Resilience: Lessons to be learned from safety and acceptable risk

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A R T I C L E   I N F O

Keywords:
Risk analysis
Safety
Risk assessment
Resilient
Resilience
Urban
Cities
Disaster management

A B S T R A C T

It is not unusual to see the concept of resilience housed in binary terms: Your city is either ‘resilient’ or not. In contrast, being ‘safe’ is widely recognized as a statement based on ‘acceptable risk’ where absolute safety is unattainable. So why do we treat resilience and, as an example, the idea of “Resilient Cities” as a distinct endpoint? In this paper, we argue that this mindset is not only incongruent with current understandings of safety and risk but could create a false sense of security for systems that otherwise have been judged ‘resilient’. An alternative is that we can and should consider framing resilience in the same manner as we do to safety. The benefit of doing this is that we can learn from the safety literature and appreciate that, like for safety, there is no such thing as absolute resilience. Instead, we should be striving to constantly identify and reduce the risks to our systems and society.

1. Introduction

Articles on resilience and resilience thinking have seen a vast proliferation of content in the last 10 years. This heightened interest in resilience to inform planning and management in all aspects of our lives has resulted in ongoing discussions around the concept. This can be readily seen in the field of urban studies, wherein resilience-based thinking is rife in the context of increasing urbanisation and effects of climate change [1].

Safety, a field that has been heavily characterised by risk-based framings, has not been immune to the resilience-trend (see for example, [2]). However, what has not yet been exposed, is how resilience can in fact learn from the risk and safety fields rather than seeking to overwhelm it with vague notions of ‘bouncing back’ or ‘forward’ or any direction we see fit. The vagueness of the term resilience sets it apart from notions of safety. To discuss ‘safety’ is to discuss an element that is largely universally understood, and yet resilience is often misconstrued, misunderstood and ambiguous in its identifications [3]. Although within the field of risk studies, despite ongoing debates about the ontology of risks (does a risk reality exist?) through to epistemological foundations of the concept (can true risk be measured, and does the researcher exist outside of this measurement?), there is a general understanding what is meant by the term.

This paper adopts a unique angle to discuss the implications of general resilience-thinking, arguing that this in itself creates a false sense of security with respect to future risks.

The hazard identification approaches put forward by risk and safety literature, on the other hand, although notoriously unexceptional at dealing with uncertainty, nevertheless does not presuppose it is something it is not (i.e., the uncertainty is clearly stipulated as part of the process). We seek to contribute to the current scholarly understanding on general resilience to provide a unique angle that argues that:

1. The concepts of safety and risk are never absolute, so notions of resilience as being seen as absolute is problematic.
2. To be ‘resilient’ in a general sense carries a false sense of readiness to confront crises and hazards, as one may not address future avoidable risks adequately.
3. Risk and Safety are often housed as principles that can be seen as ‘subjective’ or dependent on an assessor, we argue that resilience is similarly a subjective concept and should be alluded to as so.

We engage within the nexus of three fields of research: safety, risk science and resilience theories to adequately address this question of not only where resilience fits within these concepts, but how resilience thinking can, in fact, learn from key principles in safety and risk literature.

2. Concepts of resilience

Resilience is a concept used in a wide variety of fields and, as a result, numerous conceptual definitions have emerged. The materialisation of these definitions has been accompanied by continuous and ongoing disagreements over resilience’s key concepts. The challenge with this ambiguity is that it can create a barrier for resilience-based policies to be effectively operationalized [4]. This results in ‘vague’ notions and plans that can be difficult to institute and measure for effectiveness. Mutually
exclusive definitions of the term may, in turn, render holistic interdisciplinary management approaches outside the realm of possibility [5]. Addressing and resolving this core issue of discord in conceptual understanding is important so that resilience can be put into practice.

