Critical Infrastructure Interdependencies: A 'System of Systems' Approach

INTERNATIONAL CONFERENCE

14 – 15 NOVEMBER 2023

GEORG-CHRISTOPH-LICHTENBERG-HAUS, DARMSTADT, GERMANY

Call for Abstracts

Submission deadline	18 June 2023
Word count	100 – 300
Language	English
Participation fee	no fees apply

1 Concept of the conference

Cities are not only distinguished by a high spatial density of networks and flows but can be seen as complex systems of infrastructure systems characterised by various interfaces and a tight coupling between individual infrastructure domains. While interconnected networks underpin the ceaseless flows of city life in various ways and bring about efficiencies during normal operations, they also create risks of cascading infrastructural failures. As urban infrastructures become interconnected and dependent on each other and as new infrastructural nexuses emerge (e.g. electric mobility, 'waste2energy', 'power2gas', dry sanitation solutions), their complexity and tight coupling enable relatively small disturbances to escalate rapidly into compound multi-infrastructural crises. What happens to one infrastructure can directly and indirectly affect other infrastructures, impact large geographic regions, and send ripples throughout the national and global economy.
The 'system of systems' approach presents a framework through which complex infrastructure systems can be represented, analysed, and better understood as networks. It helps to explain interdependencies (within and between networks) and analyse the factors which interrupt, complicate, or enable the functioning of critical infrastructures.

Critical infrastructure interdependence is one of the central themes of the **Research Training Group KRITIS**. Thus, **the goal of this conference is to elaborate understandings on the potentials and limitations of the 'system of systems' framework in explaining and analysing critical infrastructure interdependencies.**

In this conference, the Research Training Group KRITIS aims to bring together perspectives from civil engineers, computer scientists, urban and spatial planners, architects, sociologists, political scientists, historians, and philosophers as well as practitioners from public administration and operators of critical infrastructures on the different understandings of the 'system of systems' concept and its application in analysing critical infrastructure interdependencies.

2 Keywords

Contributions may focus on, but are not limited to:

Conceptual approaches While the 'system of systems' concept has increasingly been mobilised across different disciplines in critical infrastructure research, the crosscutting use of the concept across different domains and bodies of knowledge has rendered it elusive. Contributors are invited to engage into the conceptual debates around the 'system of systems' approach in critical infrastructure research, elucidate the different ways in which the 'system of systems' concept has been conceptualised and the implications of different conceptualisations on understanding infrastructure interdependencies.

Interdependencies Interdependence is generally defined as a mutual dependency. For infrastructures, whether water supply, traffic and transport, electricity or communication, these interdependencies are highly complex and an analysis of these interdependencies of different systems can help to identify and reveal the connections of the systems. The ever-increasing interdependencies of critical infrastructures lead to the possibility of cascading effects and failure situations that have a major impact on the functioning of modern life structures. For this purpose, it is necessary to identify what interdependence of critical infrastructures means in different disciplines. This should help to develop a common understanding of interdependence.

Transformation processes The 'system of systems' represents a comparatively new analytical perspective in critical infrastructure research. As such, there has not been adequate attention to how (historical and contemporary) transformation processes of the infrastructure networks are changing the configuration of the 'system of systems'. Transformation processes are multidimensional and include technological, economic and governance processes. The participants are invited to discuss how multidimensional transformation processes are changing the configuration of 'system of systems'.

Technologies The 'system of systems' approach can find its application in new promising technological discoveries that might improve reliability, resilience, or robustness of currently existing interdependent critical infrastructures. Questions of effectiveness, feasibility, optimality, and cost-efficiency will be of the primary interest. Contributors are also encouraged to emphasise social, political, cultural, or legal challenges that form another crucial defining factor in the choice of the direction of future development.

Governance Preventing various infrastructural failures from happening and preparing for them in case they do, entails unusual governance complexities. In many cases generally accepted institutions, procedural norms, and organisational capacities that could guide urban policy making are still missing. The participants are welcome to present theoretical and/or empirical contributions that examine the application of the 'system of systems' approach in analysing the 'wicked' governance challenges involved in protecting urban infrastructures and in making them more resilient.

Safety and security Due to the complexity of critical infrastructure systems and the importance of their reliable functioning for society it becomes necessary to pay prime attention to the safety and security of infrastructure networks. This includes, on the one hand, approaches or methods aimed at addressing individual infrastructures, such as disruption management strategies, on the other hand, it also takes into account how safety and security gain further relevance across closely coupled systems. In order to identify current weaknesses and improve existing procedures we are interested in how the 'system of systems' approach has been mobilised to analyse the interdependencies with the view to enhance safety and security.

3 You are welcome to join!

Submit your abstracts in English language with **100 – 300 words** before **the 18th of June 2023, 23:59 CEST** to **sosconference@kritis.tu-darmstadt.de**.

Have nothing to present? Register as an attendee on **https://kritis.gitlab.io/sosconf2023/**. All forms of participations are **free of charge**.

4 Contacts

If you have any questions, there are multiple ways for you to get in touch with us:

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