Destructive landscapes – (Re)framing elements of risk?

Denis Fischbacher-Smith

CHERR – Centre for Health, Environment, Risk and Resilience, University of Glasgow Business School, Glasgow, UK.

E-mail: denis.fischbacher-smith@glasgow.ac.uk

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Introduction

... uncertainty concerns the complex institutional context of societal problems.
(Koppenjan and Klijn, 2004, p. 6)

Events in the early part of 2011 have illustrated the problems that we face in dealing with uncertainty in decision making along with the ways in which organisations function in the wake of extreme environmental shifts. Koppenjan and Klijn (2004) highlight the importance of both societal and organisational contexts in shaping the nature of the uncertainty that we face. Events in Japan provided a tragic example of how uncertainty can be both a pervasive and powerful element of our lives.

The media images of the Japanese earthquake, along with the subsequent tsunami and resultant nuclear accident, have provided a tragic reminder of both the interconnected nature of risk within our societies and the manner in which that uncertainty manifests itself within the various organisational responses made to that risk. The media coverage of the aftermath of the tsunami reflected the uncertainty that existed in the available information concerning fatalities, the risks of further earthquakes and the unfolding nature of the nuclear accident. The coverage of the disaster took place on a global scale as the media presented, often in real time, the unfolding nature of the event accompanied by a range of associated scripts and narratives provided by commentators. At the same time, the coverage highlighted the inherent uncertainty that was present within the disaster itself. Experts were brought in to provide further insights into a situation where their access to accurate information was invariably

limited and the media sought to provide answers to issues where the levels of uncertainty surrounding the information flows was simply too high. On occasions, the presence of too much information – often information that was highly codified – created problems of interpretation and speculation, and occasionally served to heighten the uncertainty surrounding the event.

The impacts on the global economy of the Japanese disaster will not be fully known for a considerable period of time and neither will its impact on the creation of future problems in those organisations that were directly and indirectly affected by the disaster. Perhaps the most obvious medium to long-term impact will be the effects on proposed and existing nuclear power programmes, as the vulnerability of reactors to geo-physical impact – as well as other forms of ‘failure’ – has caused several governments to reconsider their strategies for energy provision. The reliance on ‘dwindling’ oil supplies, the social and political volatility of many of the world’s leading oil producers, the investment required to make alternative technologies both viable and available and the continuing debates around climate change have all created a complex energy policy problem for many countries, many of whom may have seen nuclear provision as a means of bridging their potential shortfall in generative capacity for energy production.

The potential vulnerability of large parts of the Pacific Rim coastline to the risks of tsunami have also been brought into sharp focus. Emergency planners will be considering, for example, the impact that a similar event could have on the western coastline of the United States, and especially in cities like Seattle, San Diego, Los Angeles and San Francisco. There are also implications for those nuclear reactors located on, or close to, the coast – such as those at the San Onofre and Diablo Canyon plants in California. The implications of the 2011 disaster are therefore considerable. Unlike many of the countries struck by the ‘Boxing Day’ tsunami in 2004¹, Japan is widely considered to be one of the most earthquake-prepared countries in the world. However, the severity of this earthquake and its subsequent crises, have illustrated how important the scale of such disasters can be in overwhelming the most prepared of organisations or nations.

What the Japanese disaster also illustrates is the interconnected nature of the various hazard and risk ‘pathways’ that exist within many of our political, natural and socio-technical systems. The disaster provides an illustration of how risk in one part of a system can have implications elsewhere. It highlighted the importance and inevitable limitations that are associated with the planning assumptions that are often made around extreme events. It also illustrated the manner in which failures in one part of a ‘system’ can erode or overwhelm systems defences elsewhere. The initial planning assumptions around the ‘scale’ of a potential tsunami, for example, led to the construction of a sea wall of a given size, not to mention the wider issue of the acceptability of constructing nuclear plants in seismically-active zones. The breaching of this

first line of defence led to problems with the pumping sub-system and initiated the sequence of events that ultimately gave rise to the radioactive release. The disaster illustrated how important our assumptions are in preparing for catastrophic events and how those assumptions can change over time and across space.