The definitions of resilience that have emerged tend to cluster into three major categories or schools of thought. The first and earliest of the definitions is known as static (or engineering) resilience. Static resilience focuses on the ability of the system to maintain or quickly return to its pre-disrupted state [6,7]. Definitions of static resilience exist on the premise that there exists a single desirable or equilibrium state, an assumption that is generally accurate for many engineered or technical systems. This assumption is less suitable for ecological systems, and herein lies the second category of resilience: dynamic, or ecological, resilience. This definition diverges from static resilience by incorporating the potential for change and shifts between feasible operational states. The focus here is on the system maintaining desirable function by either absorbing disruption or adapting and reorganizing [8,6,9,10]. The third school of resilience thinking is more consistent with theories of sustainable development and environmental justice and centers around communities; in these contexts, societal systems have not reached desirable sustainable or equitable states and disturbances are indications of this failure. Therefore “community resilience” requires that the system continue to adapt and transform so to achieve its desirable state [11].

The primary difference underlying these categories of resilience is what they define to be the system’s “desired functionality/state”. Immediately, it is clear that there is subjectivity around what that desired functionality is. This has led to the argument between those claiming that resilience is simply returning to the previous state, with others tinge this position, citing the profusion of suitable states, and further, others still who argue for the need to transform (i.e., to ‘bounce forward’). Ultimately, this can be subjective as to both what the desired functionality of a system or community is, and whether or not it is currently achieving that function.

So, to discuss resilience in the most general terms, we therefore adopt the following definition: Resilience is the risk of the system achieving desired functionality, during a specific time, following an event (Logan, Aven, Guitkema, Flage, Forthcoming). Or, slightly more intuitively, resilience is the complement to risk of the system not achieving desired functionality, during a specific time, following an event. In these definitions of resilience, we use the conceptual definition of risk (SRA Glossary 2015): Risk is the consequences of an activity and associated uncertainty. Note that the consequences of an activity may be positive or negative. This definition of resilience is appropriate for all three of the traditional categories of resilience definition and therefore the following discussion is generalizable to engineered, ecological, or community-based application of resilience.

The corollary of the adopted definition of resilience is that a system is judged resilient if the risk of not achieving the desired functionality is sufficiently low. This enables us to evaluate a system’s resilience (either qualitatively or quantitatively) based on our understanding of whether the system will maintain or achieve desired functionality in the face of shocks and stresses. That is, a system is judged to have high resilience if it is believed that the consequences will be favorable following some event or resilient if those consequences (and the associated uncertainty) are within some acceptable level (Logan et al., Forthcoming).

This definition of resilience and resilient have striking similarities with how safety and safe have been defined in terms of risk. This is further discussion in the proceeding section, in addressing both definitional and practical aspects of such a comparison.

3. ‘Safe’ as representing ‘acceptable risk’ not absence of risk

Absolutely personal safety is not attainable. Safety in and of itself represents the inherent acceptability of a level of risk, of posing Fischoff’s (1978)[12] apt question: “How safe is safe enough?” However, this question touches on the many differing interpretations of risk, depending on one’s ontological standpoint (see Fig. 1). For example, concepts of risk and safety are highly subjective if one sits in the social constructivist camp, yet the other end of the ontological spectrum houses the positivist scholars who argue for the existence of a “true” risk which they claim can be measured objectively. This section first begins by discussing the differing interpretations of concepts of risk (a field of study wherein definitional disagreements are rife), followed by how these approaches feed into the argument of safety and acceptance of risk.

Risk, in a sociocultural sense, encompasses the impact upon which social constructions play in forming the ‘choice’ we make in risk acceptance. A sociocultural interpretation of risk adopts three main points, namely that (as taken from Lupton [13]):

(1) “Risk has become an increasingly pervasive concept of human existence in Western societies.
(2) Risk is a central aspect of human subjectivity.
(3) Risk is seen as something that can be managed through human intervention.
(4) Risk is associated with notions of choice, responsibility and blame.”

These points are taken from sociological studies of risk, reigning in work from sociology theorists such as Ulrich Beck, Anthony Giddens, Mary Douglas and Michel Foucault.

