Risk pre-assessment phase for Deep Underground Laboratory: hazards, consequences, and dependency mapping

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ABSTRACT

The development of a risk governance framework is one of the integrative activities of the new Swiss Competence Center for Energy Research – Supply of Electricity (SCCER-SoE). The SCCER-SoE has been established to develop basic research and innovative solutions in the domains of GeoEnergies (enhanced geothermal systems and carbon capture and storage) and HydroPower.

The risk governance process is composed of four consecutive phases: pre-assessment, appraisal, characterization/evaluation and management as shown in Figure 1. The first step starts with the pre-assessment phase, where the risk problem is framed and defined, analyzing what risks need to be analyzed in detail in next phases. Perspectives of the societal actors, such as scientific community, governments and general public, need to be combined in order to integrate expertise and values-based perspectives of the practitioners.

In this context, this poster presents a first study of the pre-assessment phase for the case of the deep underground laboratory (DUG Lab) in Grimsel, Switzerlan. DUG Lab is the site for stimulation and circulation experimental research and aims to collect data on induced seismicity related to deep geothermal systems. Risk pre-assessment phase for DUG Lab focuses on hazards, consequences and dependency mapping.

For hazards, consequences and dependencies mapping, a set of Hazards, *H*, a set of Consequences, *C*, and a set of dependencies, *L* are identified. The latter ones can be interlinks between elements of different sets *H* and *C* and/or intralinks between elements of one set. Starting from a selection of elements of *H*, *C* and *L*, a graph is mapped out. For DUG Lab, this assessment is conducted on the basis of internally available expert knowledge from different disciplines, involved in the SCCER-SoE program. The experts of SCCER-SoE are asked to select subsets of *H, C* and *L*. In this manner, a collection of graphs is identified.

Different graphs represent different frameworks for the same task; a big dispersion in the network shape and topology leads thus to larger model uncertainty reflecting disagreement or lack of knowledge of the problem. On the other hand, a small dispersion of the graph structure indicates a good understanding of and general agreement on the model, which translates into a smaller model uncertainty.

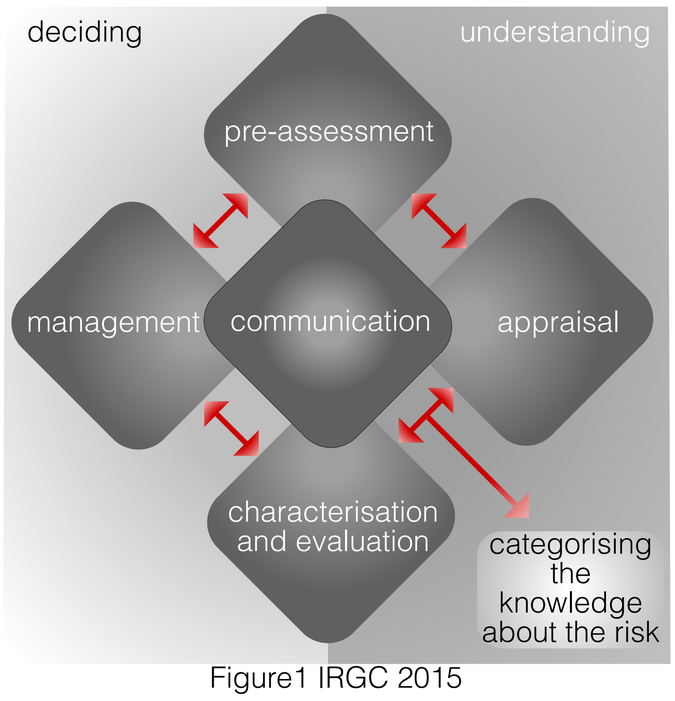
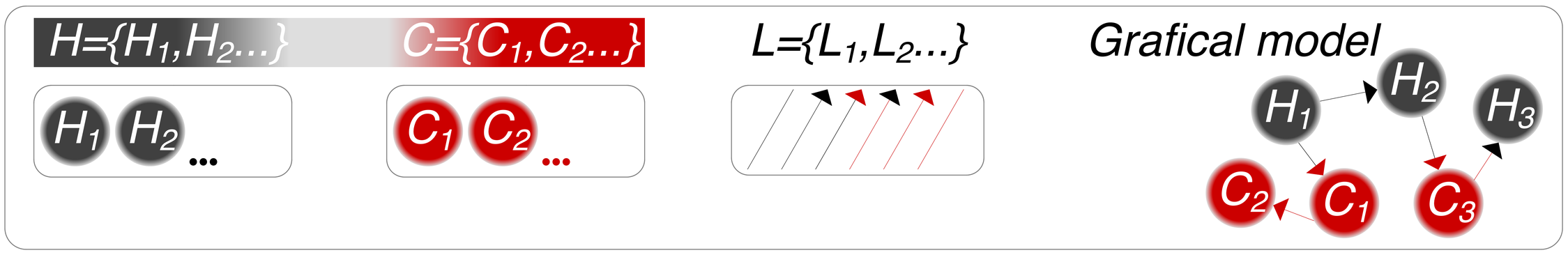


