>

1 EnBW, Energie Baden Württemberg A.G., Research and Development Department, Geothermal Energy, Karlsruhe, Germany 2 GFZ German Research Centre for Geosciences, Postdam, Germany 3 GTN, Geothermie Neubrandenburg GmbH, Neubrandenburg, Germany

## What is risk?



$$R = E[U(a_q)] = \sum_{risk \ acceptability}^{n_{Oq}} p(O_i|a_q) * u(a_q, O_i)$$

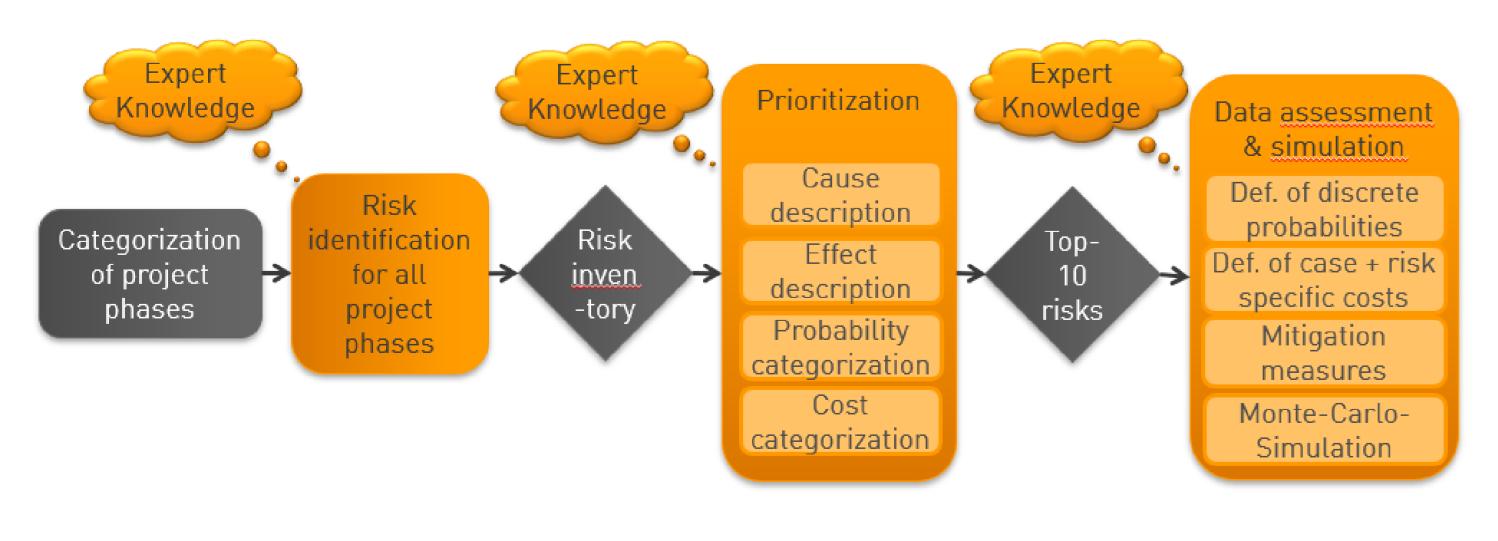
#### Risk factors are....

Features, events or processes that prevent/enable a company to reach the company goals, endanger/secure the existence of the company, the wellbeing of employees and the safety of the environment