The aim in this discussion piece is to examine the role of the central dynamics of space, place, time and scale in the shaping of risk and to consider some of the main elements of 'organisational activities' that help to configure the various 'landscapes' and 'spaces' of destruction. The underlying rationale is to highlight issues within the management of risk that would be suitable for consideration within this journal. This is not to constrain the publication of research findings that deal with other aspects of risk but rather to give shape to, and encourage, the development of debates that consider the evolutionary nature of risk and its role within our societies. It is also an attempt to encourage the research community to see this journal as a outlet for policy-relevant research that speaks to real-world problems at the policy interface around risk, crisis and disaster.

Space, Place and Time – The Creation of Landscapes of Destruction

There has been considerable debate within the social science literature on the nature of risk within 'post modern' societies (Giddens, 1990, 1999; Beck, 1992; Adam, 1998; Urry, 2003). One of the key aspects of many of these debates around modernity has been seen as the 'erosion' of time and its associated abstraction from place. The argument that time has been 'emptied out' (Tsoukas, 2005) and that distance has been eroded by the development of new means of interaction (Cairncross, 1997) have been used to suggest that both time and space have been abstracted within modern societies. One result of this process is that:

Abstract time and abstract space can be separated and recombined at will. Organizations, being the carriers of modernity par excellence, both exemplify and contribute to the disembedding of social systems: social relations are lifted out from their local contexts of interaction and are recombined across indefinite spans of time-space. (Tsoukas, 2005, p. 42)

This raises some interesting challenges for risk management.

One result of this 'disembedding' process has been the increased power of experts within the processes of decision making, especially around the consideration of uncertain futures, and this has obviously become especially important for debates around risk (Giddens, 1990, 1999; Beck, 1992; Lasch, 1995; Tsoukas, 2005). Within these debates, risk has also often been portrayed as becoming more global in its scope – climate change is the oft-quoted example used to legitimise this argument – and many of the burden of proof debates

around cause-and-effect relationships have inevitably taken on the guise of an expert-mediated, but socially constructed discussion. These debates have often proved to be problematic in terms of a resolution as there has often been insufficient evidence to ensure the implementation of an agreed policy solution. There have also been suggestions that, despite increased attempts at control, these new forms of risk have continued to emerge and evolve in ever more complex forms (Perrow, 1984; Sagan, 1993; Erikson, 1994; Tenner, 1996; Reason, 1997) and this has served to erode public confidence in the abilities of organisations to manage risk. In order to frame our discussion around these issues, it is possible to set out a range of observations made by Tsoukas (2005) around risk and modernity as these provide a useful starting point for framing the debate.

Tsoukas argues that in early societies, the hazards that were faced were essentially local in their impacts. In contrast, he argues that many of the modern-day threats that we face have the potential for much more of a global dynamic (Tsoukas, 2005). For some hazards, the modernisation of society has had a significant effect. We have, for example, created a set of socio-technical risks that have a considerable ability to cause harm over long distances. There are also many forms of 'natural' hazard that have perhaps greater potential to cause harm on a global scale. One obvious example concerns the range of disease outbreaks that have caused considerable loss of life in earlier periods and which still generate significant problems today (Oldstone, 1998; Crawford, 2000; Cantor, 2001). As the outbreaks of SARS and, more recently, Swine Flu (H1N1) have illustrated, modern societies have also developed more effective methods of mitigating those hazards. At the same time, developments in transport may also have led to an increase in the potential speed of transmission. The configuration of risk is, therefore, a constantly evolving process arising from the interaction between multiple elements that are present in its particular 'landscape'. It is the interaction between 'natural' and socio-economic activities, for example, that creates the potential for increased populations at risk and it is impossible to remove the human element from such disasters (Steinberg, 2000, 2001).

