3RG REPORT

Risk Factsheet 9
The Practical Application of Resilience: Resilience Manifestation and Expression

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Purpose: The Swiss Federal Office for Civil Protection (FOCP) has tasked the Center for Security Studies (CSS) at ETH Zurich with compiling factsheets on Critical Infrastructure Protection and on risk analysis to promote discussion and provide information about new trends and insights.

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1 INTRODUCTION

This factsheet aims to overcome some of the theoretical and disciplinary complexity associated with the concept of resilience by reflecting on the way it manifests and is expressed in response to a disturbance. By focusing on resilience as response, and reflecting on the various ways in which resilience may manifest or be expressed, the factsheet seeks to highlight an element of practicality in this term that may otherwise be overlooked. This factsheet builds on the SKI Factsheet 8, which discussed the expression of resilience in the context of the 'bounce back' and adaptation forms of the concept.[1]

This factsheet makes a deeper exploration of the response, and how the expression of resilience is connected to the way it manifests in an entity (person, infrastructure, ecological system, *etc.*). The background section briefly reflects on the 'bounce back' and adaptation points made previously, highlighting possible points of interest in an extended discussion about both manifestation *and* expression. Section 3 describes the ways in which resilience might manifest and ultimately be expressed, and the connections between these. The Factsheet concludes with a brief outline of why focussing on resilience as response is important, and what a focus on response will mean for the implementation of resilience building processes in Switzerland, particularly in the case of critical infrastructure.

1 Giroux, J. and Prior, T. 2012. Expressions of Resilience: From 'Bounce Back' to Adaptation. SKI Factsheet 8. Center for Security Studies, ETH, Zurich.

2 BACKGROUND

As duly noted, resilience is used in a range of contexts and disciplines. Many authors suggest that the modern application of resilience has been drawn from early conceptions of the term by systems ecologists in the early 1970s. Indeed many systems (social, technical, economic) share outward characteristics of resilience that indicate the concept can be used interchangeably between systems.[1] Examining the resilience of linked social-ecological systems has contributed to a deeper understanding of human interactions with the natural environment. [1-9]

However, as Norris and colleagues point out in the context of the export of resilience from systems ecology: "Looking back, one wonders if perhaps the social and psychological sciences should have created their own language, free from inherited meanings". [13: 128] The authors make this observation in light of the fact that applying resilience has not always proved successful or straightforward – that it is fashionable, but not always functional. The same issue applies in the context of critical infrastructure protection and resilience, where notions of technical resilience may even contradict conceptions of resilience in social or ecological systems. For instance, analysing social dynamics in resilience through the lens of ecological theory overlooks specifically social characteristics or constructions like culture, politics, personal and collective beliefs, attitudes and values, and decision trade-offs that might limit the applicability of the systems ecological approach to resilience in the social dimension. [1, 10-12]

The challenge of applying resilience in social, technical or economic contexts raises another problem that is highlighted by resilience's boundary-skipping nature. Arguably, a definition of resilience from systems ecology based on change, learning or adaptation, as is most popular in current applications of the 'resilience paradigm', is unfaithful to the real meaning of the term: where resilience was once a 'state', it could now more accurately be described as a 'process' or 'outcome'. This poses fundamental problems in real-world applications of resilience: without an appropriate conception of what resilience *really* is and where it comes from, how do we know who has got it? How can we tell who needs it? What do we need to do to encourage it? By focusing on resilience as a response, and articulating how such a form of response develops and is expressed provides a considerably more practical means by which to answer some of the question posed above.

3 RESILIENCE AS RESPONSE

The complex and extensive discussion of resilience in disaster management, critical infrastructure protection, and in the context of social systems is fundamentally associated with a mechanism of response. While authors discuss the meaning of resilience with some disciplinary contrariness, most recent usage reflects on the fact that resilience 'happens' only in response to an event that disrupts normality. In fact, without disruption, disturbance, crisis or change from normality, there would be no necessity to demonstrate a capability to respond at all. Resilience is then simply a reflection on what is normal, or what is perceived to be normal, and gains relevance in disruption.

