

Resilience in IRGC's Recommendations for Risk Governance (Risk Governance Framework)ⁱ

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Resilience, as an approach or simply a characteristic of a system, aims to help systems cope with unexpected changes. The concept has gained popularity among scientists and practitioners alike who are faced with addressing the limits and boundaries of risk management. In 2005, the International Risk Governance Council's White Paper (IRGC, 2005) proposed an inclusive risk governance framework to deal with risks marked by complexity, uncertainty, or ambiguity. Further the White Paper identified a specific space for resilience building focused on the context of governing risk. Since then, IRGC has continued to make the case that resilience-building can be a relevant strategy to address the consequences of certain types of risks, such as with emerging risks, or risks with high uncertainty about causes and impact, and potentially catastrophic consequences.

IRGC proposes that resilience strategies should be considered for risks marked by uncertainty and unexpectedness, as often the case in complex adaptive systems. However, we also argue that other conventional risk management strategies should not be neglected. For example, risk managers need to identify and address trade-offs between hardening and protection (robustness) versus resilience and recovery. This paper includes excerpts from the description of the IRGC risk governance framework (IRGC, 2005; IRGC,2008).

Risk and resilience

In IRGC's thinking and recommendations for risk governance, risk is defined as an uncertain consequence of an event or an activity with respect to something that humans value (definition originally in Kates et al. (1985: 21)). Such consequences can be positive or negative (depending on the values that people associate with them), but most people are concerned risks that pose various harms. Systemic risks are those risks that affect the systems on which society depends, such as with health, transport, energy, telecommunications, etc. Systemic risks are at the crossroads between natural events (partially altered and amplified by human action such as the emission of greenhouse gases), economic, social, and technological developments and policy-driven actions, both at the domestic and the international level.

ⁱ This paper is part of the IRGC Resource Guide on Resilience, available at: <https://www.irgc.org/risk-governance/resilience/>. Please cite like a book chapter including the following information: IRGC (2016). Resource Guide on Resilience. Lausanne: EPFL International Risk Governance Center. v29-07-2016

In this context, risk analysis is used to inform a process by which resilience is built, when and as needed, to help strengthen the capacity of a system to cope with surprises. Resilience is a protective strategy to build in defences to the whole system against the impact of the realisation of an unknown or highly uncertain risk. Resilience strategies will primarily aim to reduce exposure and vulnerability. For example, they will aim to design systems with flexible response options, or improve emergency management.

