Identification of risks beyond macro threats – a system based approach

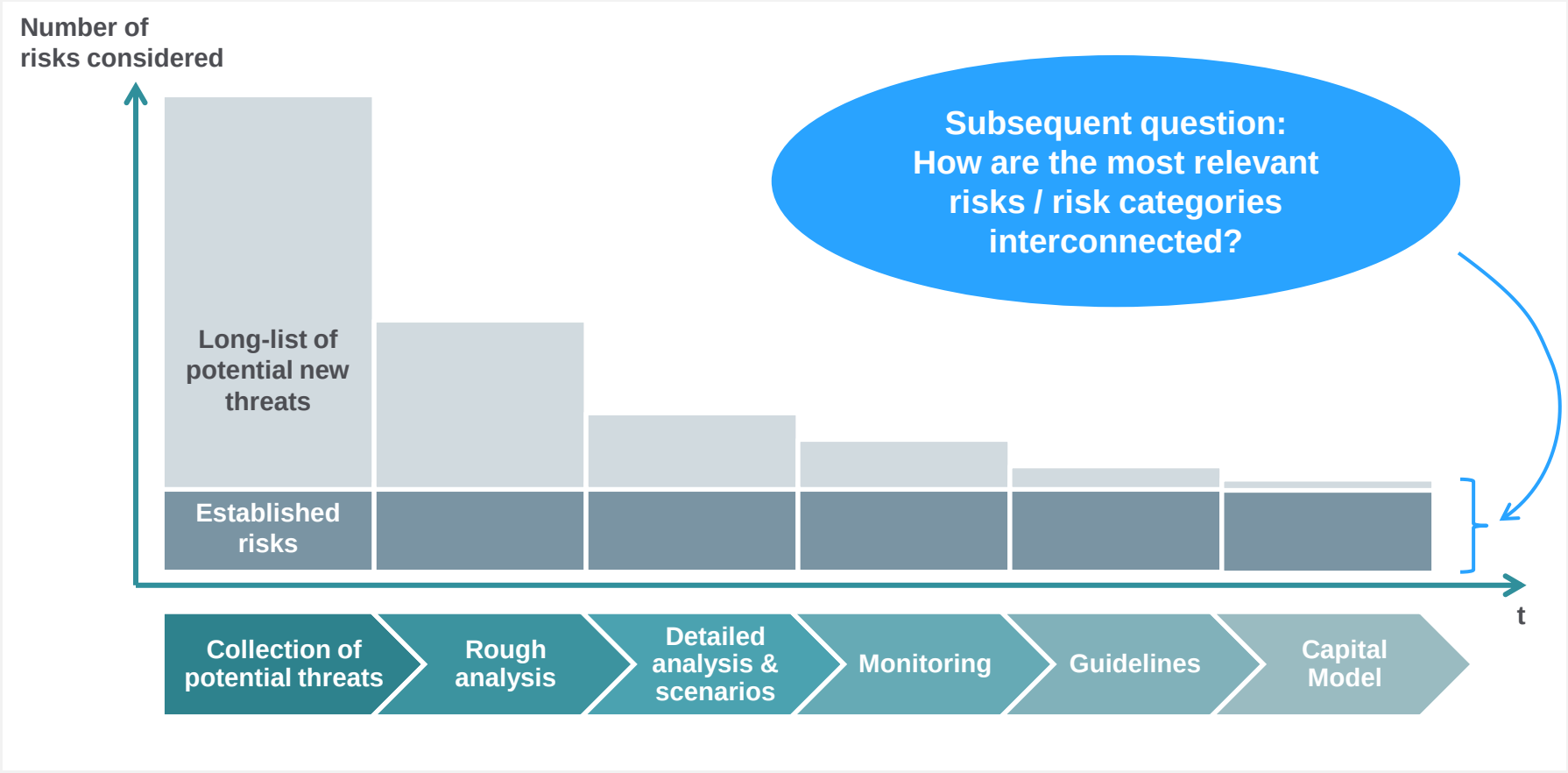
London, 10 September 2013

Dr. Markus Wadé

Munich RE

Standard process for risk identification (top-down)

Standard process for risk identification (top-down)



Analysis of new risks and estimation of top-level dependencies rely heavily on expert judgments.

Challenges for risk identification

Munich RE

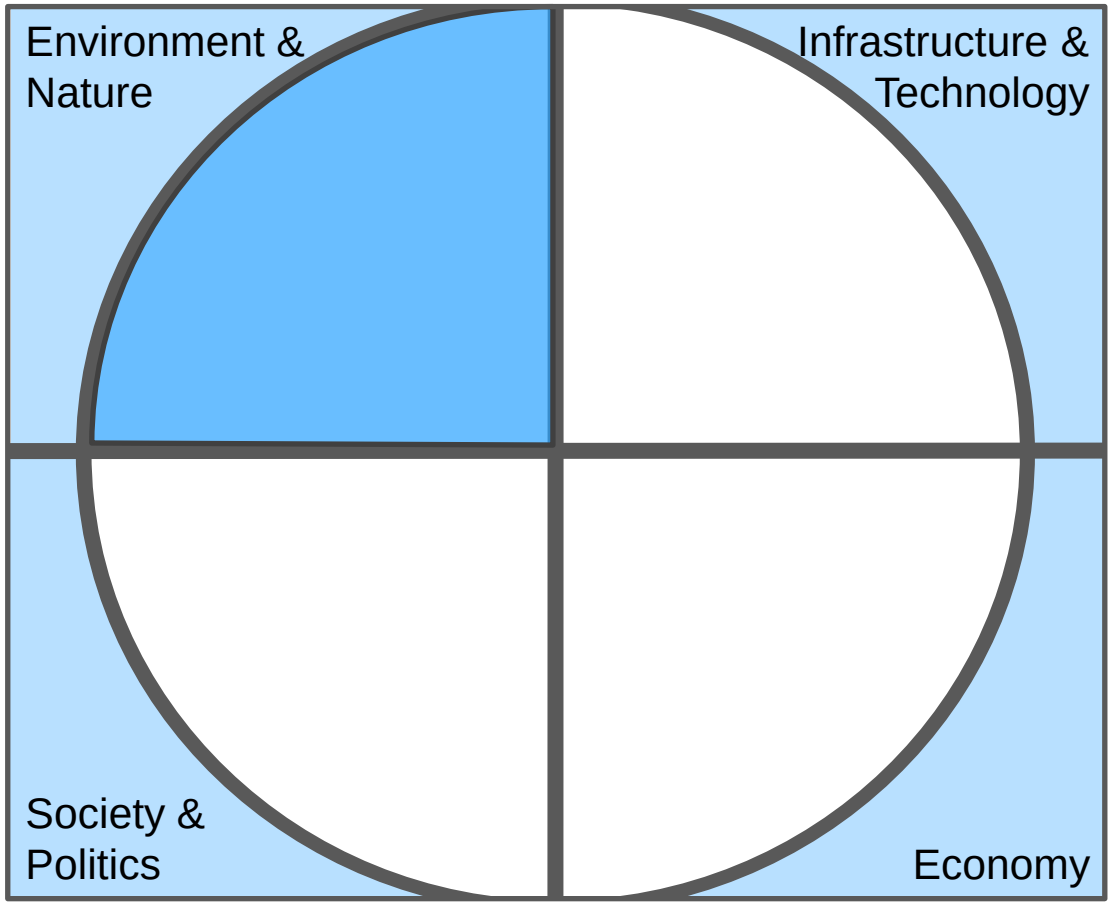
- Efficient organizational framework
- Efficient knowledge management
- Identification of risks resulting from complex dependencies and indirect consequences
- Validation and continuous improvement of expert estimates on top-level dependencies