Figure1 IRGC 2015

CONCEPT



D U G lab pre-assessament (Sample size 6 "experts")

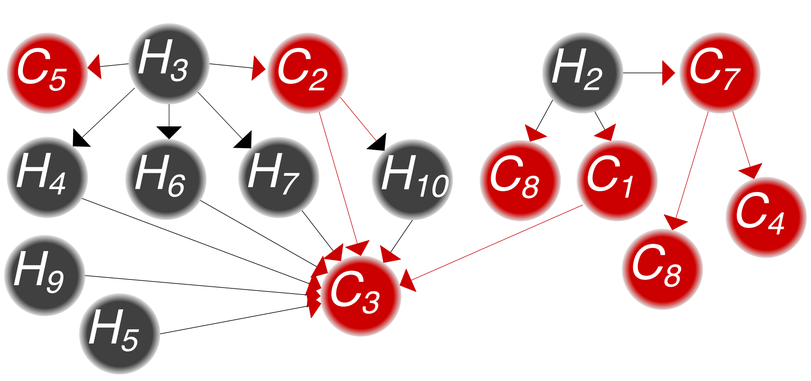
H={H1,H2...}

		Y%	N%
H_1	Tectonic seismicity	33	67
H_2	Induced seismicity	100	0
H_3	Triggered seismicity	67	33
H_4	Avalanche	67	33
H_5	Rock burst	17	83
H_6	Rock fall	83	17
H_7	Landslide	50	50
H_8	Fire, blowout	33	67
H_9	Operational haz.	83	17
H_{10}	Lake tsunami	67	33

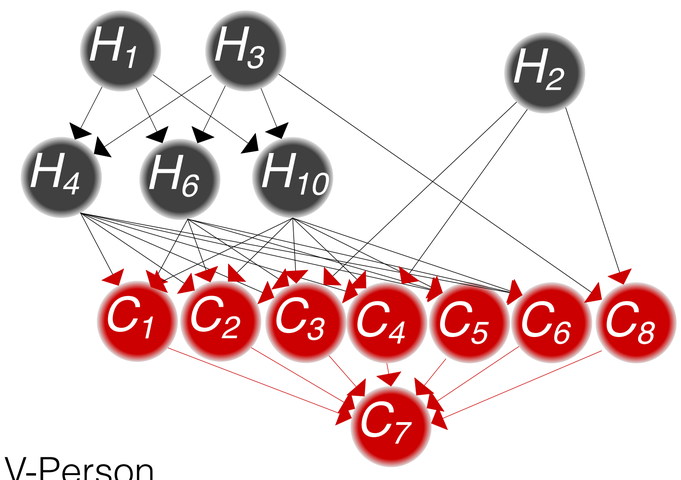
C={C1,C2...}

		Y%	N%
	Critical infrastructure		
C_1	Tunnel damage	83	17
C_2	Dam damage	83	17
C_3	Fatalities	100	0
C_4	Contamination[*2]	83	17
	Facilities damge		
C_5	Power house	67	33
C_6	Building	67	33
C_7	Business interr.[*1]	100	0
C_8	Leakage well	83	17