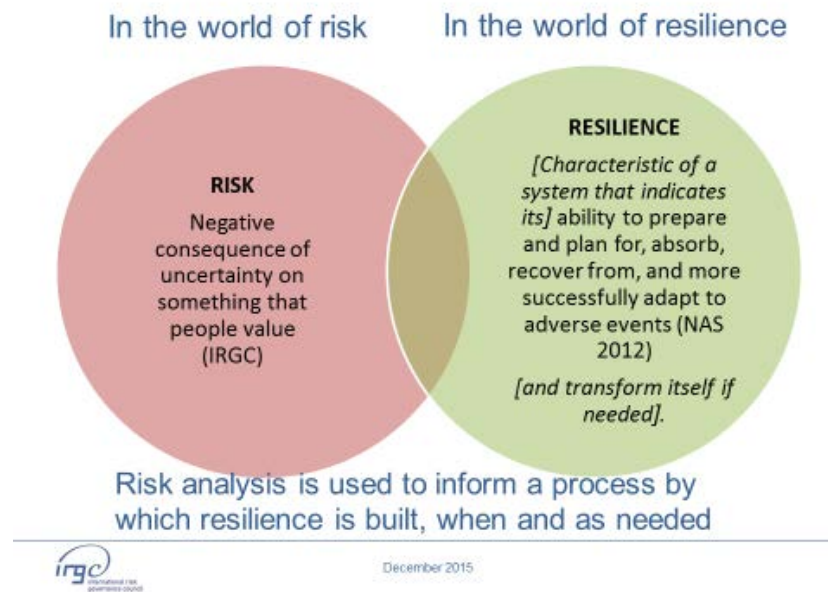


Figure 1: Risk and resilience

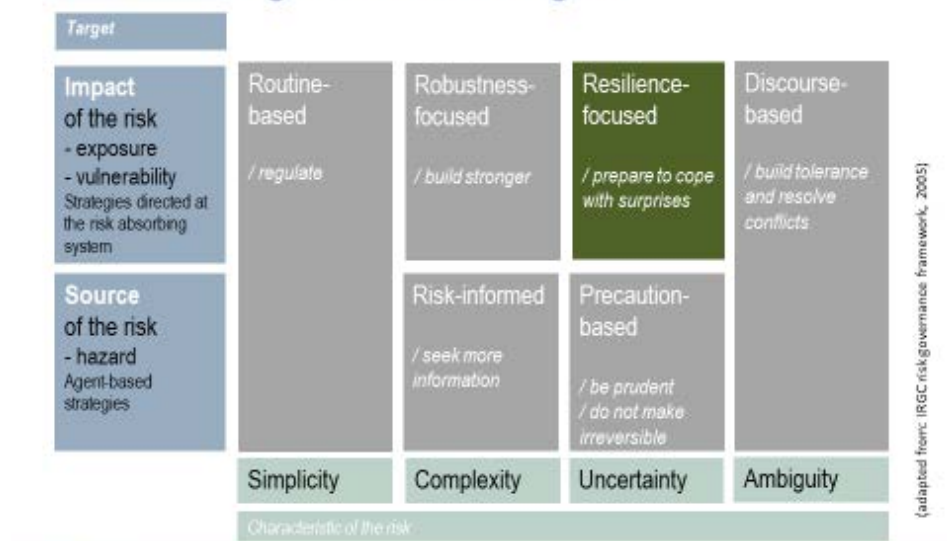
Resilience as a strategy for managing risks marked by uncertainty and unexpectedness

Targeted risk governance strategies differ according to the dominant characteristic of the knowledge about the risk issue ('simple', 'complex', 'uncertain', 'ambiguous')

- 'Simple' risk problems can be managed using a 'routine-based' strategy, which draws on traditional decision-making instruments, best practices, and/or time-tested trial-and-error.
- For 'complex' and 'uncertain' risk problems, it is helpful to distinguish the strategies required to deal with a risk agent from those directed at the risk-absorbing system: complex risks are thus usefully addressed on the basis of 'risk-informed' and 'robustness-focussed' strategies, while uncertain risks are better managed using 'precaution-based' and 'resilience-focussed' strategies. The former strategies seek to access and act upon the best available scientific expertise and at reducing a system's vulnerability to known hazards and threats by improving its buffer capacity. The latter strategies pursue the goal of applying a precautionary approach in order to ensure the reversibility of critical decisions and of increasing a system's coping capacity to the point where it can withstand surprises (IRGC, 2005; Klinke, 2001).
- Finally, for 'ambiguous' risk problems, the appropriate strategy consists of a 'discourse-based' strategy which seeks to create tolerance and mutual understanding of conflicting views and values with a view to eventually reconcile them.

These strategies are presented in Figure 2 and in more details below.

Risk Management Strategies



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Figure 2: Risk governance strategies

Complex risk problems

Complexity refers to the difficulty of identifying and quantifying causal links between a multitude of potential causal agents and specific observed effects.

In the case of complex risks, a major input for risk management is provided by the scientific characterisation of the risk. Complex risk problems are often associated with major scientific dissent about complex dose-effect relationships or the alleged effectiveness of measures to decrease vulnerabilities (for complexity refers to both the risk agent and its causal connections and the risk absorbing system and its vulnerabilities). Resolving complexity requires receiving a complete and balanced set of risk and concern assessment results that fall within the legitimate range of plural truth claims. In a situation where there is no complete data, the major challenge is to define the factual basis for making risk management or risk regulatory decisions. So the main emphasis is on improving the reliability and validity of the results that are produced in the risk assessment.

Robustness concerns primarily the insensitivity (or resistance) of parts of systems to small changes within well-defined ranges of the risk consequences. The terms robustness has different meanings in different contexts. For example: in most of the *natural hazard literature*, robustness is one of the main components of resilience. In much of the *risk literature*, robustness refers to the insensitivity of numerical results to small changes, while resilience characterises the insensitivity of the entire system against surprises. In the *literature about decision-making*, robustness characterises decisions that display good enough (though not optimal) performances for various possible futures.

Risk problems due to high unresolved uncertainty

Uncertainty is a state of knowledge in which the likelihood of any adverse effect or the effects themselves cannot be precisely described. If there is a high degree of remaining uncertainties, risk

management needs to incorporate hazard criteria (which are comparatively easy to determine), including aspects such as reversibility, persistence, and ubiquity. Further, risk management must then select management options which empower society to deal with worst-case scenarios (such as containment of hazardous activities, close monitoring of risk-bearing activities, securing reversibility of decisions in case risks turn out to be higher than expected).