Need for new approaches and complementary tools in regard of an increasingly complex and interdependent environment.

Complex accumulation project (CARE): (I) Development of a system landscape

Munich RE

How could a representation of all relevant systems be structured?



ILLUSTRATION

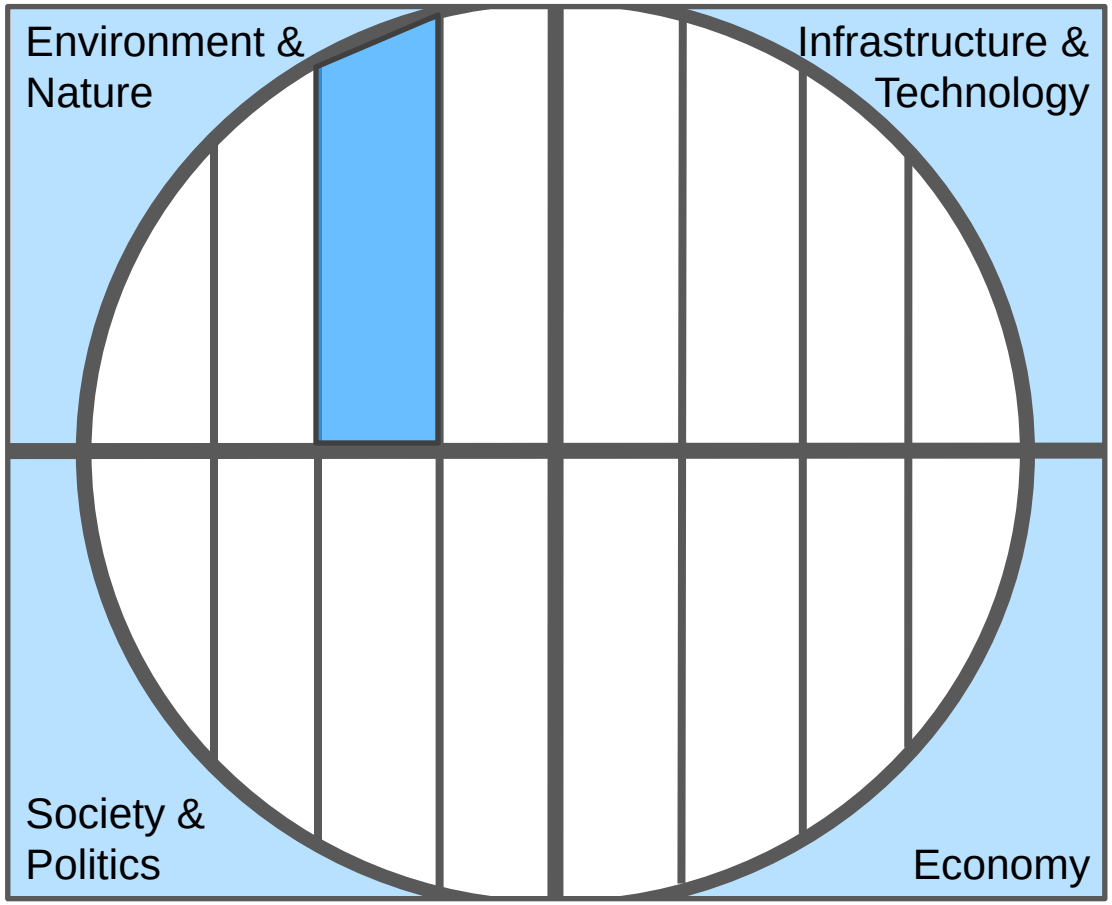
The world can be separated into four **system fields**…

Example: „Environment & Nature“

Complex accumulation project (CARE): (I) Development of a system landscape

Munich RE

How could a representation of all relevant systems be structured?



