



Kent Academic Repository

Burgess, Adam (2019) *Environmental Risk Narratives in Historical Perspective: From Early Warnings to 'Risk Society' Blame*. Journal of Risk Research, 22 (9). pp. 1128-1142. ISSN 1366-9877.

Downloaded from

<https://kar.kent.ac.uk/68574/> The University of Kent's Academic Repository KAR

The version of record is available from

<https://doi.org/10.1080/13669877.2018.1517383>

This document version

Author's Accepted Manuscript

DOI for this version

Licence for this version

UNSPECIFIED

Additional information

Versions of research works

Versions of Record

If this version is the version of record, it is the same as the published version available on the publisher's web site. Cite as the published version.

Author Accepted Manuscripts

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding. Cite as Surname, Initial. (Year) 'Title of article'. To be published in *Title of Journal*, Volume and issue numbers [peer-reviewed accepted version]. Available at: DOI or URL (Accessed: date).

Enquiries

If you have questions about this document contact ResearchSupport@kent.ac.uk. Please include the URL of the record in KAR. If you believe that your, or a third party's rights have been compromised through this document please see our [Take Down policy](https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies) (available from <https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies>).

Environmental Risk Narratives in Historical Perspective: From Early Warnings to ‘Risk Society’ Blame

Adam Burgess

Abstract

The ‘storying’ of risk is an important and neglected dimension and narratives such as ‘nuclear catastrophism’ have powerfully framed experience and acquired considerable independence, with ‘what might have been’ becoming as real as what actually did. This article builds upon limited earlier risk narrative research, focusing upon their historical development in the US and UK. Analysis proceeds from an understanding of risk as a tool that brings together an understanding of threats, what is threatened and how that might be remedied in the future, increasingly based upon past experience. Risk narratives emerge historically with the growth of concern for the public impact of environmental events, through individuals recognising these in secular terms, prepared to warn others and, later, challenge denial of institutional responsibility. But the explicit language of environmental risk only emerges in post-war America through public challenges to fluoridation, pesticides and consumer safety, the article arguing that we can approximately distinguish ‘risk society’ narratives concerned with human-made threat and an assumption of corporate and institutional responsibility, focused upon victims and blame for their condition. This singular focus can be problematic in its impact upon victims themselves in the case of nuclear catastrophism, however. A concluding suggestion is that if narrative is to be used in risk communication it will require more sophisticated forms that go beyond only exposing risk, insisting upon blame and inferring limitless harm.

Key words: environment, risk, narrative, blame, history

Background, Framing and Definitions

Environmental risk narratives are the terms in which we describe what has happened around us, whether it could happen again and what might be done about it. They are *accounts*, involving an identification of the cause of environmental impacts, who might be affected in future and how this might be avoided, woven in often evocative narrative terms. They are also distinct from a simple recording of events; not only in the banal sense that literary and journalistic accounts are inevitably dramatized and subjective. Rather, events are consistently framed in distinct, even curious ways, where those that affirm narrative bias are selected for attention, whilst complexity and contradictory evidence are ignored.

To an extent, narratives are necessary to order experience and expectations, and are from exclusive to discussions of risk. And they can be heightened and become particularly impervious to change under different circumstances. Take an everyday example of the storying of a UK sports clubs’ fortunes. Liverpool football club is a once successful ‘fallen giant’ that has struggled to excel in the new era of Premiership soccer. Yet, expectations remain high amongst a demanding mass fan base who now voice their frustrations through social media and are conditioned to expect only another ‘false dawn’ even if the team performs better - as it began to do under a new manager from 2016. Improvement was unsurprisingly gradual, however, and focus developed upon an - initially partly true - perception of a team that was excellent at attacking, but defensively poor. As one record of the team’s development illustrates, even as they continued to dramatically improve into 2018, *any* goals (that are inevitably conceded by any team) continued to be held up as evidence of the fundamental truth of the narrative and the need to get rid of the club owners, in the absence of unrealistic total dominance (Tomkins 2018).

Concerns about environmental risk are at least as charged as sporting hopes and passions. A fundamentally different way of thinking about the world informs the public/expert divide in assessing environmental risk that renders more objective knowledge and assessment often irrelevant (Margolis 1996). The stories we tell ourselves about what might happen are constructed not only from available information, but in the context of psychological biases and fears, social uncertainty about who and what can be trusted and a political sense of whether future outcomes could be made different. In the most extreme cases such as ‘nuclear catastrophism’, discussed further below, a powerful story of near disaster and imagined consequences can establish itself as the truth despite a lack of evidence, and remain impervious to it even over time.