When thinking about resilience as response, two features of the response are worth exploring in detail in order to understand how the concept may be better applied in a practical context. Firstly, how does resilience **manifest**, or where does it come from? Secondly, when resilience does manifest, what does it look like, or **how is it expressed**? Both features are necessarily similar, but minor differences between the two highlight potentially fertile areas for the future development of resilient responses. This section examines these two features, with the view to developing a deeper understanding of response as a more appropriate means of conceptualising resilience in reality, one that is removed from the ambiguity of definition and transdisciplinary conceptual translation.

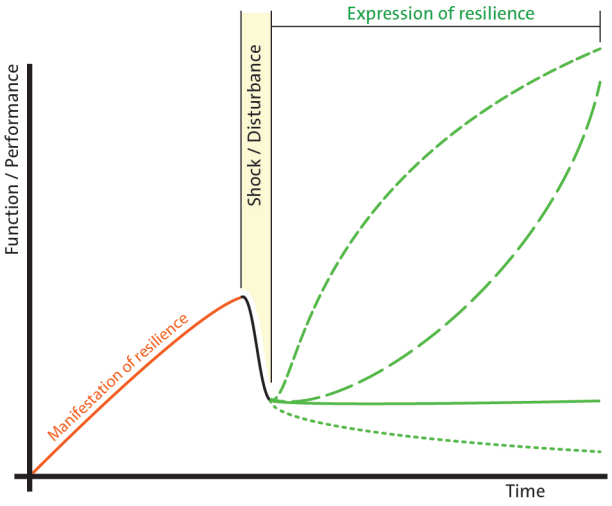


Figure 1: The manifestation (pre-shock) and expression (post-shock; multiple possibilities) of resilience in 1a and b. Entities depicted by the lines 1c and d are non-resilient.

Figure 1 illustrates the relationship between the manifestation and expression of resilience in relation to a shock or disturbance, and in light of the function or performance of an entity. In this practical response conception, resilience develops or manifests in the normal day-to-day functioning of an entity. The structural composition, operational management and nature of the entity confer its resilience. As such, the possibility of 'being resilient' is a latent characteristic of the entity, that can be influenced by decisions taken well before a shock or disturbance occurs that might influence the function or performance of the entity. By contrast, the expression of resilience reflects the outward appearance of resilient features following a disturbance or shock. In Figure 1, two variations of resilient expressions are illustrated (a & b) along with two illustrations of non-resilient responses following a disturbance or shock (c & d). The entity depicted at 1a exhibits a fast return to normality, and possibly a 'bounce back' form of resilience. The entity depicted in 1b shows a slower, but nevertheless resilient response, consistent with a response through adaptation. This section describes the manifestation of resilience, and particularly focussing on the possible ways in which resilience may be encouraged in a normal pre-disturbance system, and the ways in which resilience may be expressed following a disturbance.

3.1 The manifestation of response (where does resilience come from?)

Manifestation describes a process of appearance or materialisation – a characteristic or an object becomes evident or apparent. Much of the discussion surrounding resilience focuses on what it looks like, how it comes about, and how to operationally build or encourage it. This discussion sits on relatively uninformed ground because there are often few chances to witness the manifestation of resilience: not all entities experience function-changing events, like natural disasters or occurrences of terrorism for instance, so it is difficult to control the assessment of resilience, or even to know that what is being assessed actually *is* resilience. In this context it is relevant to note that the world is not a deterministic place, and systems are themselves affected by uncertain and unpredictable events, responding in different ways, even with respect to different occurrences of the same disturbances, events or shifts from normality. Three modes by which resilience manifests as response are evident: as a spontaneous characteristic, as a result of the ecosystemic features of and surrounding the entity, and as the result of a facilitated process. These manifestations of resilience need not be mutually exclusive, but exploring them separately is helpful in a discussion about the manifestation of resilience.

Spontaneous response

A spontaneous response is one that occurs innately without being called on specifically. Once normality is disrupted by disturbance, innate (but latent) capacities of an entity may promote resilience without external intervention.(14) As noted, disturbance is uncertain, so also is an entity's response to disturbance, and where one entity may respond spontaneously to one particular type of disturbance, the same spontaneous response cannot be guaranteed in the context of a different disturbance. Given the variable nature of disturbance, the manifestation of resilience with a spontaneous response is an attractive concept, but in reality the ability to build or encourage a spontaneous response in individuals or entities may be challenging.