ILLUSTRATION

The world can be separated into four **system fields**…

Example: „Environment & Nature“

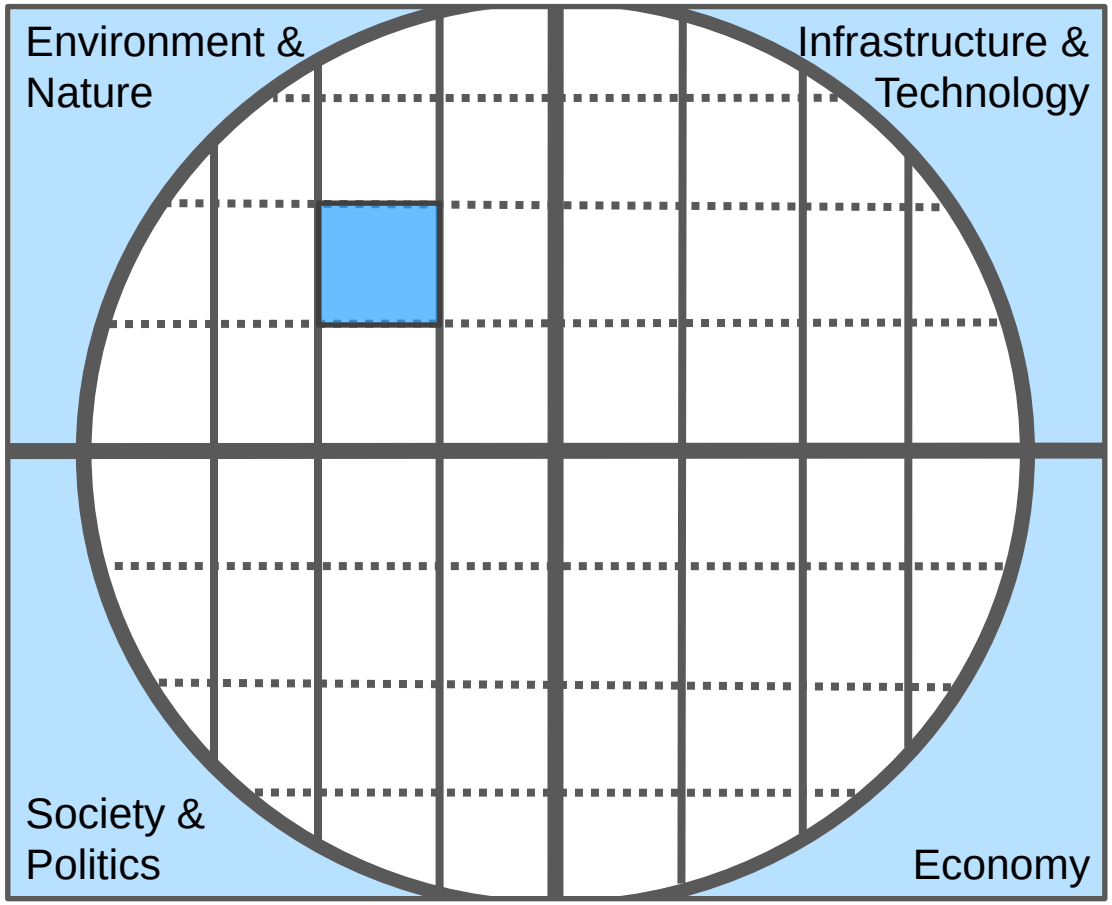
… which can be separated further into **systems**

Example: „Hydrosphere“

Complex accumulation project (CARE): (I) Development of a system landscape

Munich RE

How could a representation of all relevant systems be structured?



ILLUSTRATION

The world can be separated into four **system fields**…

Example: „Environment & Nature“

… which can be separated further into **systems**

Example: „Hydrosphere“

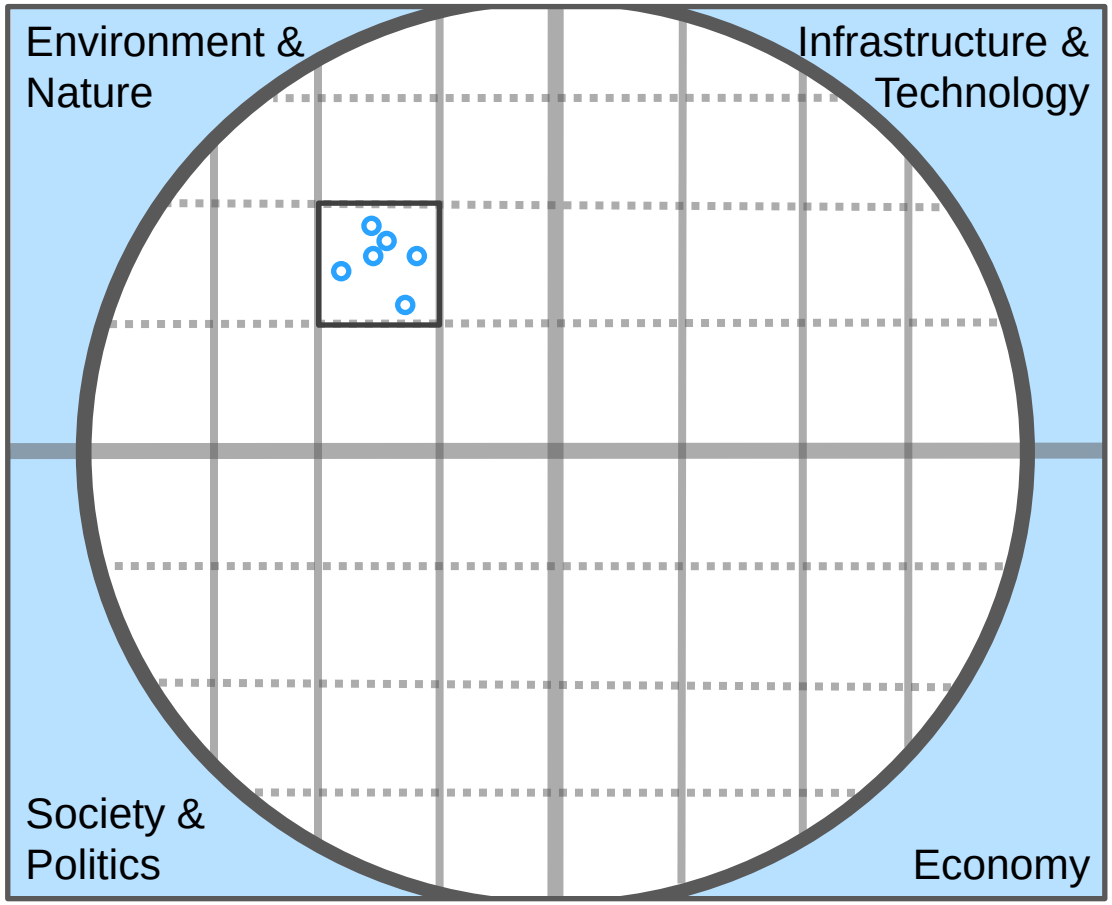
… which in turn can be fragmented into several **subsystems**.