Narratives can play an active role in making sense of experience and allocating blame when they put prevailing norms and anxieties into effective words and frames. This article sets out to place this development in historical context, allowing a specific appreciation of their changing nature and potential impact. Whilst we can identify continuity in the characteristics of environmental risk narratives from their beginnings in early modern England, there is also considerable change in their focus and implications, as impacts tend to be over rather than under-stated, and victims and blame for their plight predominates. In short, the narratives of the ‘risk society’ are fundamentally different to their predecessors, despite sharing general characteristics of making sense of disaster and warning of its potential recurrence.

This introduction sets out definitions and some intellectual background, including the related fields of framing and stigmatization. The article then proceeds chronologically, beginning with the absence of narrative in ancient Roman accounts of environmental events. It then moves forward through 18th century beginnings, the development of more critical responses in the 19th and early 20th Century, and the full emergence of ‘risk society’ type narratives, to today. Considering such a time span within limited space involves schematic rather than systematic treatment and the reader will have to forgive the significant historical leaps!

.....

It is in the context of better communicating risk to the public that interest in narrative has recently developed, drawing upon the popularity of narrative story telling as a means of popular science communication - such as to explain natural selection (e.g. Prins, Avraamidou and Goedhart 2017). There is a practical implication that the storying of experience may help us to ‘deal better with the unexpected’, and this journal special issue originates in this hope (Eidinow 2018). This contribution aims to critically situate narratives through an historical perspective that allows an appreciation of their different characters and implications – despite their formal similarities.

The study of narrative has long been important in the humanities, though what is perceived as a macro-theorising theme of risk has been left to sociologists like Beck (Martin 2012). The storying of experience is also central to narrative psychology, including around events such as 9/11 (Schiff, McKim and Patron 2017). But there has been very little social research on risk narrative as such, with only one scholar directly developing the theme, Gaspar Mairal (e.g. 2011), and a few recent studies engaging it in relation to risk communication (Fuentes and Fuentes 2015; Sellnow et al 2018). A significant barrier are the methodological difficulties of researching narrative in the more rigorous manner expected in social science. Only recently has sociological risk research begun to explore ways of mapping narrative both more quantitatively and contextually, in collaboration with socio-linguistics (Zinn and Macdonald 2018).

Whilst there is a great deal of risk research on the role of media and communication, common focus is upon the process of ‘social amplification’ and whether it has occurred, or not (e.g. Pidgeon et al 1992). Where attention has been paid to the nature, linkages and impact of messages is in relation to framing and stigmatization, and both are important to, and inseparable from, any reflection on risk narrative, which concerns the terms in which the public are made aware of events and their

consequences. Narrative and framing are used interchangeably such as in the study of 'climate-gate' by Nerlich (2015). Allan, Anderson and Petersen (2010: 44) note that the concept of framing 'is being increasingly recognised as a useful means of characterising...the news reporting of science and risk', and defined as a 'discursive strategy utilised by journalists to define the nature of a particular event.' Frames can alternate and compete. Hargreaves, Lewis and Speers (2003) note two contrasting forms in relation to genetic technologies: either the negative, hubristic 'tampering with nature' that must inevitably 'end in disaster' form; or the 'bold experimentation of scientists prepared to do the unthinkable and potentially find cures for conditions we accept as incurable' frame. Whilst closely connected, narrative involves more specific focus upon words, 'story' and the connections between the different objects and subjects involved, as in narrative analysis more broadly.

A risk and blame frame prioritises identifying responsibility and demands redress and is particularly relevant to contemporary risk narratives, based upon recognition that in its contemporary form risk language concerns the contested allocation of responsibility (Douglas 1994). It has been employed in relation to various issues, from vaccination (Holton et al 2012) to climate change (Freeman 2017). The consequences of such framing can be the establishment of environmental risk stigma, defined as a 'process of discrediting settings, places, objects, non-human lifeforms and surroundings, as well as people associated with these environments' through a process of metaphorical 'contamination' (Edelstein 2001: 49). Radiation stigma is among the most powerful.

Reflecting on framing, stigma and narrative involves understanding risk as an idea rather than a 'bad' or potentially damaging thing (definitionally a *hazard*). Risk is a secular conception of what might happen in the future, informed by what happened in the past and the chance of its recurrence. In the terms of Mairal (2011: 42): 'risk is not a fact, it is rather an artefact, a tool that is used to bring together objects, facts, events or any other entities which can produce harm and others which can be harmed'. Whilst originating in ideas of probability, through the framing of events in journals and newspapers, an: 'expert concept...crossed over into the cultural sphere through narrative, which spread the idea among a progressively wider public', as the future 'has taken shape through the use of different journalistic styles' (Mairal 2011: 65). Risk stories then link a series of events, give meaning to them and thereby establish 'semantic networks comprising objects at risk, risk objects, and relationships of risk' (Boholm and Corvellec 2011: 185). They remain distinct from other narratives in their implicit or explicit claim to be based upon what has verifiably happened and the chances of wider impact and recurrence. As warnings to others, they are also intended to make a public impact and modify how we think about a problem and its urgency.