The spontaneous appearance of resilience in response to disturbance is most obvious in the business, psychology and engineering literatures. In these fields, people, structures or organisations arguably either have the capacity to 'bounce back' or not, and this capacity only becomes evident when an entity is disturbed. In this context it is worth noting, however, that some authors (15) point out that structures cannot be resilient, they can only be vulnerable or invulnerable.[2] This point highlights the belief that resilience must encompass some form of learning or adaptation in order to actually be resilient, which would negate the possibility that the innate capacities of something or someone would underlie the spontaneous response. A response may still occur spontaneously, but the process of response development would be learned, rather than innate.

Undoubtedly some entities (some people, materials or businesses for example) do exhibit spontaneous resilience, but an equal or greater number may not possess these spontaneous capacities. Spontaneous response is entity-focussed and rests on the assumption that the agency of the entity, or its characteristics, spurs the response based on the intrinsic or latent capacity. Clearly spontaneity will be beneficial for the entity that exhibits it, but given its innate nature, it is unlikely that the experience of spontaneous resilience may be of lesser use in the development of resilient response across a population or system,

2 This point highlights again that discussion about resilience and how it works is mired in the inability to nominate and utilise a standard definition of the concept.

for instance in the context of civil protection. Not all entities can respond spontaneously following disturbance, suggesting that non-spontaneous entities are going to be disadvantaged in disturbance, thus raising the necessity to foster a response.

Ecosystemic response

The claim that spontaneous resilience could be the result of intrinsic or latent characteristics of the entity can be made with less contention, perhaps, with respect to engineered structures than in social systems. By contrast, the idea of ecosystemic resilience originates from the idea that an entity or individual exists in an environment that helps to confer resilience on that entity. The ecosystemic label originated from social and community psychologists [16, 17], who's work began to illustrate how "unfamiliar, artificial, and short-lived" [16: 513] were the situations that informed the traditional views of peoples' responses to adversity, and on which foundations the earliest conceptions of psychological resilience were built. By contrast, these authors contend that understanding human behaviour, and by proxy understanding how resilience (and other characters) manifests, required an understanding of "the environment beyond the immediate situation containing the subject". [16: 514] While developed in the social sciences, the concept of ecosystemic resilience also holds currency in technical systems like critical infrastructure, where system function can be influenced dramatically by characteristics of the system, and the system's interdependencies.

A spontaneous resilient response may only develop with respect to known or experienced disturbances. [18] If the disturbance type or magnitude are not known, or fall outside of the entity's experienced history, then an understanding of the way in which resilience manifests as a product of the ecosystemic context of the entity is likely to be of greater functional use. In this way, the ecosystemic manifestation of resilience results from more generic characteristics that exist in the influencing environment, [19] rather than the intrinsic or innate and specific characteristics of the entity itself (though these can also be conceived as influential factors). Identifying what parts of this environment confer resilience in the entity can then be used to foster an ecosystemic manifestation of resilience.

Unlike the spontaneous response, which is clearly individualistic, the ecosystemic response downplays the role of the entity alone. [17] If resilience is less dependent on the intrinsic character of the individual than on the external character of their environment, then perhaps developing the resilient response is more likely, and is exhibited by a greater proportion of entities existing in that environment. Whether a resilient response originates from ecosystemic or spontaneous factors, both avenues require knowledge of the way either the intrinsic or extrinsic character of individual or environment influence a resilient response.

Facilitated response

Resilience is a response feature of an entity that has faced a disturbance. In this context it is considered to yield benefits to an entity that assist it to recover from the consequences of disturbance. As such, the need to facilitate, build or develop resilience in society, critical infrastructure, the environment, or any other entity that might be threatened by disturbance, increasingly features in resilience-related discourse and practice. Yet, whether resilience is a state that can be switched on or off, a process that develops along a continuum from low to high, or an outcome that can be measured against a known baseline, the reality is that in order to switch it, to develop it, or to measure it requires an understanding of how resilience changes, or can be changed.