Example: „Rivers“

(II) Identification of relevant events

Munich RE

What disrupting events could occur in a subsystem?



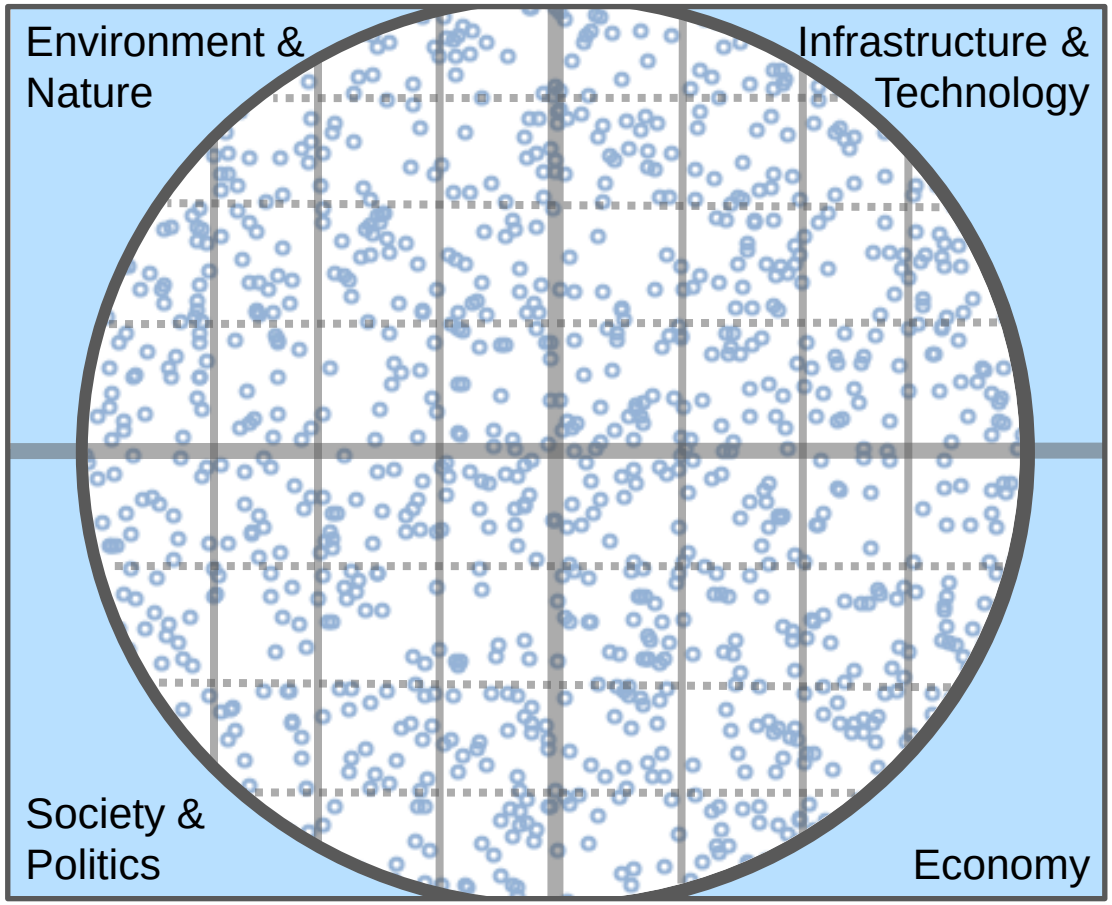
ILLUSTRATION

Example: What disrupting events could occur in the subsystem „Rivers“ ?

- *River flooding*
- *River water level decrease*
- *River warming*
- *River pollution*
- *Freezing of the river*
- *River straightening*

(II) Identification of relevant events

What disrupting events could occur in a subsystem?



ILLUSTRATION

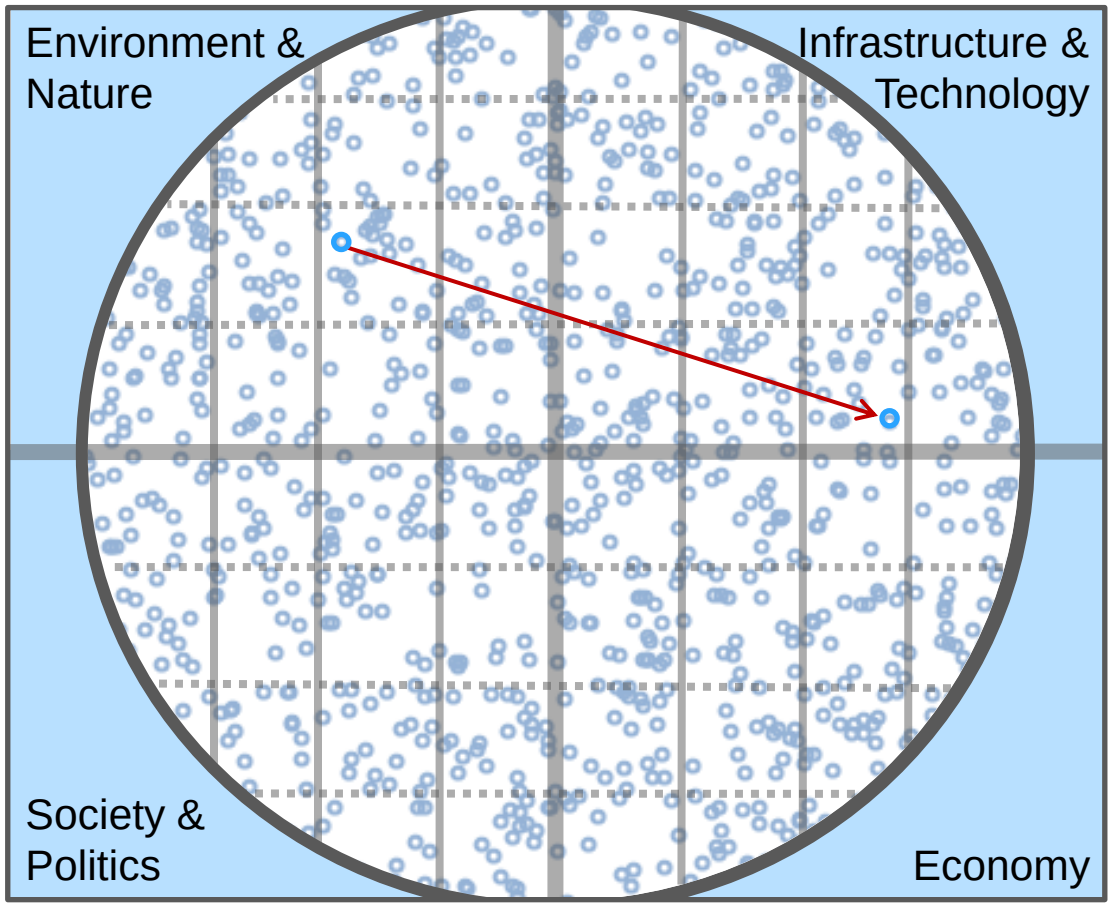
Example: What disrupting events could occur in the subsystem „Rivers“ ?