According to IRGC, the management of risks characterised by multiple and high uncertainties should be *precautionary*. Since high unresolved uncertainty implies that the (true) dimensions of the risks are not known, one should pursue a cautious strategy that allows learning by restricted errors. The main management philosophy for this type of risk is to allow small steps in implementation (containment approach) that enable risk managers to stop or even reverse the process as new knowledge is produced or the negative side effects become visible. The primary thrust of precaution is to avoid irreversibility (Klinke and Renn, 2001).

With respect to risk absorbing systems, the main objective is to make these systems *resilient* so they can withstand or even tolerate surprises.

Robustness and resilience are closely linked, but they are not identical and require partially different types of actions and instruments. In contrast to robustness, where potential threats are known in advance and the absorbing system needs to be prepared to face these threats, *resilience* is a protective strategy against unknown or highly uncertain hazards whereas it concerns a whole system. Instruments for resilience include the strengthening of the immune system, diversification of the means for approaching identical or similar ends, reduction of the overall catastrophic potential or vulnerability even in the absence of a concrete threat, design of systems with flexible response options, and the improvement of conditions for emergency management and system adaptation.

Resilience strategy for systemic risk

Resilience strategies are needed for systemic risks that develop in complex adaptive systems with emergent properties. Due to the difficulty of identifying and analysing how elements in the systems interact with each other, the management of systemic risks often become very complex and challenging to apply in such a way that all the components of the system are included. A limitation of resilience management approaches is that if all components of the system are not included, the way the trade-offs are resolved may incur new risks. Management strategies for one network often rely on the functionality of another network. For example, building resilience to the risk of unexpected failure of a waste-water management system will also require that a resilience strategy for the electricity system is implemented.

An adaptive approach to resilience assessment and management is often recommended to learn as knowledge is improved from experience about how to reduce the consequences of systemic risks and their unexpected impacts. Focus must be on enabling business continuity by understanding changes in the critical functionality of a network over time after a shock, reducing time to recovery and extent of disturbance. Working on the capacity of social-ecological systems to adapt or transform in response to unfamiliar, unexpected or extreme shocks, Carpenter & al (2012) suggest that conditions that enable general resilience include: diversity, modularity, openness, reserves, feedbacks, nestedness, monitoring, leadership and trust.

Conclusion

Resilience-focused strategies target the risk absorbing system and, in particular, aim to improve the capability to cope with surprises. Options include diversity of means to accomplish desired benefits, avoiding high vulnerability, allowing for flexible responses, and preparedness for adaptation.

Objectives of a resilient system include to:

- Guarantee the functionality of the system and the services it provides, in the case of stress or disaster
- Limit the extent of impact and losses if the services are discontinued
- Ensure fast recovery if the provider of the service is unable to continue to provide the services

Scholars and practitioners are advised to work together to operationalise resilience approaches in a multi-stakeholder, multi-sectoral and multidisciplinary manner. Such work must include feedback from experiences in organisations that work to building resilience in the context of disaster preparedness and management, engineering design, cyber security or ecological systems. Advocates of resilience-building will need to make the case that metrics for resilience assessment and management must and can be developed in such a way that robust investment decisions can be made to allocate financial and other resources.

Annotated Bibliography

Carpenter & al (2012). General resilience to cope with extreme events, *Sustainability* 2012, 4: 3428-3259.

This paper focuses on rare or unprecedented disturbances in social-ecological systems. When these disturbances are unusually intense or extensive, a more broad-spectrum type of resilience is required. General resilience is the capacity of social-ecological systems to adapt or transform in response to unfamiliar, unexpected and extreme shocks.

Kates, R.W., Hohenemser, C. and Kasperson, J. (1985). *Perilous progress: managing the hazards of technology*. Westview Press, Boulder, p. 21.

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IRGC (2005). Risk governance, towards an integrative approach, International Risk Governance Council, Geneva. Available from <https://www.irgc.org/risk-governance/irgc-risk-governance-framework/>

This report introduces the IRGC risk governance framework, a comprehensive approach to risk framing, scientific and concern assessment, risk evaluation, risk management and risk communication.

IRGC (2008). *Global Risk Governance – Concept and practice using the IRGC framework*, Edited by Ortwin Renn and Katherine Walker, Springer.

This book presents IRGC's risk governance framework, with external reviews and case studies in which the framework has been applied to a number of significant but different risks.