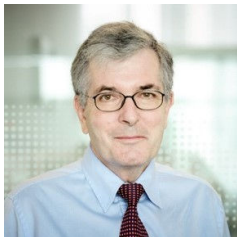


Future Resilient Systems at the Singapore-ETH Centre



Director



Prof Dr Hans R. Heinimann
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Hans Heinimann is professor of Forest Engineering at ETH Zurich. He was the Pro-rector for Education of ETH Zurich from 2007 to 2013 and is founding member of the ETH Risk Centre and chairman of the centre from 2011 to 2013.

Making interconnected critical infrastructure systems more robust and resilient

The functioning and well-being of modern societies depend on services provided by networks of critical infrastructure systems, such as power, transport, communication, water, and emergency systems.

Rapid urbanisation has been driving the increasing spatial density of assets and the interconnectedness within and between systems. At the same time, increasing uncertainty in the environmental and geopolitical systems is making the world we live in more unpredictable.

As a result of the increasing value at risk, fundamental change of behaviour, and unpredictability of social and natural systems, the magnitude of disruptions is increasing.

Future Resilient Systems (FRS) was set up to address the challenges of increasingly interconnected and complex infrastructure systems. It seeks to develop a framework, concepts, and tools to make interconnected critical infrastructure systems more robust and resilient.

FRS is the second programme of the Singapore-ETH Centre, established by the Swiss Federal Institute of Technology Zurich (ETH Zürich) and the National Research Foundation.



Research

The Future Resilient Systems (FRS) provides a cross-disciplinary and cross-cultural environment to jointly explore approaches to make critical infrastructure systems more robust and resilient. 'Resilience-based management' provides a framework for its research; while a socio-technical approach takes into account that infrastructure systems are made up of engineered systems, operating organisations and users of the services.

As a whole, research at FRS focusses on 4 domains:

1. Understanding and modelling Interdependent Systems

- a. Understanding interdependencies
- b. Modelling system of systems (SoS)
- c. Developing resilience metrics
- d. Detecting regime shifts

2. Optimising network extension/protection

- a. Optimising networks for robustness
- b. Optimising networks for flexibility
- c. Detecting and suppressing failure
- d. Enhancing regulatory regimes

3. Individual behaviour

- a. Strengthening response, adaptive and learning behaviour
- b. Understanding the influence of individual/social factors and incentive schemes on adaptive behaviour

4. Organisational behaviour

- a. Enhancing operating performance across sectors
- b. Fostering high reliability organisations

The Future Resilient Systems was established in 2014 as the second programme of the Singapore-ETH Centre, established by the Swiss Federal Institute of Technology Zurich (ETH Zürich) and the National Research Foundation.

The programme brings together an interdisciplinary team of nearly 100 principal investigators, PhD and postdoctoral researchers, and research assistants and engineers. The team comes together from Switzerland-based ETH Zurich and Paul Scherrer Institute (PSI), and Singapore-based Nanyang Technological University (NTU), National University of Singapore (NUS), and Singapore Management University (SMU).

For more information about Future Resilient Systems, visit www.frs.ethz.ch or contact info@frs.ethz.ch.

Updated: March 2018