Perspectives from Mary Douglas’ work on culture and risk, emphasizes notions of ‘the self’ in relation to ‘the other’ to inform and guide symbolic risk constructions. Worldviews of individuals place people in groupings to determine these notions of ‘other’ and in this way, the approach is one of understanding risk dynamics at a meso-level, rather than one that is perceived at a micro, individual level.

Governmentality, another risk theory with its basis in Foucault’s work on social-constructivism, represents an approach of how governments manage risk through prompting and guiding individual choices. This can be undertaken by way of overt coercion and disciplinary power, or through softer measures such as metrification and risk messaging. Other sociological theorists consider the relationship between governments and the public to be one that is reflexive, as public opinion sways policymaking through democratic practice [14]. Conversely, Ulrich Beck’s contribution to the risk scholarship centered on the idea of a ‘World Risk Society’, of cosmopolitanism and the ensuing ‘obsession’ with risks resulting from modernization, in turn creating a reflexive action in its emergence and management. Overall, these approaches consider the way that society is structured, its influences and how we relate to one another as key aspects to guiding how risk is constructed. In much the same way, safety is considered in terms of risk acceptability, but this is often related to notions of social inequity. Risks to safety of citizens is not distributed equitably, and such, structural and labor approaches to acceptability of risk cannot be ignored. A highly privileged worker may find a risk more acceptable purely because they are less likely to be injured by the danger the risk poses [15]. Risk sociologists argue that risk is not self-evident, and is infiltrated by multiple cultural meanings from differing perspectives. Therefore, risk acceptability, and the ensuing principle that ‘safe’ represents ‘acceptable risk’, is highlighted by these theorists as being one that is highly based on social contexts and socially constructed to a point that absolutes can never been achieved, as cultural contexts, justice, and symbols alter so significantly between societal groups. Risk will always exist to some groups, but it is not an equitable existence, and one that is highly influenced by symbolic meaning.

As discussed above, there is a wide spectrum of imaginings of risk within the risk sciences, bookended by objective ‘real’ conceptualizations of risk and the socially constructivist (highly subjective) identifications. In between these two approaches lies the psychological theories of risk, an arguably post-positivist framing. These theories recognize the impact of personal mind processing in skewing a risk ‘truth’ to produce a perception of the risk that may be misaligned to ‘reality’. Risk perception literature stationed in the cognitive psychology domain, is led by subjectivity in the way that information is processed.
to guide personal actions and risk-acceptance. Psychological theories of risk, as promoted by theorists such as Paul Slovic[16], Barusch Fischhoff, Sarah Lichtenstein[12], Nick Pidgeon[17], Gerd Gigerenzer [18] encompasses qualities of how cognitive approaches such as heuristics alter personal risk calculations of the individual. These include features such as the ‘amplification of risk’ factors (see Kaspersen et al. [19,17]), trust [20] and availability and affect [21,22]. In essence, these factors create a prism through which risk is viewed, creating refractions that are unique to an individual. These risk perceptions are ultimately the main input, psychological theorists argue, upon which risk determinations and their subsequent actions are based [23]. Risk perception literature nevertheless features acceptability of risk issues that relate directly to safety. Rather than being stationed in terms of sociological constructs and symbolism in societal practice, risk acceptability in psychological scholarship is based on individual affect, which is a fluid and dynamic representation of risk at a particular point in time.

The difference between the two broad schools of thought (the sociological vs the psychological), aside from their epistemological underpinnings, is the focus from the macro, societal-level of understanding (social constructivist) to the individual (personal psychological risk prompts). Although the units of understanding are different (groupings vs individuals), there is an underlying principle which underpins both approaches to risk: that risk responses are based on subjective reasoning and the consideration of social norms in risk representation.