- *River flooding*
- *River water level decrease*
- *River warming*
- *River pollution*
- *Freezing of the river*
- *River straightening*

In each subsystem, various disrupting events can be determined.

(III) Identification of interconnections

Could one event trigger another event?



ILLUSTRATION

Collection of Trigger-Consequence- Pairs

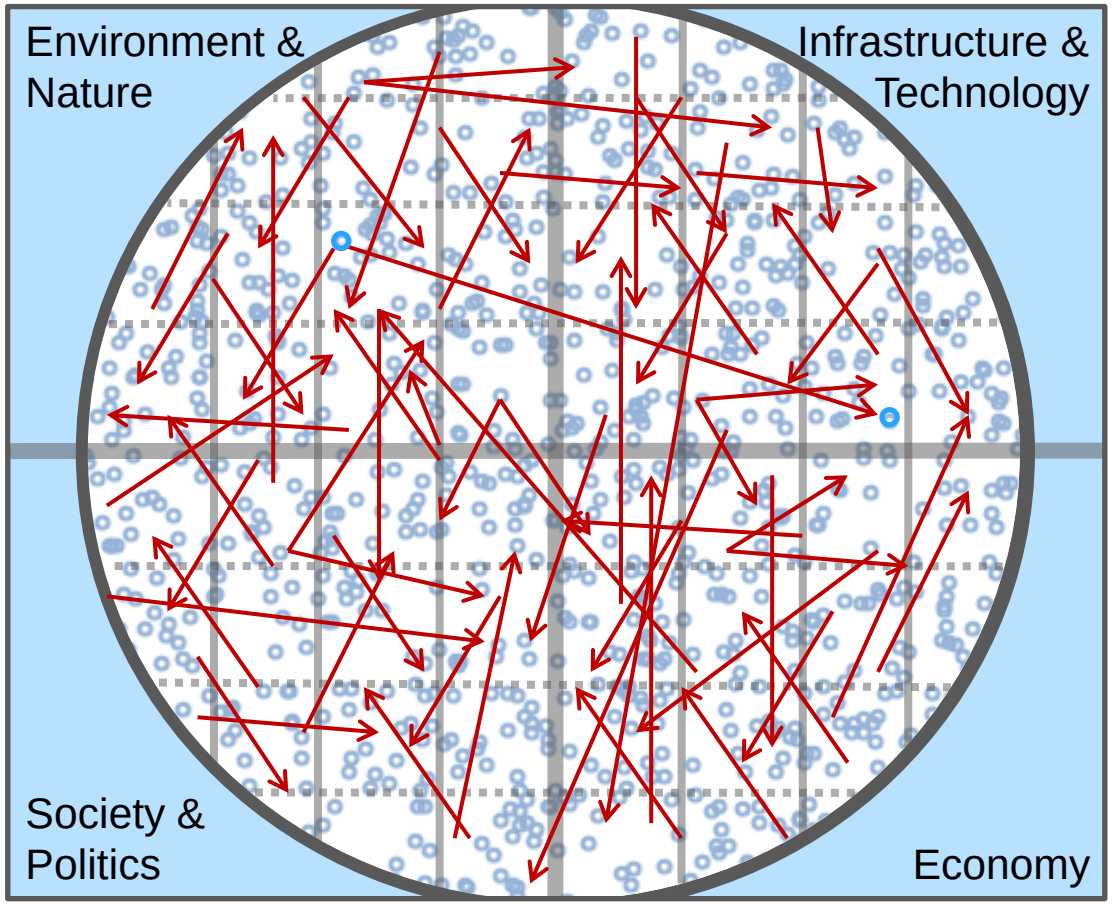
Example:

„River warming“ could lead to „Disruption of power plants“

(III) Identification of interconnections

Munich RE

Could one event trigger another event?