Ideas of risk first become institutionalised through the threat posed by sea travel, with marine insurance, and narrative developed alongside. The prospect and spectacle of shipwreck has provided a 'metaphor for existence' from ancient Greek times (Blumenberg 1996). Seafaring sharply posed a danger to be managed for the Ancients in a way that their lack of control over life more generally did not, and they characteristically did this by encouraging *fortune* through repeating rituals associated with previous successful journeys. A risk perspective requires a more open-ended, secular and human-centred sense of the future than was characteristic of the pre-modern world, where *fate* predominated. In general terms, understanding and managing risk explicitly only emerges in early modern times, particularly through sea exploration and trade. Seafarers began to take more calculated risks. Mairal (2011) describes Christopher Columbus using the term in relation to the crossing of the Atlantic, where the 'objects of risk' are the sea and pirates, and the 'object at risk' the cargo. Through the journey the two become linked narratively, introducing those 'at risk' and its nature; here the monarchs funding the journey.

The more open-ended sense of possibility involved in risk narratives is central, with the future no longer being fatalistically fixed as 'acts of gods'. Narrative then takes on significance as a means of warnings that might prevent or limit negative outcomes, without relying only upon fate and fortune. Characteristically, environmental risk narratives are public narratives oriented towards warning

some section of the population of possible harms. Mairal (2011: 72) draws out an understanding of risk narrative as communicating evidence-based contingent harm whereby, ‘...events which happened before are turned into a *lesson to be learned*.’

As well as understanding risk in general, stigmatization and blame framing this study is also situated in ideas of the ‘risk society’ and the less well known ‘other side’ of Beck’s sociological approach, individualization (Burgess 2018). Beck’s (1992) influential thesis postulated a sense of global risks presenting unprecedented threat and was part of – and made popular following – the catastrophist framing of the Chernobyl nuclear accident. It reflects the sense that science and official institutions are not only unable to now manage risk but part of the problem of blind, uncontrolled technological development. The heightened perception of risk is also rooted in a secular process of individualization based on the dissolution of traditional bonds, ties and assumptions, leaving the individual to map their own way through the uncertainty left in its wake. A consequence is increasing victim-centredness and demands for the determination of culpability evident in reactions to environmental events, but also in other spheres such as crime and the introduction of the charge of corporate manslaughter in English law in 2007, for example (Garland 2002). Having set out some of the intellectual background, the article now moves on to establish the very different terms in which environmental events can be understood in different contexts, and then proceeds to provide a sketch of their historical development.

Early Warnings, to Accounting for Public Tragedy

Risk narratives are particular and historical phenomenon that emerge as a ‘modern’ way of making sense of the world around us, especially negative impacts. It is not the nature or even the scale of events in themselves that determine the terms in which they will be understood but prevailing norms and wider context, and whether and how authority is held to account and the prospects of redress and change among other factors. Environmental protest in Russia under Putin in the late 2010s, for example, shares the insistence upon blame characteristic of contemporary risk narrative, but the focus is upon corrupt local officials. Putin’s political impregnability, among other factors, determines he be cast as the ‘good czar’ who can ‘put things right’, if he can be made aware of what’s been done in his name (Robertson 2011; Roth 2018). The focus of blame following the Grenfell tower block fire of 2017 in London was, by contrast, systemic; a ‘radical recreancy’ narrative of inequality and neglect of the poor, concentrated upon the Prime Minister herself (Freudenberg 1993). Official reaction was deemed totally inadequate in a context where she had been cast as hopelessly out of touch with the concerns of ordinary people in the recent general election. The tower block and technical issue of its external ‘cladding’ that allowed the fire’s rapid spread were then cast as symbolic of social inequality, in a narrative successfully promoted by liberal newspapers and the opposition Labour Party. Significantly, the public inquiry that continues into 2018 has prioritised the claims and fate of victims and the bereaved, with their narratives opening proceedings. Widespread demands that blame be apportioned – including against the fire brigade itself – will prove difficult to reconcile with the technical fact-finding purpose that remains central to the inquiry process.