# Risk management process

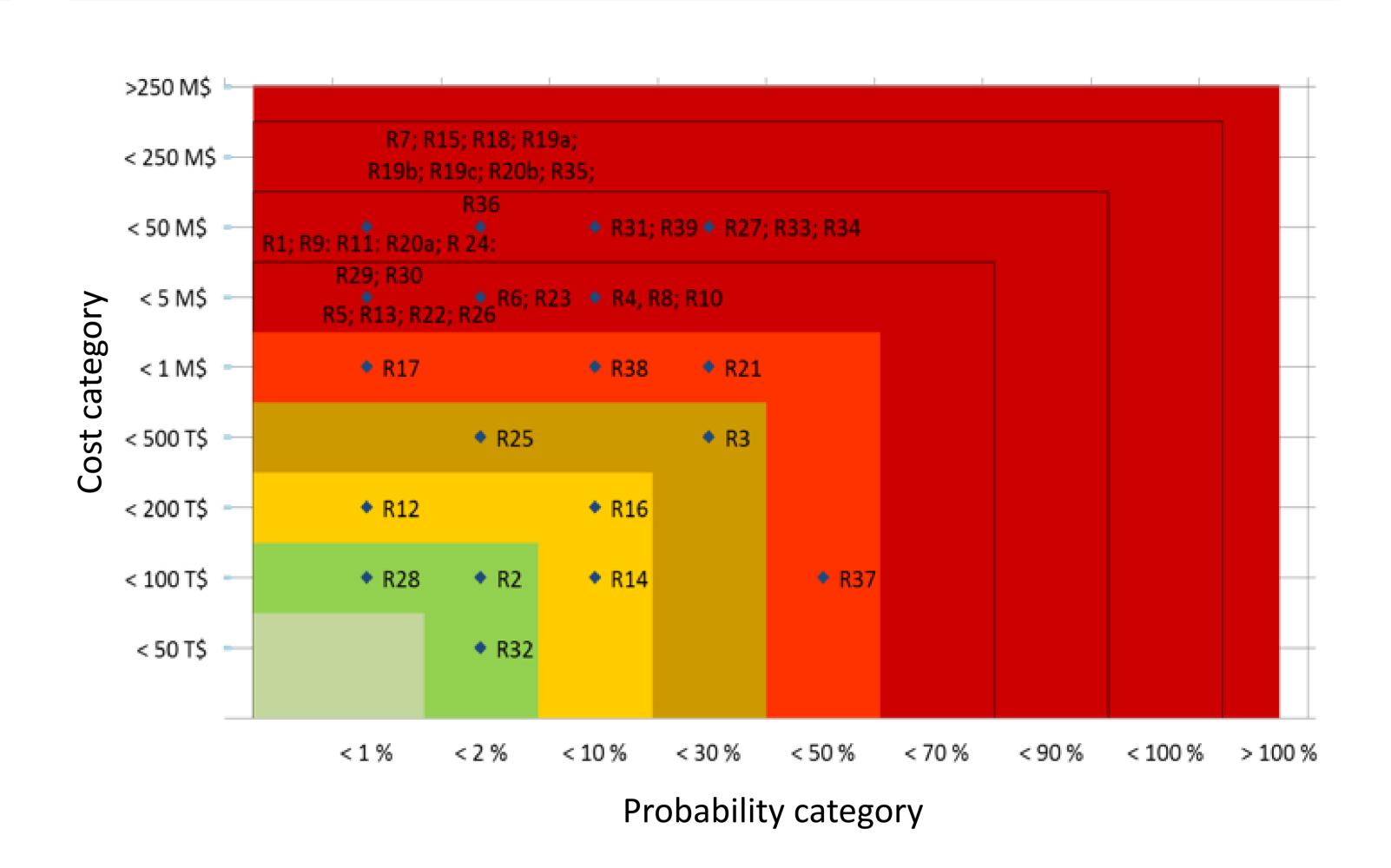


# Risk assessment and evaluation process



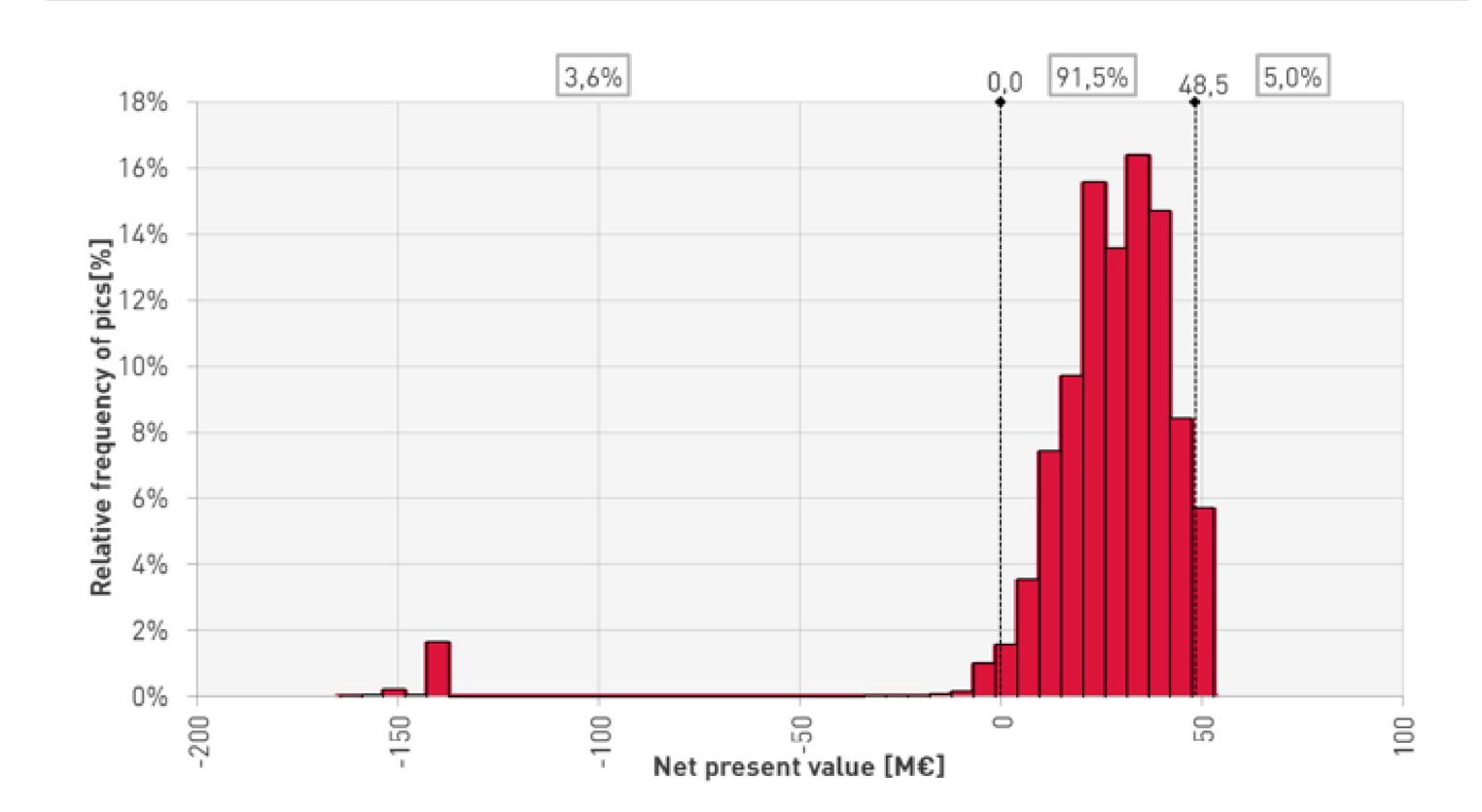
- > Before a detailed evaluation, a prioritization of risks shall be done
  - > Therefore values for probability and effect (e.g. monetized effect) have to be estimated before an in deep evaluation of the risk
- > Risk = probability and effect (e.g. monetized effect)

# Results of prioritization



- Risk assessment is done as part of the preparation of the chemical stimulations in Mezöberény (Hungary).
- The prioritization is done with an approach called "risk heat map"
- Risk factors are normally linked to an uncertainty
- Therefore, a single value for risk associated costs and probability of occurrence is difficult to give
- Risk factors with high probability and high risk associated costs are prioritized

## Results of evaluation



# Conclusions

- For the operations planned for the chemical stimulation at the Mezöberény site, nearly 30 risk factors were identified that could potentially influence the project.
- The identification of risk factors enables the operator to take steps for the mitigation
- Including the risk factors in the planning at an early stage ensures a costefficient mitigation as well as an increased mitigation effect through sound planning