Subjective reasoning is rarely, if ever, considered in policy-based notions of safety. These methods of risk assessment capture the sentiment of naive realism to engender a theory that can be measured and stratified to produce clear answers on questions of risk. These measurements of risk can generally be easily communicated through metricization and as such, form popular processes for risk management. Such is its appeal for those in policy and decision-making positions. However, two main criticisms of this engineering and technical approach to risk (the risk approaches most notably witnessed in the natural sciences) is that there is little consideration of psychological biases and cognitive skewings of consequences and likelihoods of hazards, particularly those that are social in nature. In addition to this, there is little room afforded to the way in which social and cultural norms affect risk choices and communication. Despite these criticisms, naïve realist understandings of risk are rife in private and public sector decision-making (see for example, Environmental Protection Agency Victoria (2004)[24]; Kosovac et al. [25].

A recent study by one of the authors of this paper contends that current approaches of measuring risk in these public sector practices (many of which are based on the ISO standards [26,27]) highlight the varied levels of risk acceptance and aversion among individuals [25]. These practices, based upon classic quantitative risk matrices with hazard probability and consequences in the vein of the classic US nuclear regulatory risk management process [28], have been shown to produce widely varied conceptions and measurements of risk, which consequently influences its subsequent management [25].

Through understanding these various epistemological positions of risk and risk theories, how can resilience (and safety) be reimagined amongst these notions?

Sociological, psychological and technical ways of viewing risk is largely on a scale without pure extremes (i.e., not absolute). One can never state, no matter what epistemological standpoint they take, that an action is completely ‘risk-free’ or that there is undeniable certainty that a risk will render a hazard certain. An overarching understanding across all risk approaches is that risk lies on a spectrum that is not binary. Even positivist risk approaches recognise the importance of, and difference in, acceptability of risks among individuals. Notions of safety are notably housed ‘acceptable’ limits which can be conceived in terms of what is tolerable for a community, a policymaker, designer etc.

Risk is always described in the future, whereas resilience is often not. “To be resilient” is a current state of being, in accounting for future shocks and actions.

Resilience is often touted as a desirable approach to managing future hazards, mainly due to its oft-cited ability to manage uncertainty. Although resilience is often taken to refer to absolutes, i.e., aims of achieving a ‘resilient’ status at a select point in time, resilience will be reliant on responding to future hazards, which will always have a degree of uncertainty. So, if risk and subsequently, safety, are never seen in absolute forms, why do we house resilience in such terms? We explore some of the implications for safety below.

4. Does this, in turn, create a false sense of readiness?

In a similar vein to the discussion of safety and risk in the previous section, we adopt a partly socially-constructivist approach to understanding perceptions of resilience. The primary concern for framing resilience in an absolute form is the potential for creating a false sense of readiness or preparedness. The 100 Resilient Cities Programme, established by the Rockefeller foundation in 2013, was a network of 1000 cities that sought to develop resilient buffers to the physical, social and economic shocks and stresses that cities increasingly face. The inherent narrative of this programme has an underlying connotation that an
‘end point’ of being ‘resilient’ is achievable and desirable. If the perceived goal of being ‘resilient’ is reached by decision-makers, could this imply a false sense of security? Most concerningly, this could manifest if individuals or a society believe they are resilient [to all hazards and uncertainty], as aresult of being resilient to a single [type of] hazard.

Perpetuating the absolute view of resilience is the notion of general resilience [29]. Proponents argue that general resilience is “the capacity to absorb shocks of all kinds, including novel and unforeseen ones” [29]. They claim that general resilience is achieved through enhancing several key conditions that they have identified (e.g., leadership, diversity, modularity, etc.). However, in social systems, the idea of general resilience is potentially flawed, in a manner consistent with the issues surrounding the “all-hazards approach” to hazards. The all-hazards approach is “an integrated approach to emergency preparedness planning that focuses on capacities and capabilities that are critical to preparedness for a full spectrum of emergencies or disasters” [30]. It is criticized predominantly due to the differences required to respond to different hazards can often be quite vast and the commonalities may not be simple [31]. And yet, these commonalities are the basis of general resilience [29].

The issue with both the all-hazards approach to risk and the notion of general resilience is the potential for a false sense of readiness that results in suboptimal preparation [31].