These narratives have developed with the communication of news about environmental events to a wider public, in the process accounting for what has happened and indicating how the future might be different. This was not the case for most of our history when the fate of the ‘masses’ was of little concern or interest other than as a military or manpower resource to be used and controlled. ‘Environmental’ problems were not generally seen as significant in such terms or open to amelioration, and the language and assumptions of risk did not exist. The explicit notion of ‘environmental risk’ is a contemporary, post-war phenomenon of what sociologists term ‘late modernity’ and the ‘risk society’ (Beck 1992). This can be indicated with Google’s NGram viewer,

that counts references to terms in their vast digital archive of published works between 1500 and 2008. Graphically, 'environmental risk' reveals a completely flat line of too few references to register until 1967, and then a dramatic and consistent increasing curve, up until the 2000s. In *The Times* digital archive, stretching back to 1785, 'environmental risk' makes its first appearance in 1973. In the *Guardian* archive, there are negligible mentions in the decade of the 1940s, then 11 in the 1950s, 53 in the 1960s, 560 in the 1970s, 1224 in the 1980s, and 2633 in the 1990s. Such indicators are crude, and events prior to this period may have been cast in different terms rather than necessarily ignored. At the same time, the conceptualisation of events in terms of 'environment' and 'risk' denotes an important evolution as problems coming to be seen as both significant and more systemic, and more potentially open to change – with the narratives themselves central to this process.

Whilst it's beyond the scope here to provide an elaborated history, we can schematically outline some key contours and moments where underlying shifts are revealed. A useful starting point - and counterpoint - are the classical ancient civilizations that first produced reflective and available accounts of 'environmental' events. These societies lacked a language or even word for risk. Ideas of fate and fortune can be considered their equivalents in societies far more vulnerable to impacts such as of disease, and lacking effective means for their management. In Ancient Rome, the masses were famously assuaged through 'bread and circuses' and foreign conquest, but otherwise their condition found little public expression in a society dominated by an insulated military-aristocratic elite. There was, of course, no mass media and records largely for internal elite rather than public consumption. Toner (2013) analyses of accounts of major Roman events such as military defeats and mass disease outbreaks indicate how concern focused around their impact upon symbolic state buildings, military capacity and, above all, religion; 'Roman accounts are most interested in what can be gleaned from the disaster about the state of relations with the gods' (Toner 2013: 128). He quantifies the focus of Roman accounts, noting that only a quarter attempt to give cause or define the breadth and impact of events, 16% consider the number of casualties, 6% mention rescue work and only 2% suggest social and economic consequences. Responsibility and even the fate of rulers in antiquity could be shaped by disaster, particularly military defeat, but this was more likely to be a question of their disfavour and unsuccessful management of relations with the gods than in the contemporary sense of political culpability for perceived neglect of public security.

Societies have characteristically attempted to make some official sense of, frequently devastating, environmental impacts. In general terms, histories of disaster discern a pattern of increasing: '...manipulation of disaster experiences by those who were in a position to dominate the ways in which they were communicated, documented, and interpreted...' This was achieved through: 'Official proclamations and religious sermons designed to give meaning to what happened and to channel people's behaviour in the desired direction', and, above all, 'to re-establish order' (Janku, Schenk and Mauelshagen 2012: 19). Historically, this remained an elite project as it was for the Romans, however, and one not willing or able to account for events in rationalist risk terms. It was only in the Renaissance that a more independent and scientific approach began to develop that was not concerned only with order, but understanding and even controlling nature. The secular study of earthquakes and other 'natural' events began in the 18th Century and its defining moment the response to the Europe-wide devastation of the Lisbon earthquake of 1755, for which the European intelligentsia sought a determinedly rational explanation even as official responses remained shrouded in the traditional terms of divine retribution.

The development of media through which individuals sought to narratively alert society to future dangers developed in parallel to scientific advancement, in the early eighteenth century. Mairal (2011) identifies Daniel Defoe as a key figure in its emergence; regarded as the first English journalist, and an author we know as sensitive to misfortune and how even the lone individual might manage it, through his novel, *Robinson Crusoe*. But it was in his other, journalistic, work that Defoe is significant here. In his account of the Great Storm of 1703 he innovated bearing witness to events,

interviewing participants and involving: ‘narrative structure of time...in which something terrible begins, takes place and then had serious consequences’ (Mairal 2011: 70). Asking why ‘the great storm’ has passed into cultural memory, a recent reflection describes Defoe’s: ‘detailed and popular account which turned the storm into Britain’s first weather-related major news story’ (Jones 2018). Whilst Defoe was still of his time (seeing ‘winds as part of the works of nature by God’) he pointed toward the future, compiling a list of terms - a ‘table of degrees’ – to classify wind forces, at a time when meteorology barely existed.

Defoe later turned his attention to another, quite different potential risk. Mairal identifies his, *Journal of the Plague Year*, of 1722, as the first journalistic narrative of risk, turning possibility into probability and uncertainty into risk by drawing upon past experience – in this case of an earlier disease outbreak. The journal employed a mixture of data and imaginative recreation as fictitious memoir (he’d only been a child in the 1665 plague) to warn the people of London of renewed imminent threat, linking past tragedy and future possibility. As well as the focus upon the future, Defoe’s writing is concerned to convince the audience his account is accurate and based upon expert knowledge. He does not use the language of ‘environmental risk’, however, and impact remained limited before the age of mass media and a less deferential and more visible public. And it was only with new voices – more forceful than that of Defoe – prepared to contest official narratives, that they would begin to develop into a form recognizable today.

