INDM 2009 – 4th International Conference on Disaster Management and Civil Defence for National Resiliency
01 – 02 March 2009 in Tehran and 04 March 2009 in Mashad

Abstract

On the Role of Resilience in Integral Risk Management

Walter J. Ammann, President, Global Risk Forum GRF Davos, Flüelastr. 11, CH-7260 Davos, Switzerland
e-mail: walter.ammann@idrc.info, www.grforum.org, Tel. ++41 81 417 02 31

Across the globe, disasters due to natural hazards, failures of critical infrastructure and services, pandemics, acts of terrorism and financial crises are severely impacting individual and collective societies. Global climate change will aggravate the situation further. Over time, humans develop individually and collectively, adapt and learn how to deal with these events. The abrupt and often unpredictable dynamics associated with these events however, has led to greater uncertainty in spite of technological and scientific advances. Increasing human population, urbanisation, and overall development have generated more vulnerability of life and property to these events and greater potential loss of ecosystem goods and services.

To reduce vulnerability means reducing risks with appropriate measures within a holistic risk management process. Risk is thereby defined as the product of hazard and the related potential damage. To estimate the damage is often very difficult, in particular the indirect damage as a consequence of subsequent failures during the response and recovery phase or due to missing or reduced services and production capabilities. It is also during that period where human behaviour influences at most the resulting damage pattern. Risk analysis always is a “point- estimate”, valid for the moment of doing it. The time dependency of the indirect damage development can only roughly be taken into account, often by a simplified multiplication of the direct damage estimates by a factor – which may go up to 2 and beyond.

The resilience concept as an add-on to the risk management concept allows time dependency to be included in the response and recovery phase. This addition is in particular valuable for critical infrastructure systems and services, as they play an important role in community-wide disaster mitigation, response and recovery, and the overall ability of the community to be resilient. Failures in critical infrastructures can cause substantial indirect losses and damages, and thus drastically influene the resulting overall damages.

Resilient systems reduce the probabilities of failure, the consequences of failure and the time needed for recovery. Resilience reflects a concern for improving the capacity of physical and human systems to respond to and recover from extreme events. Resilience is both inherent strength and the ability to be flexible and adaptable after environmental shocks and disruptive events. Resilience can be measured as an example by the functionality of an infrastructure system and by the time it takes for the system to return to the pre-disaster level of performance – resulting in a “resilience triangle”. Resilience fails when the system loses its capacity to absorb disturbance.

Resilience enhancing measures aim at reducing the size of the resilience triangle through strategies that improve the functionality and performance and/or that decrease the time for full recovery. Robustness, redundancy, resourcefulness and rapidity are attributes and determinants for the resulting resilience. Robustness is the ability of “systems” to withstand disaster forces without significant degradation or loss of performance. Redundancy defines the extent to which “systems” are substitutable in case of loss or significant degradation of functionality. Resourcefulness defines the ability to diagnose and prioritize problems and to initiate measures by mobilizing material, monetary, informational, and technological and human resources. Rapidity is the capacity to restore functionality in a timely way, containing losses and avoiding disruptions.

To add resilience to the integral risk management concept will allow risk reduction measures to be consistently handled along the whole risk cycle of prevention, response and recovery and will add an additional way of evaluating the effectiveness and efficiency of measures to be taken. Four different domains for resilience can be distinguished. Thereby, the technical domain refers to the ability to resist damage and loss of function. The organisational domain relates to organizational capacity, planning, training, leadership, experience and information management that improve emergency-related organizational performance. The social domain refers to population and community characteristics that render social groups either more vulnerable or more adaptable to disasters. The economic domain refers to the ability of firms to make timely adaptations for post disaster improvisation, innovation and resource substitution and in general to the capacity to reduce both direct and indirect economic losses resulting from disasters.

Humans, structures and services, organisations, economies, social systems, and ecosystems develop and change over time in form and function and their resources, vulnerabilities, responses, and thus resilience reflects their development over time. Ideal goal of a final development stage is the full coping capacity respectively functionality of a community or system. Consequently, the same strategies to promote risk reduction and increased resilience to cope with future threats will not work for different stages of development.

This paper addresses the various meanings of resilience and risk reduction, puts resilience into an overall conceptual context of risk reduction management, discusses the four major domains of resilience of technical, organisational, social and economic origin and the four different paths of increasing resilience, and proposes some resilience metrics. Mitigation based strategies, the development of robust organisations and communities to respond to disasters, the improvement of coping capabilities of businesses and households – all these support the efforts to reduce risks and enhance resilience with the aim of reducing indirect damages.

Davos, 24 February 2009/ Walter J. Ammann

.