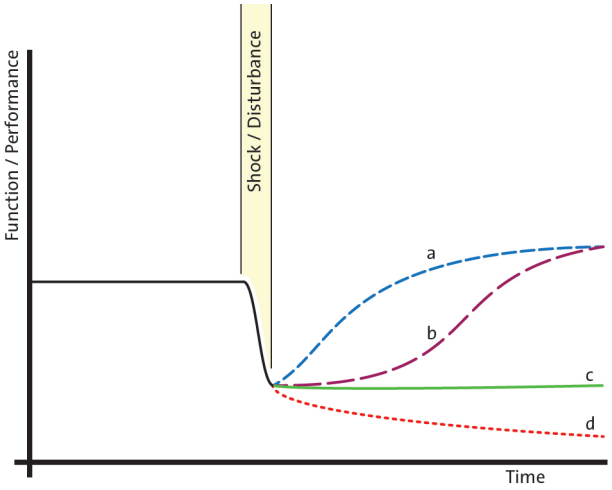
Suggesting the necessity to facilitate a resilient response also assumes that we know what response should manifest, and those that should be prevented from manifesting because they are (thought to be) counter-productive. For an indeterminate concept like resilience, this pre-deterministic approach to influencing the manifestation of response such that the ultimate response is one that (outwardly) suits the facilitator could be incongruous. By suggesting the need to encourage resilience, proponents invoke the precautionary principle, which states that it is better to address a problem before it materialises than after. Yet, precaution in the context of resilience is hampered by conflicting notions of resilience pre-disturbance, and uncertainty about what aspects of the entity, or its environment, should receive the resilience-stimulating attention in order to yield the desired post-disaster response.

Deciding that entities should be *made* resilient is preceded by an *a priori* decision that they need to *be* resilient – that all entities might lie at some point on a continuum between low to high resilience, and that the goal is to move them towards a state of high resilience. [20] Facilitating resilience relies on substantial interaction, understanding of, engagement with and deliberation with those entities that are to be made resilient (or with the entities' managers). In the context of social resilience, this raises the spectre of a top down process, which directly opposes the populist notion of resilience as a distributed and strongly individual response to a disturbance. Facilitators face the risk that in facilitating resilience, they are forcing it onto entities that may otherwise not want or (perceive they) need such a feature. It also begs the question of what kind of resilience is being facilitated, and whether the facilitated form of resilience sits well with those entities – *i.e.* can they work with it? Is it meaningful to them? Does it help them, and ultimately, does it help the facilitator to actually foster resilience? This concern is clearly not associated with technical or critical infrastructure resilience, except where the human managers of such systems are the subject of the resilience building exercise.

3.2 The expression of response (what does resilience look like?)

The second aspect of resilience that is worth exploring in this more practical comprehension of the concept is the way resilience is actually expressed in reality. Where manifestation describes the process by which resilience appears or materialises, the expression describes the manner or form in which the character exhibits. While there are many, and often disparate, conceptualisations of the resilience concept, resilience discourse across disciplines identifies two primary modes by which resilience is expressed in response to disturbance. These were dealt with in detail in Risk Factsheet 8: 'Expressions of Resilience: From Bounce Back to Adaptation'. This factsheet highlighted that resilience can be expressed as a 'bounce back' or as an adaptation, and that both expressions have proponents and detractors. Importantly though, each expression is more or less meaningful given the context, circumstance, discipline or disturbance in which each expression is proposed.

Figure 2 illustrates two possibilities by which *both* the bounce back and adaptation expressions (a & b) might materialise. Figure 2a shows a relatively quick return to normal function/performance, which could be associated with a 'bounce back' expression. Figure 2b shows a slower return to normal function that would likely represent an adaptation form of resilience expression, where an entity reorganises over time to respond to the disturbance or shock. Figures 2c and 2d illustrate possibilities where an entity shows no resilience following a shock or disturbance.



a Resilient to shock or disturbance; function regained ('bounce back')
b Resilient; responds more slowly (adaptation)
c Not resilient; unable to respond to shock
d Not resilient; decline in function continues after shock

Figure 2: Expression of resilient entities' responses (a & b) and non-resilient responses following shock or disturbance.