In a further large historical jump, it is during the long Victorian period of the 19th Century that responses to the increasingly visible and extensive risk brought with industrialization became more urgent and secular, even as its victims remained invisible. Historians complain of over-simplified pictures of risk in Victorian society and ‘classical’ modernity more generally, as one more at ease with it than in the ‘risk society’. In fact, it was ‘fraught with anxieties about modernization and its dangers, both globally and locally’ (Martin 2014: 49). Nonetheless, it was understood very differently to today and Martin (2014) notes the difficulty in identifying a consistent language of risk at all. Accidents were increasingly perceived less as ‘acts of god’ but could still be experienced fatalistically without means of redress, limiting the development of narrative. Under these circumstances risk could even be enjoyed as spectacle rather than avoidable disaster. For example, in one of a series of London-based examples used here, the ship, the *Princess Alice*, sunk on the Thames in 1878 with the loss of 600 lives, but there was no public inquiry and the inquest couldn’t decide which ship was to blame (Neal 1992, cited in Burgess 2011). The next day hundreds of onlookers went out on the *Alice*’s sister ship to see the crash site for themselves, apparently lacking any clear sense of another ‘accident waiting to happen’.

For those in authority, such accidents could be seen as simply the price to be paid (by others) for progress and, crucially, the responsibility of the individual rather than the corporation, state or free market system itself. Especially prior to the Railways Act of 1889, there were regular fatal train accidents, for example, mainly caused by the lack of basic organizational safety. Transport owners, nonetheless, typically refused to accept responsibility. For the Victorians, the problem was reconciling concern about accidents with any regulatory consequences (Hutter 2001). The principle of ‘self-government in the conduct of our affairs’ was central, and regulation seen as antithetical to the entrepreneurial spirit at the heart of Britain’s success. These assumptions were a considerable barrier to the development of wider risk narrative beyond simply holding an individual responsible, as was the likely fate of the Victorian train driver. More broadly, reaction to even large-scale public impacts remained subordinate to the national interest, determining an absence of narrative. The Silvertown munitions explosion of 1917 killed 73 and devastated a substantial section of the East end, but was marked only by a plaque, not a narrative (Neal 1992). It was deemed that investigation and publicity may have been damaging for wartime morale and any critical voices thus silenced, despite the obvious ‘lesson to be learnt’ of not siting munitions so close to population centres.

Crucial in determining change was the pressure generated by campaigning groups and individuals. Pioneering figures dedicated themselves to shaming the authorities into making safety improvements to the technologies of industrialization, articulating new narratives in the process. A fundamental problem was that most accidents involving significant casualties were of the poor, who scarcely figured in the attentions of Victorian society, driving the efforts of Charles Dickens and others. It is thus unsurprising that greater interest in accidents was often only catalysed by incidents involving 'respectable' victims. The mass drowning in Regents Park during the Great Freeze of 1866-7 caused uproar as the majority of victims were middle class, and no blame was assigned to the skaters by the media (Neal 1992). In rare cases the proximity of the respectable determined a story be told, such as the accident following the launch of the *Albion* cruiser in 1898. Whilst the 38 onlookers killed were ordinary citizens, the presence of royalty meant the incident became a focus of national attention upon public safety at such occasions.

More critical responses to accidents and environmental impacts began to develop piecemeal into the twentieth century but remained tempered by a still paternalistic culture. Even into the 1950s major events with major loss of life could be understood in uncritical terms, as was the case with the devastating floods of 1953. What is striking from a contemporary perspective is the lack of demand for institutional accountability expressed in media and public discussion, as if they were only a natural occurrence. The amplification of risk and accompanying narratives cannot develop without a focus for institutional blame, indicated by its absence in cases such as 'acts of god' like the volcanic ash cloud of 2010 (Burgess 2012). In so far as one can be identified, media narrative sought in reactions to the flood evidence of a continued community-wide 'blitz spirit' amidst the bleakness of post-war Britain (Toner 2013: 128). Such narratives illustrate how they can be wilfully constructed around an idealised, lost past, particularly in the continued absence of a forward-looking response more critical of authority. Hall (2011) argues this was actually the trigger point for a shift from accepting 'acts of god' to searching for responsibility, driven by the growth of a truly mass media and the expansion of the middle classes. Subsequently, as revealed in responses to extreme weather events in 1978, 1987 and 2007, Hall (2011: 404) suggests a shift from 'communities of resilience to an individualistic climate defined by vulnerability and blame'.

