Enhancing safety culture in complex nuclear industry projects

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Major projects have often experienced

schedule, quality and financial challenges

STUK; 201; Ahola et al., 2014; Brady and Davies, 2014

Project delays and quality issues have been perceived mainly as **economic problems.**

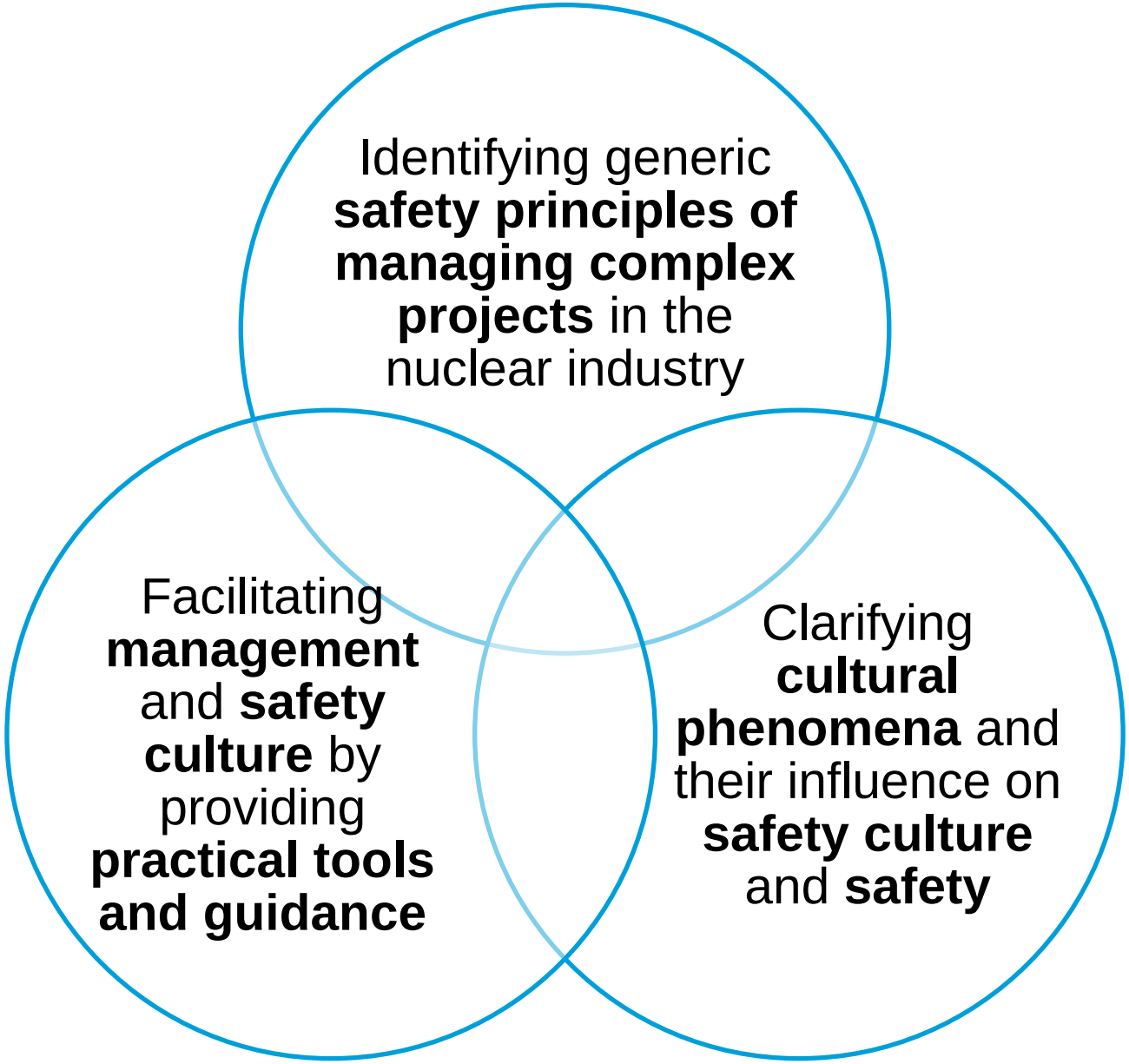
Project management issues remain understudied in safety research.

When a systemic view is applied, safety cannot be separated from other performance aspects.