The risk 'portfolio' facing societies is constantly evolving – both in terms of the range and nature of the hazards, as well as around the speed, scale and extent of the transmission of harm and the potential that exists for mitigation. This evolutionary nature of risk is clearly double-edged. On the one hand, the hazards themselves have evolved and developed. Obvious examples here include the range of viruses which mutate and evolve (the BSE outbreak, HIV and a range of other exotic forms of virus) and which display adaptive and emergent characteristics that require new responses from organisations and the health professions. At the same time, the societies that play host to such hazards have also 'evolved' – both in terms of their mobilities, population densities, and as well as scientific capabilities to deal with the task demands of

such threats. The mechanisms by which we live and organise ourselves has increased the population densities of countries and has also put a strain on the resources that we need for survival. We now seek our resources across large distances with the result that we create new forms of potential vulnerabilities in terms of our supply chains and the continuity of supply of those resources. At the same time, resource exploitation creates a spatial imbalance of problems for different societal groups (Fischbacher-Smith and Hudson, 2010).

What also differentiates the modern period from earlier ones is the issue of the scale of the hazards and the populations at risk. More people occupy hazard zones due to the increasing pressure for land and the benefits that often accrue to living in such areas. This process, which is akin to the occupancy of 'sinks' or 'ecological traps' in the natural world (Delibes *et al.*, 2001; Battin, 2004), generates a greater potential for fatalities and casualties as a function of the density of the population and, in some cases, creates problems associated with their evacuation.

Tsoukas's second issue concerns the 'perceptible nature' of the risks facing society (Tsoukas, 2005), echoing Beck's arguments that modern-day hazards (and their associated probabilities) are socially constructed (Beck, 1992). The combination of these factors, and the role played by the media, has resulted in a heightened perception of risk among many sections of society, despite the fact that we invariably live longer and have a better quality of life than our ancestors (Giddens, 1990; Beck, 1992; Gigerenzer, 2002; Gardner, 2009). The result has been the creation of a 'culture of fear' in which the media heightens our concerns around risk (Gardner, 2009). It is the 'intangible' nature of such risks, the difficulties that exist around the determination of cause and effect relationships, and the central role played by expertise within the determination of those risks, that have typified much of the current discourse around risk in society (Beck, 1992; Nowotny *et al.*, 2001). A key component of this process has been the role and nature of powerful elites in shaping policy agendas for the control of such hazards (Collingridge, 1984, 1992; Smith, 1990; Smith and Tombs, 1995; Irwin, 2001, 2006).

Tsoukas's third issue is around the 'normative' nature of risk and its acceptability. Societal assessments of risk invariably reflect the values that are held within them (often shaped by the various cultures through which they operate). Many of these assessments are invariably shaped by the assumptions that we bring to bear on the assessment of both the likelihood and consequences of particular risk scenarios and this is linked to the manner in which expertise is used within the process (Smith, 1990). It is this issue of measurement, especially for low probability, extreme and emergent forms of risk, that provides risk management with a significant challenge (Kunreuther *et al.*, 2001; Kunreuther and Pauly, 2004; Taleb, 2007; Wilson *et al.*, 2010). The manner in which we measure and express risk is also a function of the 'boundaries of consideration' (Tickner, 1999; Jackson, 2002) that we apply to considering cause and effect

relationships along with the extent of the information that we collect (Seidl, 2004, 2007) in order to undertake risk assessments.

The fourth issue raised by Tsoukas (2005), concerns the role played by human agency in the creation of 'modern' forms of hazard. There is little doubt that many of the current issues facing societies result from either direct human action or from the increasingly interconnected nature of our societies. We have created socio-technical systems that are both 'tightly coupled' and 'interactively complex' (Perrow, 1984) with the result that they fail quickly and do so across a range of interconnected 'pathways'. The hazard range associated with the failures of some of these socio-technical systems has been considerable (in the case of Chernobyl) as has the death toll associated with the events (particularly, Bhopal) (Hazarika, 1987; Shrivastava, 1987; Lapierre and Moro, 2002). Human agency also has a role to play in terms of determining the population at risk. The SARS outbreak in 2003, for example, illustrated the speed at which disease can spread both as a function of the improvements in travel times and as a result of population density (Chan-Yeung and Yu, 2003; Riley *et al*, 2003; Wenzel and Edmond, 2003). The 1918–1919 flu pandemic may also have spread due to the presence of large numbers of suitable 'hosts' in confined spaces and the movement of large numbers of people in the aftermath of World War I. There is, however, still considerable debate concerning the origins of that epidemic (Oxford, 2000, 2001; Barry, 2004; Oxford *et al*, 2005), the mechanisms of its transmission (Smallman-Raynor *et al*, 2002; Chowell *et al*, 2008), along with its implications for modern pandemics (Morens and Fauci, 2007) and bio-terrorism (Schoch-Spana, 2000). Our abilities to learn from past events is a key component of the development of prevention and mitigation strategies by organisations and should, therefore, be a central component of risk management.