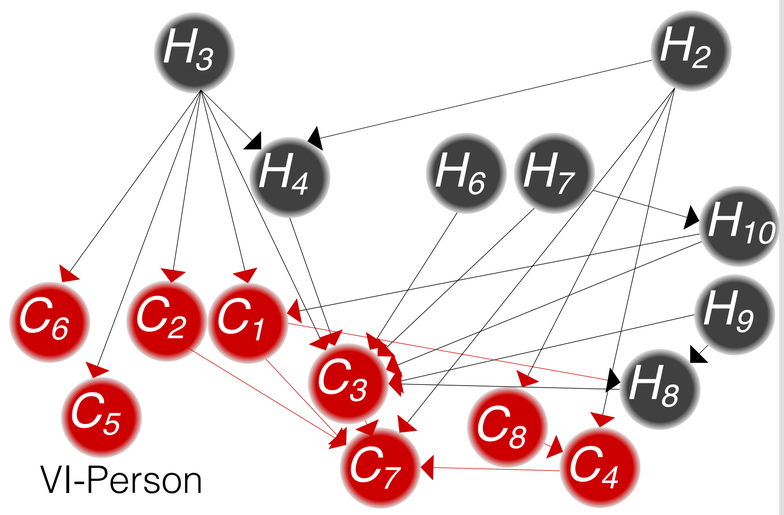
I-Person



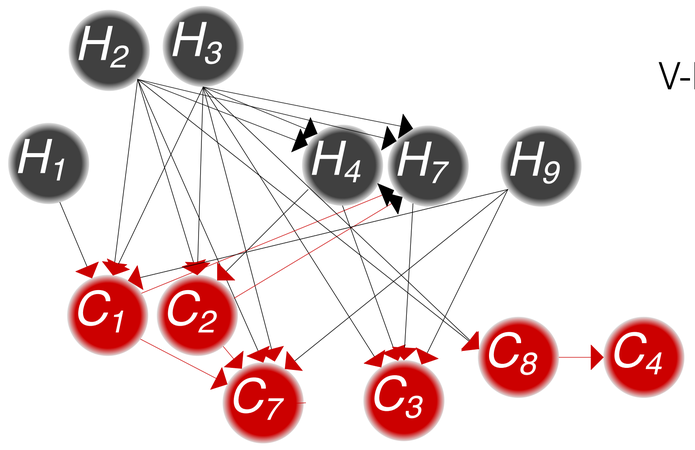
II-Person



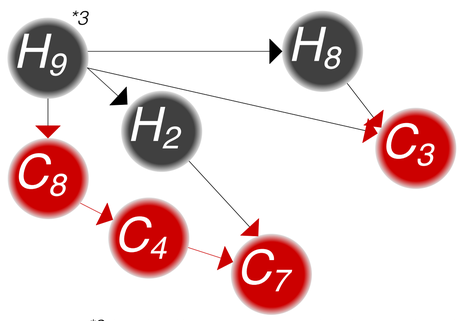
III-Person



IV-Person

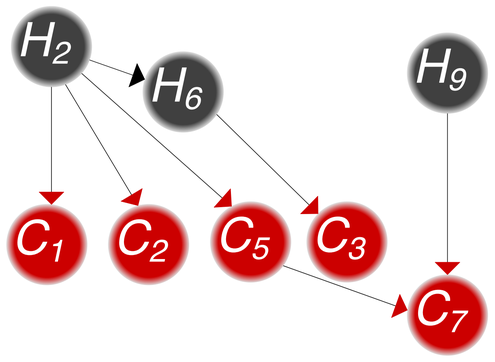


V-Person



[3] including project design mistakes

VI-Person



[1] Business/experiment interruption: stop experiments in DUG lab and other activities overground
[2] Contamination: water contamination/ radioactive from other experiments