The aim is to provide an overview of an ongoing interdisciplinary research project, “Management principles and safety culture in complex projects” (MAPS)

Funded by SAFIR2018, the Finnish Research Programme on Nuclear Power Plant Safety 2015-2018

The objective of MAPS project is to enhance nuclear safety by supporting high quality execution of complex projects in the nuclear industry

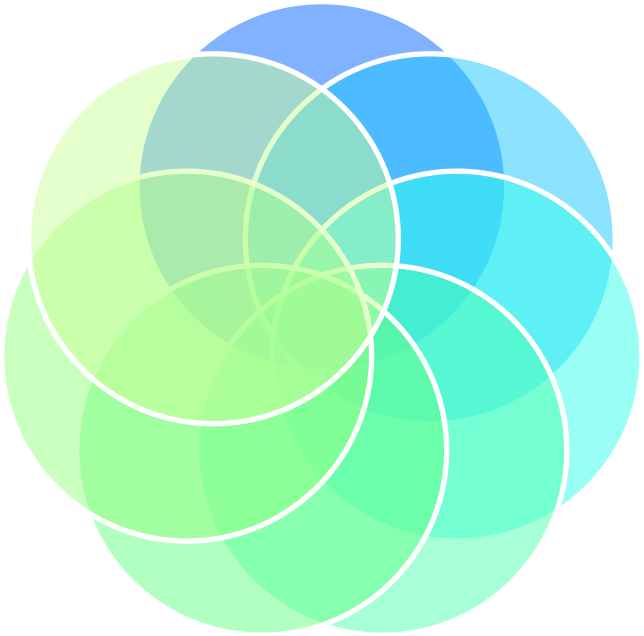

Identifying generic **safety principles of managing complex projects** in the nuclear industry
Facilitating **management** and **safety culture** by providing **practical tools and guidance**
Clarifying **cultural phenomena** and their influence on **safety culture** and **safety**

Key concepts

Project

Complex adaptive systems

Complexity



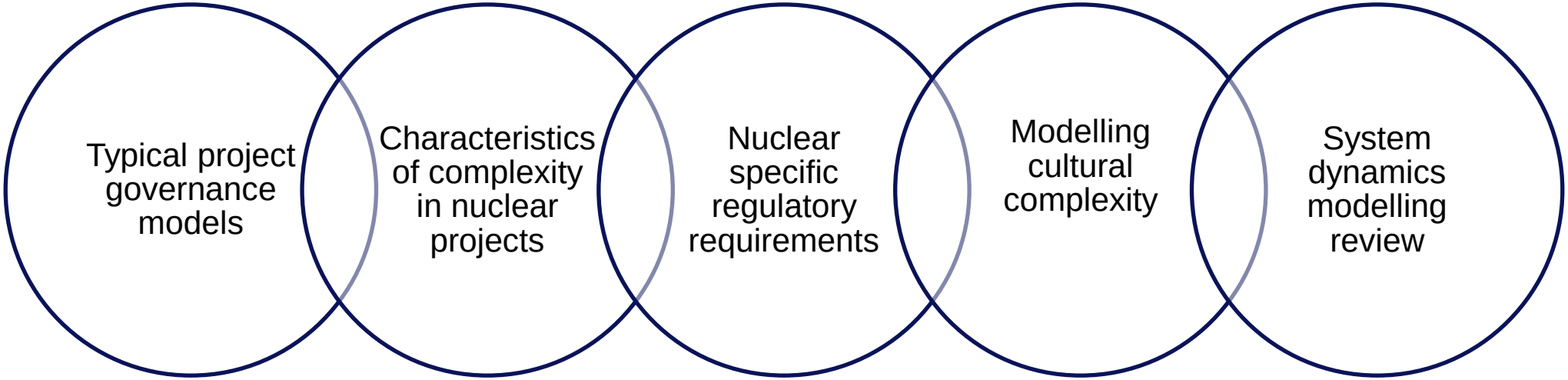
Project governance

Safety culture

Project networks

(Sub)culture

MAPS 2015: Key tasks



Typical project governance models

How to build governance systems for nuclear projects to meet safety related goals?