ILLUSTRATION

Collection of Trigger-Consequence- Pairs

Example:

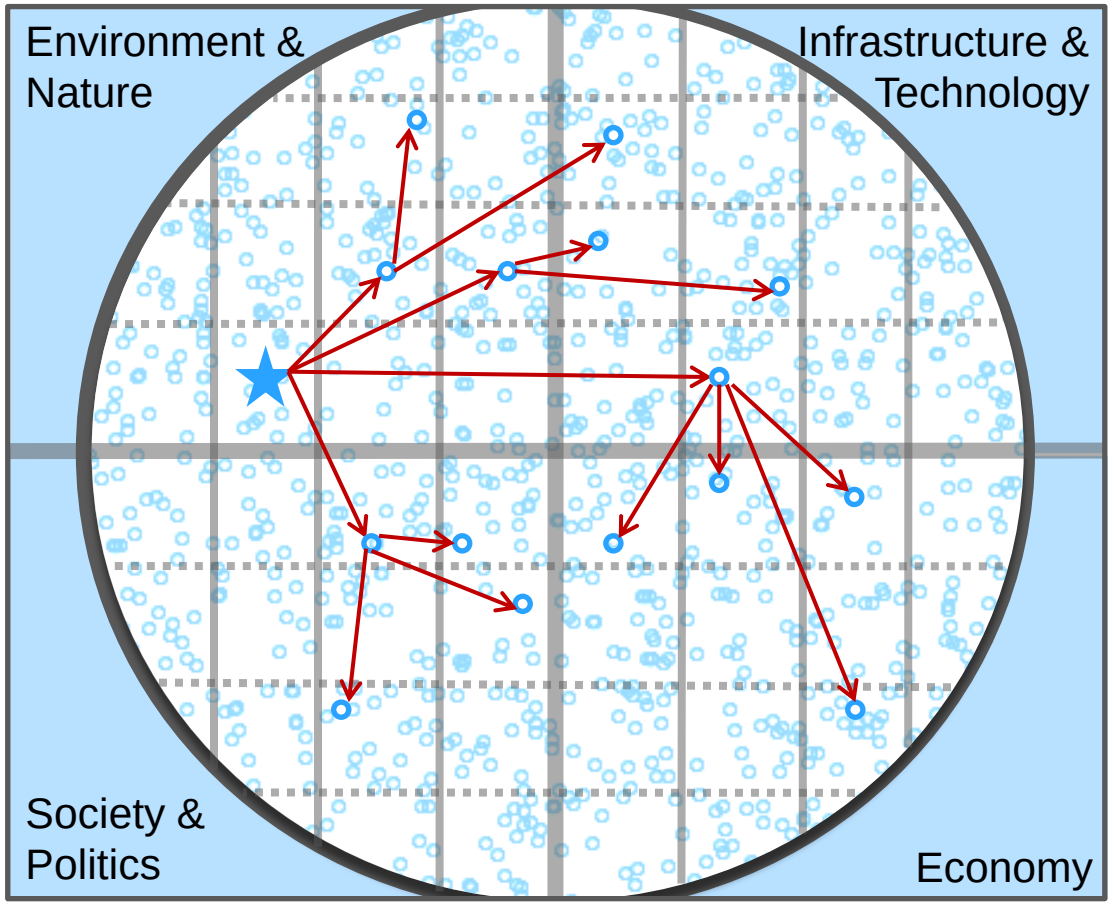
„River warming“ could lead to „Disruption of power plants“

All events can function as trigger for and consequence of other events.

For each identified pair additional information can be collected: e.g. classification of probability, loss relevance

Based on the collected data, various qualitative and quantitative analyses can be derived automatically

A simple qualitative analysis: an event cascade



ILLUSTRATION

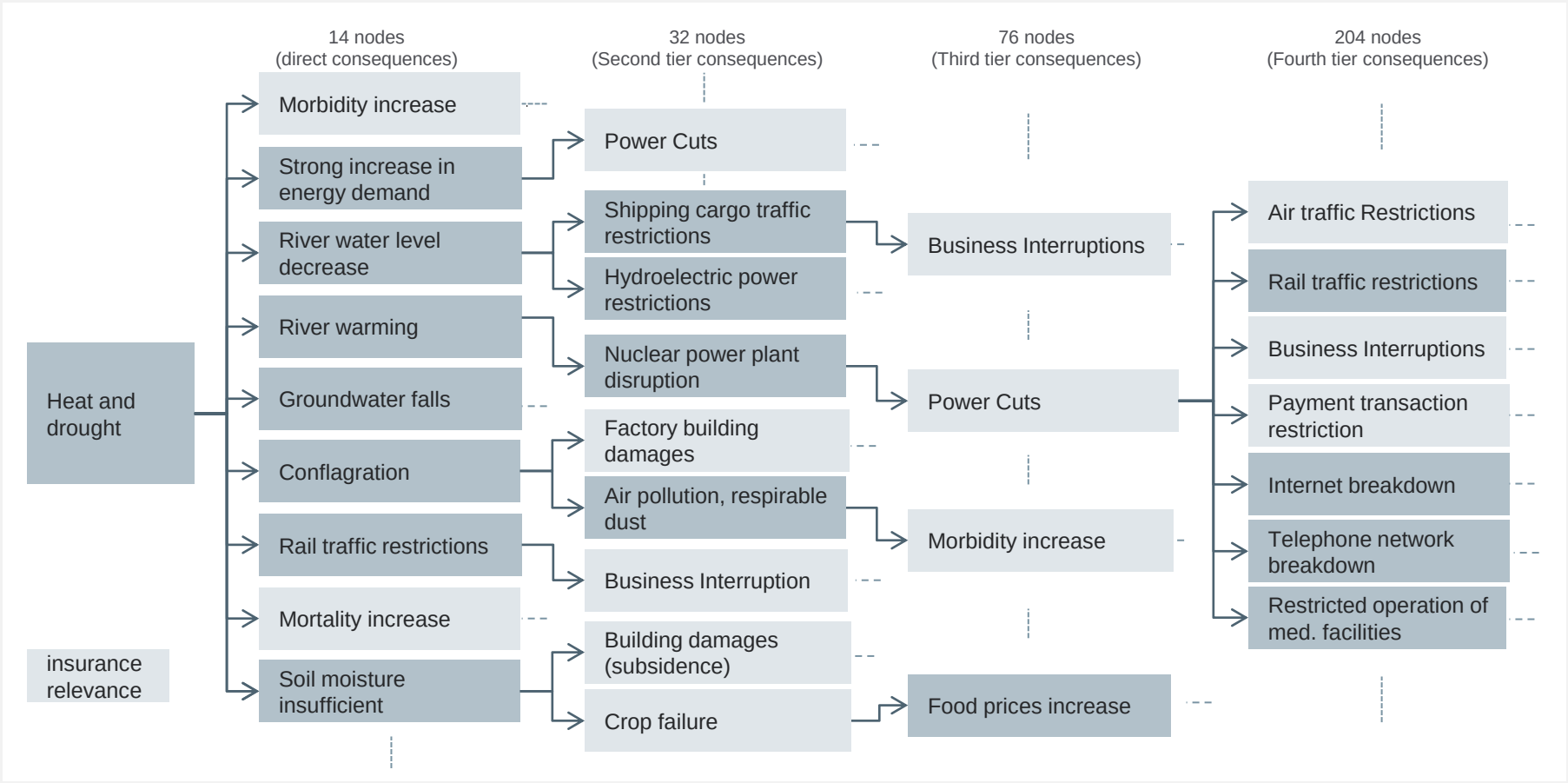
Starting with a specific event, it is possible to look at…