The cultural and political transformations of the 1960s stimulated the emergence of a less deferential, hierarchical and more public society, and less compliant media. Whilst socio-cultural changes provided the opportunity for a different kind of narrative and response, it would still require determined individuals and hard-fought battles to reconfigure framing. An important landmark, in the UK, in developing a more public narrative was the coal landslide which buried the village of Aberfan in Wales, including its school, with the loss of 144 lives in 1966, recounted in the 'story' account of Austin (1967). The Tribunal that followed can be regarded as the first contemporary public inquiry which resolutely set itself against any dismissal of the tragedy as a mere accident without cause or blame (Burgess 2011). The Inquiry was pushing against still unyielding and anti-democratic authority personified by the Coal Board. They refused to initially even contemplate, let alone accept their responsibility for the landslide. Rather than accommodate this response, however, the inquiry was prepared to pursue and condemn the Coal Board in the strongest terms and echo the feelings of bereaved relatives - something deeply shocking at this time. According to the inquiry's famous description that remains a powerful cultural memory in the Welsh community (Shipton 2016):

The Aberfan disaster is a terrifying tale of bungling ineptitude by many men charged with tasks for which they were totally unfitted, of failure to heed clear warnings, and of total lack of direction from above.

The report was only published in full against considerable pressures. A further public inquiry and accompanying critical media narrative in the following year. The Ely inquiry of 1967 into staff mistreatment of geriatric patients and the unresponsiveness of the Ministry of Health was the first

that although conducted in private, was opened to public and media scrutiny. Complaints about Ely were first aired through a letter in 1965 to *The Times* and, later, a damning booklet of testimonials and the *News of the World* newspaper lent their populist weight to the campaign (Burgess 2011). Further, in 1968, Harold Evans led his campaign as editor of the *Sunday Times* to expose the scandal of the drug thalidomide, which he described as ‘a pharmaceutical outrage...that remains the greatest manmade disaster’ (Evans 2014: 1). At least in the UK, these developments remained partial and disconnected, however, and there was still no more consistent narrative of environmental risk, even as a more critical culture was emerging around single events and scandals and Evans’ prescient language of ‘manmade disaster’.

Into the – American - Risk Society and ‘Man-Made’ Nuclear Catastrophism

The more formed ‘environmental risk’ narrative reflected in the NGram data above developed firstly in the United States, already a less deferential political culture where, from the 1960s, entrepreneurial and organised campaigns emerged around consumer and environmental rights, marking a new stage in the development of an American ‘risk society’ (Mohun 2013). A new culture sensitive to environmental risk developed beyond single events and issues, described in the terms of Douglas and Wildavsky’s classic work (1982) as a shift from one defined by the values of the traditional ‘centre’ to those of an emerging counter-cultural ‘periphery’. The objects of risk were wide ranging; key examples of fluoride, cars, pesticides and radiation are focused upon here, but there are other important examples - such as water contamination, associated with the iconic figure of ‘ordinary mom’, Erin Brockovich. The subjects at risk of these new narratives, meanwhile, were both specific (particularly children) and unprecedentedly wide-ranging, suggesting threat not only to all, but even future generations.

The new environmental and consumer narratives of the post-1960s were less familiarly anticipated by the contesting of the fluoridation of the water supply in the 1950s. There we see already a narrative not only characterised by causality and responsibility but also a ‘risk society’ type concern with possible future harm of incalculable scale, vigorously – even conspiratorially – ranged against an official narrative of necessary progress (Beck 1992). Yet, the anti-fluoride campaigning of the 1950s tends to be forgotten as its populist, anti-state politics were quite different, even antithetical to the self-consciously counter-cultural character of successors; ‘the strange protests of the anti-fluoridationists of the 1950s seem much less strange today’, as one account put it (Sapolsky 1990: 86). Largely dismissed by the social science of the time as irrational ‘public alienation’, important elements and characteristics of the ‘risk society’ type narrative were established, and the controversy still endures internationally.

The post-war programme to put fluoride into the water supply reflected a still naive sense of scientific optimism that a ‘magic bullet’ could eliminate tooth decay (Carstairs 2015). Reaction was animated by a relatively distinctive American culture of suspicion of the federal state; of ‘Washington’ extending its reach to interfere even in everyday life. It was led by two physicians, Exner and Waldbott, lending evidential authority to their claims; the latter having conducted research into fluoride toxicity. Their major work, *The American Fluoridation Experiment* (Exner and Waldbott 1957), initiated the subsequently powerful narrative theme of the public being used as guinea pigs in an unnecessary scientific exercise. Published by a mainstream rather than academic press for maximum exposure, it was written in animated prose. Echoing contemporary precautionary arguments, they insisted research was needed into possible long-term health side-effects, suggesting government-industry complicity in masking risk and expanding the reach of the state into public life. The risk of tooth decay was best addressed through reducing sugar consumption, in their view, but industry self-interest determined indiscriminate fluoridation.