The final issue raised by Tsoukas concerns the counterfactual nature of modern risks (Tsoukas, 2005). Perhaps one of the more topical of such 'unreal' or 'not yet events' (Tsoukas, 2005) concerns the risks associated with terrorism, although there are a range of other 'doomsday' scenarios that have attracted attention within the literature. The impact of terrorist-related risks on policy making has been considerable – especially in the aftermath of the September 11 attacks – and terrorism presents some interesting challenges for the processes of risk assessment. Tsoukas argues that many of the counterfactual approaches used within terrorism debates serve to draw 'the future into the present' (p. 45). The problem for policy makers is that the future is surrounded by high degrees of uncertainty, particularly for terrorist and other 'intentional' events. In these cases, the issue is less with a concern on the probabilistic aspects of risk (although they are still important), but more with the motivations and capabilities of the individuals who would seek to cause harm. Another important aspect of this process concerns the vulnerabilities of those organisations that are targeted for attack. A common response to such

Figure 1: Challenges for organisations around risk management.

concerns has often been the move to implement the ‘precautionary principle’ within policy making, and especially for those risks that are considered to have significant consequences (Deville and Harding, 1997; Tickner, 1999; Fischbacher-Smith and Calman, 2010).

Tsoukas thus provides us with a series of issues around which we can frame challenges to the ways in which organisations deal with risk (see Figure 1). These ‘discontents’ provide the core of a landscape within which much of the general debate around risk management occurs. If we consider some of the underpinning processes that drive these debates then we can argue that they relate to the mechanisms by which risks are generated, transmitted and ‘realised’ – that is, how the mechanisms of damage occur. These processes are underpinned by four main elements – place, space, time and scale, and we need to elaborate on each of these in turn.

Configuring Risk

Place is important within any discussion of risk, as it serves to frame the ‘location’ within which a hazard is generated and also provides the setting in which damage takes place. In other literatures (most notably in work dealing with environmental impact), this relationship is often seen in terms of a ‘source’ and ‘sink’ relationship that can be separated by space and time. It can be seen as an important element in the processes around the development of ecological niches and the associated adaptation of populations to environmental pressures (Kawecki, 1995; Chen *et al.*, 2008). We also often associate a particular place with the damage caused by a specific hazard, disaster or crisis. As places represent the locations of populations – in the context of our present discussions this represents those who are deemed to be ‘at risk’ – and, given the predominance of anthropocentric concerns within risk debates, then we often frame the damage

caused within the context of particular places. Places also represent the context for differing perceptions of risk and the associated levels of acceptability that become associated with them. The spatial dynamics of risk (often expressed in terms of risk contours) and the associated perceptions of those deemed to be at risk (Smith and Irwin, 1984) are inevitably grounded in place and are therefore important elements of the debates around acceptability. Place is, therefore, a central element of the various processes highlighted by Tsoukas.

Time is also an important element in configuring risk – the length of exposure, the time taken for damage to be caused, the ability to take mitigating action and the intergenerational aspects of exposures to hazards – are all elements by which time gives shape to risk. The ‘tight coupling’ (Perrow, 1984), that is commonly accepted to exist in modern socio-technical systems, can be seen as a key factor in which such systems fail quickly. The speed of interaction between elements of the system can be seen as an important aspect of highly efficient systems but may well impact on their effectiveness at the point at which an initial failure moves the system out of its normal range of ‘design’ perturbations. At this point, the speed of failure may overwhelm the abilities of systems’ controllers to bring the system back within its control parameters. Our abilities to process information will also be constrained by the time it takes us to ‘decode’ the volume of inherently codified information that accompanies a systems failure. Time, therefore, provides a serious constraint on the abilities of management (as both a function and a process) to make effective decisions to bring a tightly coupled system back under control. The ‘distributed’ nature of many organisations adds a further temporal dimension to the problem, but also brings the issue of space into the equation.