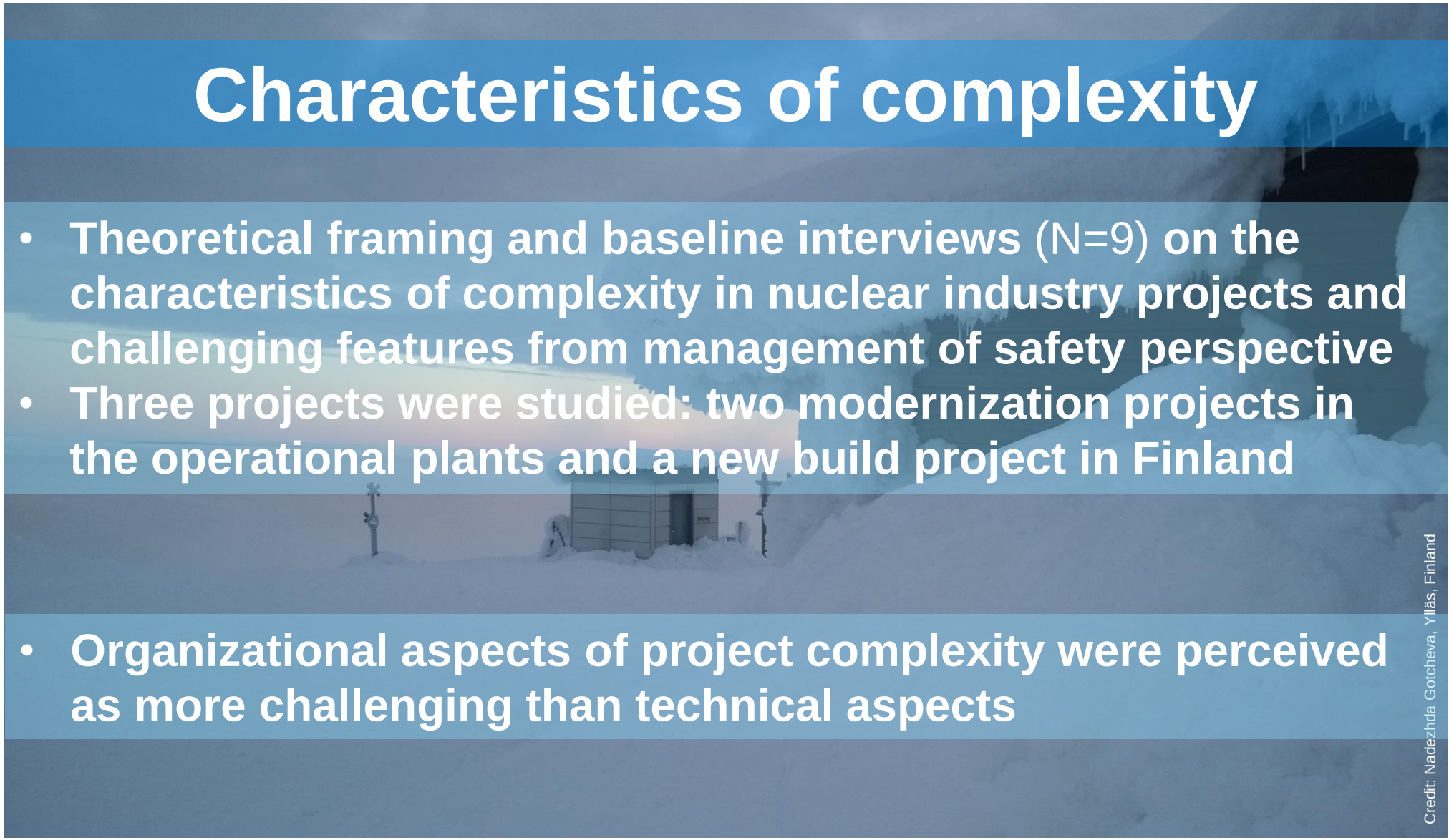
A systematic literature review on project governance in networks: six key interdependent dimensions

- Goal setting
- Incentives
- Monitoring
- Coordination
- Roles and decision-making power
- Capability building

Characteristics of complexity

- **Theoretical framing and baseline interviews** (N=9) **on the characteristics of complexity in nuclear industry projects and challenging features from management of safety perspective**
- **Three projects were studied: two modernization projects in the operational plants and a new build project in Finland**

- **Organizational aspects of project complexity were perceived as more challenging than technical aspects**



Credit: Nadezhda Gotcheva, Ylläs, Finland

Nuclear specific regulatory requirements

- **Interviews at STUK and power companies** (N=12)
- **Sources of complexity (requirements, scale/supply chain, interconnections between cultural, organizational and technical complexity, schedules)**
- **Means to govern safety and complexity in projects**