In the mid-1950s Waldbott began the *National Fluoridation News*, a tabloid-style newspaper, 'that favoured conspiratorial headlines, shocking revelations of pro-fluoridation tactics, scathing denouncements of fluoride's dangers, and funny cartoons' (Carstairs 2015: 17). There is continuity here with Defoe's intent of warning the population, but the focus is now upon man-made environmental risks and the complicity of authority in their spread. Waldbott further developed the anti-corporate narrative with the theme of the embattled David against the corporate Goliath in his recollection of: *A Struggle With Titans: Forces Behind Fluoridation* (1965).

The development of risk narrative in the United States displayed organizational determination and flair, a self-conscious populism and a railing against the products and even ideology of science and progress. No individual was more adept at developing effective themes and tropes than the consumer and environmental campaigner, Ralph Nader. Also using the populist book format, his most well-known was, *Unsafe at Any Speed* (1965) which argued that individual responsibility for accidents was irrelevant to the fundamental problem of the auto industry's prioritisation of comfort, and ultimately profits, over safety. Shockingly, American cars contained 'designed-in dangers', as the book was subtitled, in a further addition to the vocabulary of risk narrative. Nader added the theme of industry evading well known criticism that was to acquire far greater force with the connection of smoking and cancer revealed in the 1964 Surgeon General's report. Nader subsequently took on a wide range of consumer risk targets. Such was the impact of these new narratives that consumer protection from risk became a defining object of presidential policy and regulatory initiative under Lyndon Johnson and subsequent administrations.

Arguably even more significant than Nader in the development of risk narrative – particularly in a more explicitly environmental form – is Rachel Carson, with her seminal and evocatively titled, *Silent Spring* (1962); a book again written for popular consumption through a mainstream publisher. The background was the emergence of a range of pollution-related issues such as smog and concern about the impact of former chemical sites, from the mid-1950s. And the spectre of the atomic bomb hung over Cold War America, symbolic for Carson of how the human relationship with nature had become dangerously imbalanced. Yet, official narratives still spoke confidently of how 'wars' against 'enemies' like insects damaging crops could eradicate them, without any concern for consequences, such as from indiscriminate crop spraying.

Carson's book was originally intended as a 'grand narrative'; an ecological defence of nature against human assault and arrogance, particularly the still-dominant faith of post-war America in science and human progress. An emphasis upon human health risk from chemicals was controversial and novel, and one she originally shied away from as insufficiently political or reforming (Lytle 2007). But *Silent Spring* evolved into a focus upon the use of pesticides on crops, particularly DDT, which she argued would 'silence' wildlife as well as affect human health. As with Nader and Waldbott, this was an attack also on industry itself who were accused of spreading disinformation, with the complicity of public officials.

Her literary style allowed dramatization of dry science; the first chapter, 'a fable for tomorrow' looked back nostalgically to a small-town America 'in harmony with its surroundings' (Carson 1962: 1). Whilst remaining scientifically informed it was urgently and even luridly posed, with the most science-based chapter (3) dubbing synthetic pesticides 'elixirs of death' which marked an unprecedented stage of, and threat to, humanity. At the same, illustrating the practical orientation of her focus and campaigning of this time more generally, she advocated judicious use of pesticides rather than their outright ban. *Silent Spring* brought the environmental issue into the mainstream, reshaping the regulatory agenda. The book went on to sell over a million of copies in the face of furious industry opposition and its message and concerns shaped American policy-making, leading to the banning of DDT and the later creation of the Environmental Protection Agency.

Silent Spring left a considerable wider legacy, not least in popularising and politicising the distinction between the natural and the man-made and the scale of the dangers posed by ‘polluting’ this boundary. Whilst a distinction common to many cultures it was given contemporary force and a new science-based language of risk, directed towards the individual (Douglas and Wildavsky 1982). The Europe-wide campaign against genetically modified ‘Frankenfoods’ from the 1990s demonstrated the continued power of this narrative, leading to its de-facto ban. At the same time, Zinn and MacDonald (2018) note that *Silent Spring* did not yet fully trigger intellectual engagement with risk language, at least in social studies, and tended to remain semantically disconnected. It would take something more dramatic and compelling than pesticides to fully animate discussion of a man-made environmental risk to humans directly. It was the threat posed by nuclear technology which had originally animated Carson that stimulated the sociological engagement with environmental risk from the early 1970s and more active public concern. Classic sociological texts explore the social construction of nuclear concern (Gamson and Modigliani 1989) that was to become the most powerful of risk stigmas (Edelstein 2001). Whilst it’s wrong to absolutely counter-pose the scale and nature of earlier hazards with those of the risk society, the narrative around these risks – including in Beck’s own writings – represented a significant departure in the scale of projected harm and the independence of catastrophist narrative from evidence with which we began (Martin 2014).