The 'bounce back'

Resilience expressed as a 'bounce back' is frequently used when considering entities singularly in a non-systemic context. Individuals are said to 'bounce back' from adversity, business continuity is assured if those businesses can 'bounce back' following crisis, an iron beam regains its shape by 'bouncing back' following some displacing force. In these cases, bouncing back reflects the ability of an entity to respond, and recover, by returning to a normal state of functioning. [15] Normal functioning in the context of a bounce back response is that which an entity exhibited prior to disturbance.

Bouncing back revolves around the maintenance of stability, traditionally the most valued aspect of an entity in the context of disturbance. In the case of disasters the ability to return to normal following an event, within the shortest possible time frame has been the yardstick against which the resilient response is considered. The same conceptualisation has been, and remains, the kernel of resilience in the physical and business worlds. Although the bounce back is an outwardly simplistic connotation of the expression of resilience, the type of response is certainly an extant one. Its simplicity should therefore not be mistaken for a reason to cast it aside in future explorations and application of resilience in security, and particulary in the context of Critical Infrastructure Protection.

Adaptation and Social Learning

The notion of a 'bounce back' resilience response lies in direct contrast to notions of resilience in complex systems, which largely reflect the resilience conceptualisation derived from systems ecology. In this conception, resilience is underpinned by the ability to adapt to change: where adaptation is conferred through transformation and self-organisation, [4, 9] and in human systems, through the ability to plan for the future. Where the bounce back represents a reasonably static response, an adaptive response encompasses more of a process that ends in a different form of response expression. Where the temporality of the bounce back is fundamentally short, the process of adaptation takes considerably longer.

Adaptation suggests learning, and in human systems learning requires strong associations between members of the system. In this way, lessons learned will translate into information shared, generating social learning and adaptation. In human systems, then, social cohesion (as the binding feature underlying learning) again plays a significant role in the ability of system members to develop resilient adaptive responses. A focus on adaptive responses, and on learning, assumes that resilience is a dynamic process, [22] and for adaptable systems, or system components this dynamism is the foundation of the resilient response.

4 CONSIDERATIONS IN THE CONTEXT OF SWITZERLAND

Considering resilience from the point of view of response, and specifically in relation to the manifestation and expression of this characteristic, raises a number of important considerations for civil protection in Switzerland and the Swiss critical infrastructure protection programme. Firstly, knowledge about how resilience might manifest in a person, community or critical infrastructure is imperative if a goal is to increase resilience. The manifestation of resilience is related to the conditions of the entity, pre-shock or pre-disturbance, which determine the expression of a resilient response. Changing these conditions to increase the likelihood of a resilient response may be the most straightforward means of generating resilience. However, such actions require a strong understanding of what actually influences resilience, coupled with the ability to assess whether actions taken to increase resilience actually do as they are intended.

Secondly, approaching the notion of resilience from the perspective of response presents a new perspective from which to view and assess this (increasingly) complicated, but non-concrete concept. Given that the use and definition of resilience continues to confuse the practical application of resilience in disaster preparedness and management, a focus on response permits greater ability to actually formulate a realistic notion of what resilience is and how it should be facilitated. In addition, focusing on the manifestation and expression of resilience before and after a shock also overcomes the problem of, and discussion about, whether what we term resilience in each entity's context is actually what we conceive it to be. More simply, knowledge of how resilience manifests and is expressed can give a clearer picture of how to actually build or facilitate resilience in a target entity.

Lastly, considerations about the manifestation and expression of resilience in critical infrastructure highlight uneasiness between the conceptions of, and practices in critical infrastructure protection (CIP) and critical infrastructure resilience (CIR). CIP is perhaps more a practice, while CIR is a goal, and component of the practice of CIP. However, in the context of more generalised discussions about resilience, the act of protecting and the act of building resilience are somewhat contradictory. On the one hand, protection suggests the ability to prevent an entity from suffering as a result of shock or disturbance exists. By contrast, much discussion and application of the resilience approach in disaster risk management points to the inability to protect entities (often people or communities), perhaps because of the likely severity or unpredictability of disturbances) and the necessity to encourage resilience in those entities such that they can deal with disturbance in a more bottom-up manner. A focus on the manifestation and expression of resilience can help to articulate how CIR might sit comfortably within the practice of CIP.

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