Nadezhda Gotcheva, Hervanta lake, Finland

Cultural complexity and safety culture

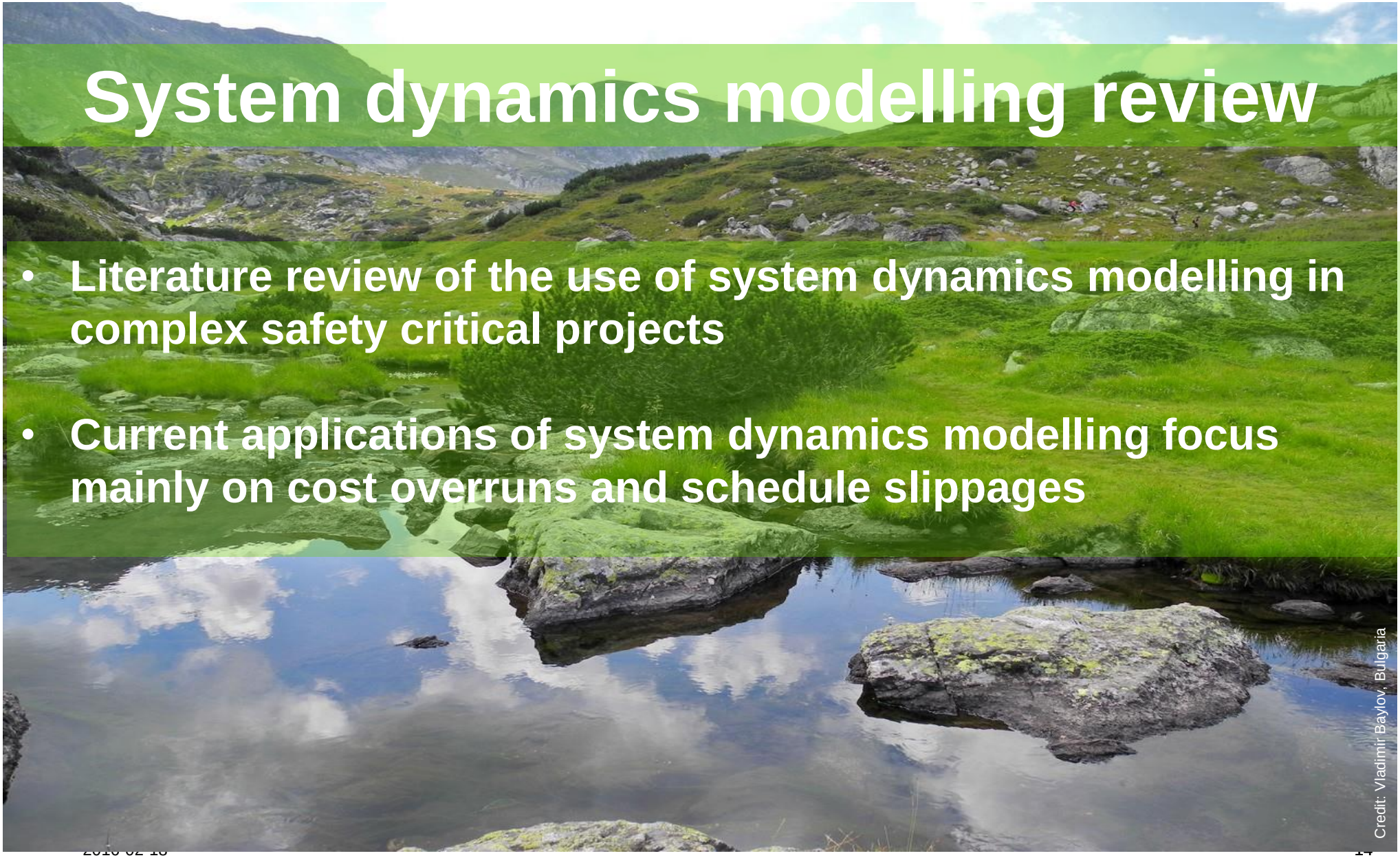
- Temporary and dynamic nature of projects challenges the notion of homogeneity of culture
- Past incidents point to the role of cultural complexity (multiple subcultures interact)

- Cultural complexity and safety in projects: challenges and opportunities
  - Balance between fragmentation and asymmetries in power and richness of perspectives, flexibility and identification of emergent risks