Space is an important element in ‘configuring’ risk and it also serves to shape the uncertainty that surrounds it. At its simplest level, space can be seen in terms of the hazard range associated with various forms of risk – the ways in which the source of a hazard and the damage that it causes are connected. Space connects the various places and time periods over which risk is both generated and realised. A key aspect of modernity concerns the extension of that space and the emergence of ‘new’ forms of connecting ‘fabrics’ – such as the internet and other forms of telecommunications – that have given rise to new opportunities as well as new ways of causing harm. In an increasingly globalised context, these connecting pathways may extend across considerable distances. The extent of this connectivity has given rise to inherently ‘complex’ and ‘tightly coupled’ (Perrow, 1984) forms of damage pathways – which often beguile and confound those who try to control them. One of the observations made by Tsoukas is that new forms of risk have generated different spatial dynamics – the damage caused is now often more diffuse and on a different scale to previous forms of hazard where the locality of harm was often much closer to the source of the hazard.

Finally, the issue of scale is a further defining factor in shaping the landscapes of destruction. The extent of an organisation’s supply chains, the amount of

Figure 2: Elements of the landscape of destruction.

hazardous materials stored on site and the interaction between scale and other elements of the system as it moves towards failure, will all contribute to the nature and extent of the damage. Other elements of scale would include the nature of the hazards' transmission – the manner in which the hazard can impact upon significant numbers of the population or can cascade across connected organisations – extends the population at risk and ultimately increases the potential for that harm. Scale is perhaps one of the most important measures of risk – we record the impacts of catastrophic events in terms of the scale of their impacts and the damage caused – but it is also dependent on the interaction with space, place and time.

Each of these four elements inevitably overlap with the others and they can also be seen as mutually reinforcing processes in which the result of their interactions provide the underlying foundations of the interconnected landscapes within which organisations and societies are faced with the potential for harm. Figure 2 illustrates some of the issues that are found within such a landscape that arise out of the interaction between space, place, time and scale. The destructive nature of the interactions that take place between these elements, serves to provide a set of signposts for issues within risk management and, as a consequence, for this journal.

The elements highlighted in the outlying areas of Figure 2 are all shaped by the core dynamics of space, place, time and scale and their significance will vary depending on the specific nature of the risk. Although these issues are not meant to be inclusive – the nature of destructive potential is inherently variable – they do provide an illustration of why risk has proved to be a difficult and complicated 'process' to manage and has generated complex outcomes

for organisations, societies and individuals to deal with. A return to some well-known examples of risk serves to illustrate the dynamic and evolutionary nature of the problem and the difficulties involved in developing an effective policy response to it.

Spaces of Destruction

As a general proposition it is fair to argue that through generations organisations survive by adaptation in response to risks to their continued existence rather than by eliminating potentially catastrophic risks entirely. (Taylor, 2008, p. 14)

A core proposition in this review is that risk management is an evolutionary process. By failing to change and adapt, organisations embed vulnerabilities within their processes and procedures. The twenty-first century opened with the attacks on the United States on September 11 and they illustrated how limiting managerial assumptions can be around issues of risk and security. The attacks spawned a body of work that considered the implications of evolutionary theory for the development of risk and security (Taylor, 2008; Sagarin, 2008a, b). The underlying rationale was that

Nature is never static, and organisms and lineages of organisms survive in part by maintaining variation in the face of nature's variability. Unvarying routines of the enhanced security apparatus in the United States were clearly not designed to cope with the unpredictable security environment after 9/11. (Sagarin, 2008b, p. 5)

The basis of this approach is that in order to deal with the variety inherent in the threat, organisations needed to develop sufficient variety in the responses and controls that were put in place to respond to the risk. Such an approach is based upon Ashby's Law of Requisite Variety that requires us to manage the complexity in the environment with complexity in terms of the organisation's response capabilities (Ashby, 1956, 1958).