…its potential direct consequences

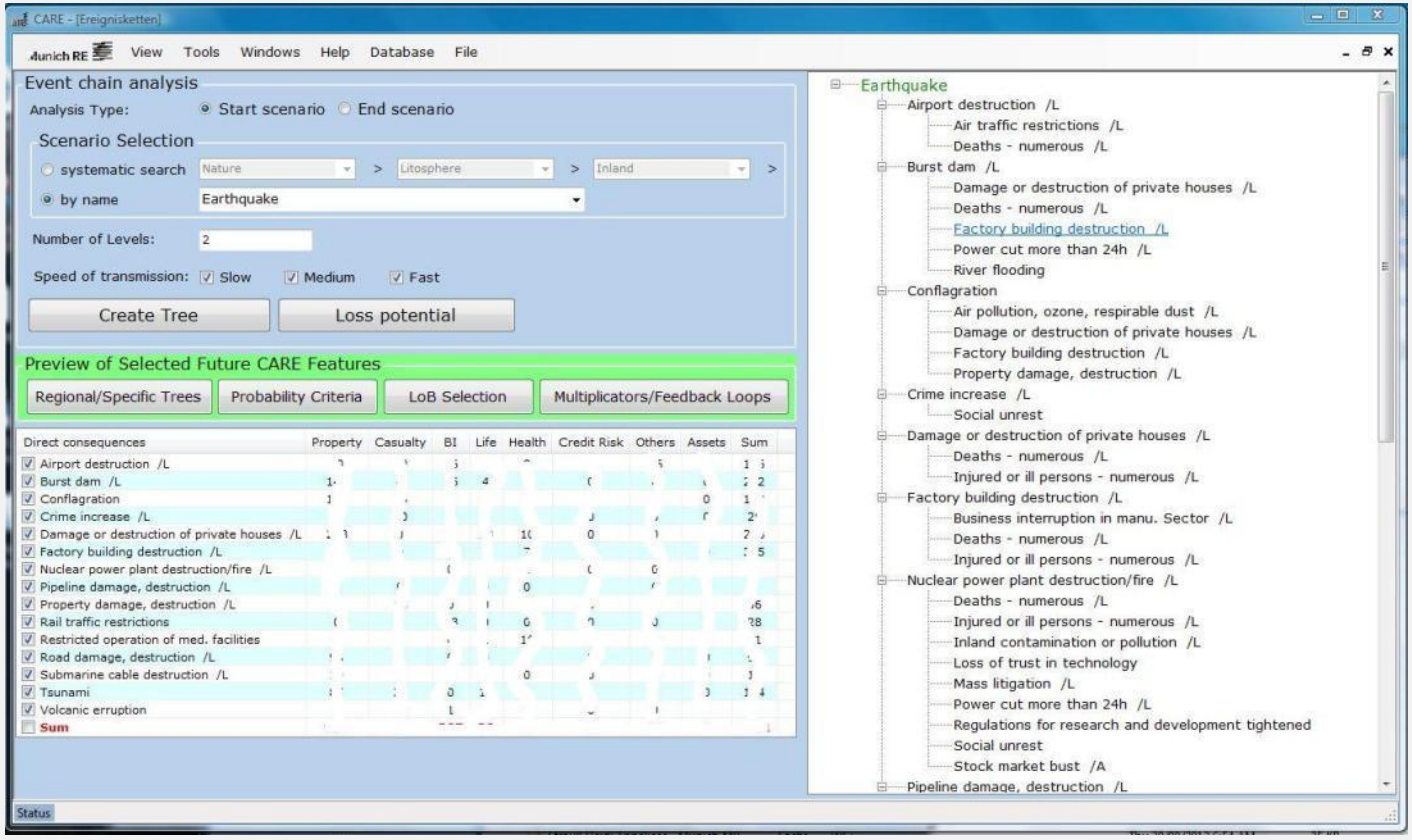
…the second tier consequences

…

Example: Potential consequences of a prolonged “Heat & Drought” period (selected nodes)