This false sense of readiness manifests in a feeling of security that may not be endangering the safety of many, especially when considering large scale disaster risk.

For example, several years ago the United States could have judged to be resilient to many forms of crises. However, the COVID-19 pandemic shows how the country failed to respond in a suitable manner and, with the benefit of hindsight, pre-existing conditions state such as rampant inequality, a lack of universal healthcare, and erosion of trust can be identified as issues. Similarly, countries such as New Zealand and Iceland that have recently been identified as some of the best places to survive global societal collapse [32]. However, such a perception may result in these countries ignoring rising stressors such as racial tensions and widening inequalities that could erode the ability to respond to unseent or unanticipated disruptive events.

While reducing societal stressors (such as inequality, erosion of trust in government etc.) is critical to absorbing shocks, it is not sufficient preparation for the diversity of unknown threats that may transpire. The issue with general resilience, as much as it is an issue that is often level against naïve positivist risk approaches, is that its vague notions and unclear definitions often result in differing perceptions of what ‘resilient’ means to each person. As much as we like to put that ‘resilient’ blanket on, and hope it protects us from all the shocks and upheavals we did not expect, it is nevertheless important to recognize the psychological prompt that drive the saliency of particular types of resilience-building over others. Building general resilience signifies a choice as equally as it represents a values-statement. Increasing general societal resilience through welfare programs, increased capacity of healthcare systems and reducing inequality is an announcement, essentially, of the world you would like to create. By using the being ‘resilient’ terminology, however, implies that if you address these (self-promoted) issues, then the perceived ability to deal with unrelated shocks automatically goes up. This puts the seemingly ‘resilient’ in more risk than ever, through the inability to fully comprehend and address the shocks at hand prior to the onslaught. Essentially, one is using the wrong tool for each issue, and it is not a one-size-fits all.

Conceptually, general resilience is encompassed by the definition we propose: Resilience is the risk of the system achieving desired functionality, during a specific time, following an event. As with the concept of risk, it theoretically includes all future events and consequences. In practice however, a risk assessment must identify specific events and consequences, as would any resilience evaluation—thus making it specific resilience.

Today’s risk science has advanced such that it can address uncertainty and unknowns. Exploratory discussions with wide perspectives are necessary to reduce surprises and identify potential black swans [33,34]. Identifying a wide range of potential threats provides a pathway to understanding and debating mitigation options, as well as providing a differing viewpoint of the perceptions of risk and resilience that have been argued by theorists to be individually derived based on psychological prompts. Approaches such as general resilience and all-hazards approaches to risk management do not attempt to identify all possible threats and that means major effects could be overlooked. There may be a more effective ‘bounce back’ effect from developing general resilience, but this should not take the place of effective risk management.

5. Conclusion

How resilient is resilient enough? The parallels between resilience and safety are striking and perhaps considering resilience as the analogy to community or societal safety is how it needs to be characterized. This would require factoring in aspects of recovery, robustness, and long-term adaptability. However, to do so would enable the concept to be more readily understood and recognized for its inherent subjectivity. If we accept the definition that a system is judged resilient if the risk of not achieving the desired functionality is sufficiently low then that judgment is based on the knowledge, values, and aversions of the individual or group making that decision. This inherent subjectivity of resilience, requires that care is taken around how the concept is communicated to avoid creating any false sense or misconception. This is especially critical in community resilience settings where the decision-makers are often not experts in risk or hazard analysis. This subjectivity also raises ethical and social justice questions around what is valued by the community, over what time frame is risk considered, and who is making these decisions.

By accepting that absolute resilience is non-existent, it is then important for researchers to explore how “resilient enough” may be established in communities. Risk-based approaches such as ALARP (as low as reasonably practical) and risk-tolerance are necessary to discern what required level of risk is acceptable to a community. Achieving this will require constantly striving to reduce stressors, building the capacities that have been characterised as key to “general resilience,” but primarily will require exploring and evaluating potential hazards and appropriate ways to respond, so to constantly seek to reduce risk.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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