Credit: Vladimir Baylov, Bulgaria

System dynamics modelling review

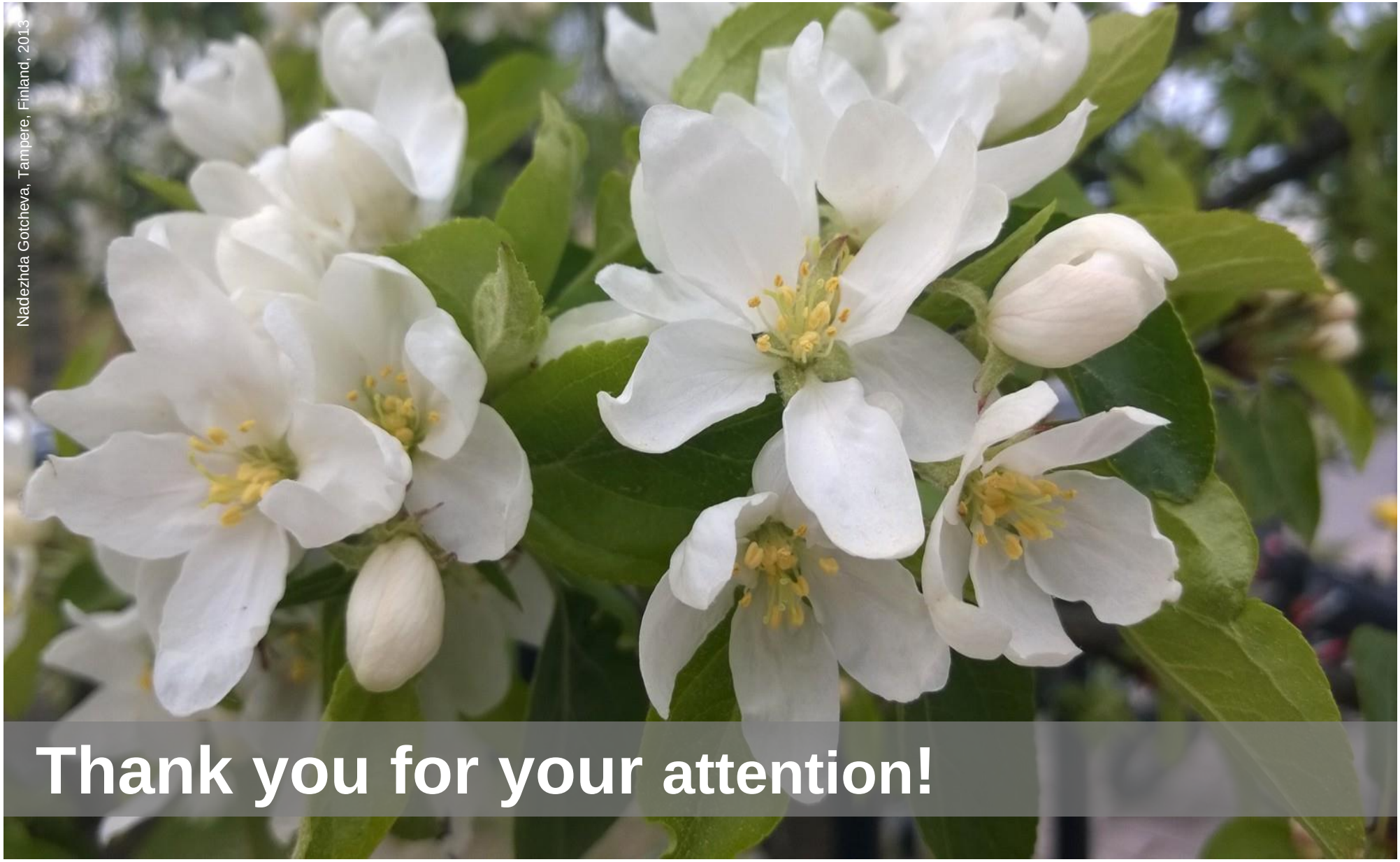
- Literature review of the use of system dynamics modelling in complex safety critical projects
- Current applications of system dynamics modelling focus mainly on cost overruns and schedule slippages



Credit: Vladimir Baylov, Bulgaria

Conclusions and next steps

- Managing complex nuclear industry projects and keeping safety in focus in dynamic project environments is a very challenging, long-term task
- Need for an improved theoretical understanding and practical tools for integrating project governance/management, cultural phenomena, complexity thinking and safety management approaches
- Next steps
  - Identifying methods to improve, facilitate and assure safety culture in complex projects
  - Developing a system dynamics simulation model of governance and cultural phenomena interactions in complex nuclear industry projects



Thank you for your attention!