September 11 illustrated the nature by which the interactions between space, place, time and scale can configure a crisis event. The national origins of the terrorists, the choice of aircraft as part of the attack strategy, the selection of originating airports (and the destination of the aircraft), along with the manner in which the crisis unfolded, were shaped by these four core elements. The subsequent wars in Afghanistan and Iraq, and the eventual death of Osama Bin Laden at the hands of US Special Forces illustrated how events can stretch out in time and space to configure the patterns of other forms of risk. Other terrorist attacks in Bali (2002), Beslan (2004), Madrid (2004), London (2005) and Glasgow Airport (2007), along with a number of 'failed' plots aimed at causing mass casualties, have highlighted both the vulnerabilities that exist

within organisations and the inherent problems in building and maintaining systems defences. The latter is particularly important as Western democracies seek to balance the drivers for increasing securitisation (especially in urban areas) and the maintenance of those freedoms that democracies value (Coaffee and Wood, 2006; Coaffee, 2009; Graham, 2009; Sassen, 2010).

These events also raise questions for risk management in terms of prediction, prevention and mitigation. The issues of prediction are inevitably problematic given the unique and emergent nature of many forms of risk. Prevention is also potentially problematic given the role of assumptions within the control strategies for risk within socio-technical systems. If we cannot prevent such risks then how do we evolve our responses to them? This has become an inherently difficult question for policy makers who have turned to the concept of resilience as a means of addressing it. The problem with resilience concerns the manner in which we define it and the subsequent policy formulation that takes shape from this definition.

Depending on its disciplinary origins, resilience has two quite distinct interpretations. The first of these has its roots in engineering approaches to resilience and is framed, essentially, in terms of how the system bounces back from any shocks that it experiences. The second approach is grounded in research undertaken in systems biology and it adopts a more adaptive approach to dealing with issues of resilience (Holling, 1973; Peterson *et al*, 1998; Gunderson, 2000; Carpenter *et al*, 2001). One can argue that the engineering approach to resilience is inappropriate for the broad set of task demands that are generated by those events that fall within the risk portfolios of many Western governments portfolio. Such a portfolio of hazards would require organisations to develop and sustain a range of capabilities that would allow them to deal with the unpredictability and requirements for adaptiveness that have been associated with many of the examples discussed here. This dynamism would require the creation of a form of adaptive management that does not seem to be present in many organisations and a key challenge for the research community concerns the nature of this approach. Although research around high reliability organisations (Guy, 1990; Roberts, 1990; La Porte, 1996) may offer some interesting conceptual insights into the possible organisational approaches needed within risk management, further work is needed to apply these concepts to different organisational and cultural settings. A further issue concerns the notion of a 'measure' of resilience that can be used within industrial sectors or regions and this is seen as an inherently problematic issue for policy makers.² Again it raises a set of challenges for the research communities around how we can, or indeed should, seek to reduce the construct of resilience to a single measure – especially given the inherent uncertainties associated with such a process.

The issues raised in this review have sought to set out parameters for the discussion of risk within the journal. They are not meant to be inclusive or to exclude discussion of other elements of the risk landscape – indeed, the main

argument in this article is that the landscape of risk is constantly changing. It has sought to frame the issues around risk within an evolutionary context in the hope that such a stimulus may lead to an evolution in the issues addressed by the journal. At its core, *Risk Management* seeks to be multidisciplinary and the next stage in its own evolution needs to be in terms of impacting upon the policy and practice agendas for risk. One of the strategic developments for this journal is to ensure that it acts as a conduit for research into practice. By encouraging the development of policy relevant research, it is hoped that *Risk Management* can become a mechanism by which both the research community and policy makers can interact in an attempt to address some of the issues identified in this review. The challenge for the research community is to seek to develop the capabilities that organisations need to deal with an evolving portfolio of risk and to encourage and sustain the processes of learning that are central to both an evolutionary approach and the development of resilience.

Notes

- 1 This is also referred to as the Sumatra-Andaman earthquake. See the United States Geological Survey at walrus.wr.usgs.gov/tsunami/indianocean.html.
- 2 A point made to the author by several key civil servants in private discussions.

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