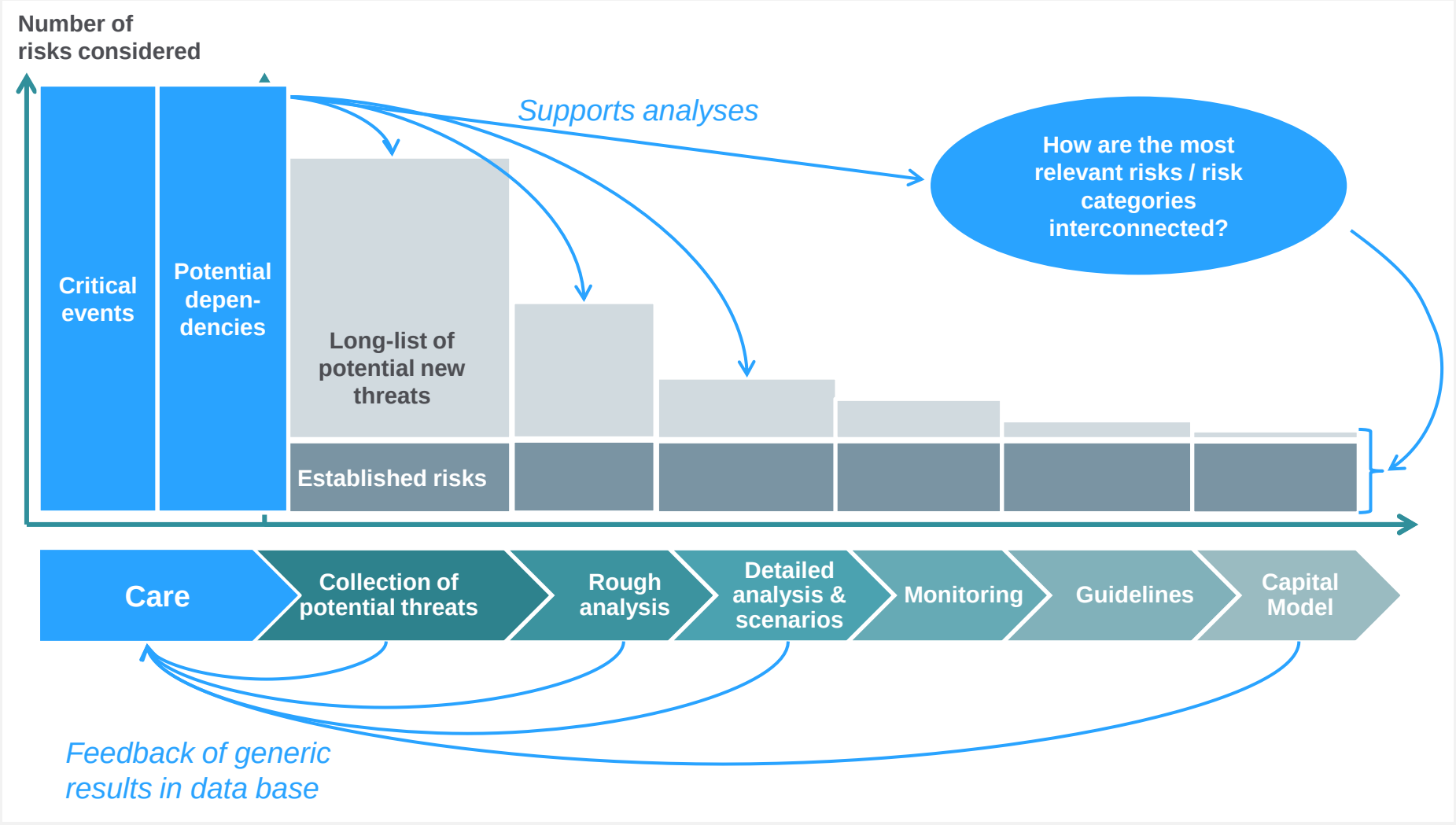
To analyze the collected information efficiently, the prototype of a software tool was developed



Interacting nodes are used to construct event cascades of variable depth. Quantitative indices are based on conditional probabilities and Lines of Business specific loss potentials

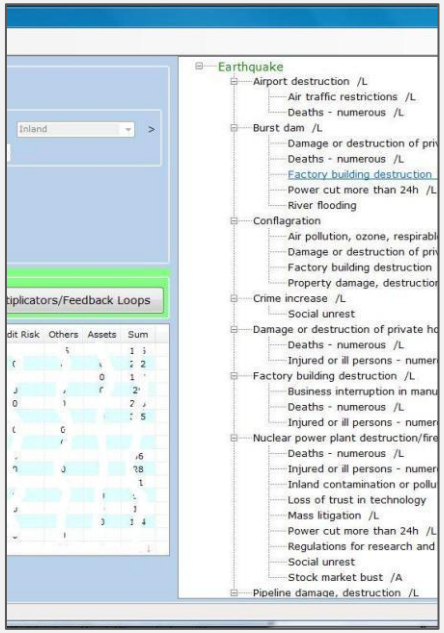
CARE in the risk identification process

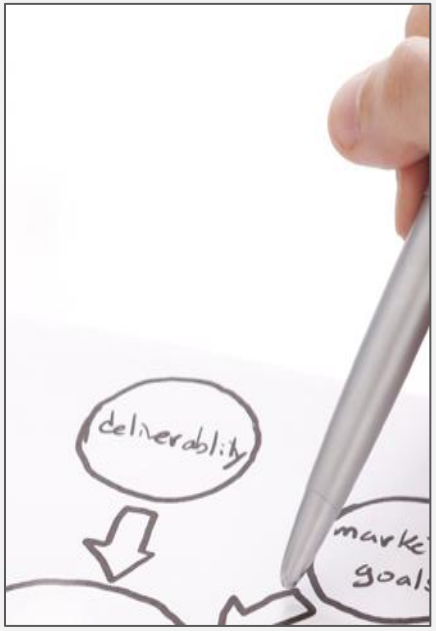
Munich RE

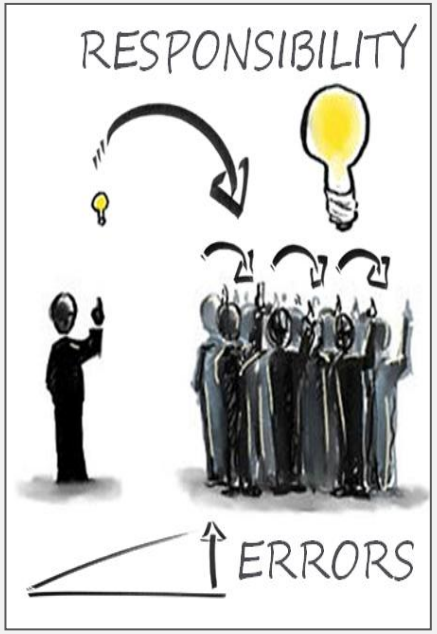


Future tasks and challenges

Munich RE







Further development of CARE and its database

Intensify external dialogue on complex risks and interconnectivity

Strategies to implement complex risks in risk management

Support research in closely related topics, i.e. human behavior

Thank you very much for your attention

Dr. Markus Wadé

Munich RE