On Resilience-based Risk Governance[i]

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Introduction

Resilience is a frequently-used but loosely-defined term. It has its hidden attributes, though, which lead people to reach their conclusion on the resilience of a system. If we say a system is resilient, we mean that it cannot be easily impacted and/or it can be easily recovered once impacted. In existing literature, resilience is defined in various forms in different disciplines. For instance, in ecology, resilience is defined as the ability of a system to absorb changes and still persist (Holling, 1973); in psychology, resilience is defined as the capacity for positive adaptation (Luthar et al., 2000); in human geography, resilience is defined as the ability of groups or communities to cope with external stresses and disturbances (Adger, 2000). Nevertheless, the essence of these definitions is no difference from ours, which is the *resistance to damage* and the *ability to recover once damaged*.

Risk governance, as a management mechanism, deals with issues which concern multiple actors or affect the interests of multiple actors in a system or organization. In a world where population and technologies explode, the risks confronting a system or organization have become more and more complicated, and the plausible consequences associated with the risks could be wide-ranging and devastating. Abundant examples manifested this. The subprime mortgage crisis around 2008, triggered by a large decline in housing prices after the collapse of the housing bubble, resulted in massive defaults and hence caused severe harm to the whole banking system. The Fukushima nuclear disaster, initiated by the tsunami induced by an offshore earthquake, resulted in the equipment failures and finally the release of radioactive material. To prevent disastrous outcomes, it is necessary to enhance the resilience of both the system and the people involved. Of course, this is likely constrained by the availability of resources.

Objective & purpose of resilience

The difference between traditional risk governance and resilience-based risk governance can easily be comprehended by borrowing the terms of *mitigation* and *adaptation* in the climate change sphere. *Mitigation* there refers to reductions in emissions associated with each unit of output

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achieved by technological change and substitution; *adaptation* is focused primarily on increasing the resilience of human and nature towards the actual or expected outcomes. The traditional risk governance bears a resemblance to *mitigation*, and resilience-based risk governance bears a resemblance to *adaptation*. Traditional risk governance puts more efforts on the causes of the risks; resilience-based risk governance is consequence-centred.

Thus, resilience-based risk governance is most wanted when we don't have much leverage on the causes of the risks and the foci of efforts can largely be exerted on coping with consequences. By examining the causes of risks, it was found that there are situations where the causes are known but uncontrollable (at least to the current generation), and there are also situations where the causes are multiple and intertwined and the causal mechanisms are to be unravelled. An example of the former situation is natural disasters; an example of the latter situation is risks associated with climate change. It is worthy of mentioning that resilience-based risk governance is not a panacea for these situations, and only works when the consequences are foreseeable.

Instruments for resilience management

The philosophy of management is no difference in traditional risk governance and resilience-based risk governance, e.g., by making rules to spread the risks, by taking engineering measures to build or reinforce the infrastructure systems, by incentivizing people to change their behaviours, with coercive laws to make people refrain certain actions, by reforming the structure of organizations to improve its robustness, and by educating people to raise their awareness. Thus, the policy instruments for resilience management can be directly chosen from the arsenal of management instruments, for instance, to provide insurance to those living in flood-prone or earthquake-prone areas, to construct levee on the seashore along low-lying coastal lines to cope with the rising sea level as a result of climate change, and to build redundant fibre cables for providing robust backbones for the internet.

But, resilience management centres on the consequences, instead of the causes of risks. Being resilient means resistance to damage and the ability to recover; management instruments should then be chosen with the goals of enhancing the ability to resist damage and/or to recover from damage. To cope with specific risks requires specific measures. As we are not discussing specific risks, we propose a procedure to help to come up with management alternatives in a general sense. Within a system or organization, the prerequisite for developing resilience-based management strategies is that the risk managers have an awareness of the risks they have to deal with. Then, serious risk assessment can be conducted, with a focus on assessing the damages or consequences. These include identifying who are the impacted, and what are the consequences, and how severe are these consequences. Centring on the assessment results, generation and evaluation of coping alternatives can then be conducted.

Risk governance requires the active involvement of the multiple actors through informal or formal approaches in coping with risks. In generating resilience-based coping strategies, it is necessary to identify these relevant actors first. For instance, to cope with a nationwide risk, governmental agencies, enterprises, and the general public all can play a role. Then, centring on alleviating consequences, the instruments available to each category of actors can be identified by fully

considering the resources and roles of these actors in the system or organization. These alternatives can then be evaluated based on the basic criteria of cost, benefit, and equity, etc.

Metrics, criteria, indicators for resilience

Resilience is easy to comprehend, but is quite elusive to measure. We define a system or organization as having good resilience when it is not easily damaged and/or it is easy to recover once damaged. Thus, developing indicators for resilience centres on these two aspects.
By 'not easily damaged', we mean it is difficult to make a system or organization to deviate from its status quo. The assumption is that the status quo is preferred than the status of being impacted. Since we are talking about risk governance and thus the impact is by default negative, this assumption is valid. The degree of deviation from status quo given the level of external shock can be an indicator of resilience, and the difference between the status after being impacted by the maximum possible external shock and the status quo as expressed by the percentage of deviation can be used to measure this indicator. The smaller the difference is, the better the resilience is. The status quo of a system or organization needs to be assessed, and the expected damage to the system or organization by the maximum possible external shock needs to be assessed as well. In practice, things are often more complicated. A system or organization may have many components, and the degree of the expected damage to the different components could vary greatly. In evaluating the resilience of the system or organization as a whole, how to weigh the resilience of the different components is itself a difficult task. We can assign weight to the components, we can just make a judgement based on the component with the poorest resilience, or we can turn to other courses. This is both a science and an art.

By 'easy to recover once damaged', we mean it is easy for the system or organization to recover to its original status or to a comparable status, after being impacted. Comparing with measuring 'not easily damaged', it is more difficult to measure the easiness to recover. It is related to the resources needed and the resources available to recover the system after being damaged to the original status or to a comparable status. By assuming that the original status and the comparable status are equivalent, we then can design and measure the indicator of easiness to recover. This indicator can be defined either as the difference between the resources needed and the resources available to recover the system to its original status from the status of being damaged, or the difference between the original status of the system and its status after recovery from damage given the resources available. The smaller the difference is, the better the resilience is. Of course, the first challenge is to estimate the resources needed and the resources available to recover the system once it is damaged. The second challenge is to estimate the level of recovery with the resource available. These are again context-dependant.

Finally, integrating the indicators of the two aspects above to measure the resilience of a system is a daunting task as could be imagined. For specific system or organization, details are required to quantify these indicators, and the discussion in this section should be able to serve as guidance.

Annotated Bibliography

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This article defines social resilience and explores the relationship between social resilience and ecological resilience. Social resilience here is defined as the "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change."

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This article studies the resilience of individuals. Resilience in this context is defined as the capacity of individuals to maintain positive adaptation in coping with adversity.