The partial reactor meltdown in 1979 at Three Mile Island spawned nationwide protests though no recorded human harm. Yet this was a single, dramatic event that portended the possibility of mass destruction, and directly connected to the ultimate ‘dread’, of radiation, providing immediacy, imagery and untold speculation about effects. The catastrophist narrative connected an original folly of attempting to harness uncontrollable energy that was born of military imperatives with government and scientific complicity in corporate self-interest, played out in the drama of hapless technicians trying to contain disaster. Eyewitness, reporters’ stories became a narrative genre following the incident, again through popularly targeted books, like the ‘hour by hour account of what really happened’, as Stephens’ work (1980) was subtitled. Gray and Rosen (1982) was simply entitled ‘the warning’, with a front-page recommendation as large as the authors’ names, describing: ‘a ripping thriller made more compelling by the fact that it is true’. Arguably, the scope for narrative elaboration was encouraged by the lack of actual devastation such as at Hiroshima. And Three Mile Island remains a parable articulated through journalistic narrative, long after the event. The subsequent account of Hampton (2001) is subtitled a ‘reporter’s story’ on this ‘race against nuclear disaster’. A website dedicated to the ‘minute by minute narrative’ surrounding the partial meltdown remains available (Johnson).

The ‘lingering dread’ of radiation engages both psychological and cultural, ‘Frankensteinian’ fears in a powerful script, triggered by nuclear accidents (Erikson 1991). In the subsequent, more significant, nuclear meltdowns at Chernobyl and Fukushima the actuality and even globalization of human catastrophe was widely and immediately assumed and continues to endure in the cultural imagination. On April 30, 1986, as the meltdown was confirmed by the USSR, lurid language was accompanied by specific death tolls, projected in time and space, framed around a narrative of catastrophism. The popular UK press on the day news emerged, mirroring others internationally, with *Today* declaring a ‘nuclear nightmare’ with ‘Russians fleeing the cloud of death’, the *Daily Mail* announced ‘2000 dead in atom horror’, the *Express* that ‘the nuclear nightmare is here’, repeating the claimed death toll figure of 2000, adding that ‘1000s more are doomed’. In more serious outlets, the *Guardian*’s leader declared ‘as disaster without frontiers’. Intellectually, the incident affirmed the reality of the ‘risk society’ and its claims of an incalculable impact of man-made risk. Like with Three Mile Island, nuclear catastrophist narratives endure. 2018 saw the publication by a major publisher of another history of the Chernobyl nuclear meltdown; reviewed as how ‘Europe *nearly* became uninhabitable’ (my italics Plokhy 2018; Beer 2018). It is a portentous tale of what *might have been* constructed through a narrative set inside the reactor control room and the inability of staff to grasp the enormity of what was unfolding and react accordingly.

Away from and lacking narrative, the scientific assessment remains one of surprisingly limited impact even from Chernobyl. The consensus of the Chernobyl Forum concluded in its 'landmark digest report' based on the work of 600 scientists that fewer than 50 deaths were attributable to the accident, and there may be up to a further 4000 above average deaths attributable (WHO 2005). The area itself is now a natural wilderness. Unsurprisingly - in an age of competing sources of authority – others contest the statistics and alternative narratives do exist. A Russian account circulated via radical media claims a casualty rate of almost a million, alleging a 'corrupt' 'cover up' by the WHO and international agencies, driven by concern to 'protect the nuclear industry', in a classic contemporary conspiratorial narrative (Grossman 2013).

A similar narrative of overwhelming radiation impacts followed the meltdown at Fukushima in Japan, caused by the tsunami in 2011. There were no direct deaths from radiation and the highly publicised increased levels of thyroid abnormalities and cancers are understood to have been the result of higher levels of screening (Pearce 2018). Meanwhile, 15,893 people were killed by the tsunami (Ritchie 2017). Despite being over 5 times the death toll from 9/11, the tsunami dead are scarcely remembered outside Japan, the natural disaster lacking 'lingering dread' and involving less obvious institutional blame than nuclear or terrorist risk.

This is not to suggest there were not much wider human impacts following both incidents, but these should be understood in the context of the impact of debilitating narrative itself upon public and official reactions. The narrative within the first was of overwhelmed 'Chernobyl victims', that: 'Encouraged individuals to think of themselves fatalistically as invalids...helpless, weak and lacking control over their future', rather than survivors. This has led either to 'over cautious behaviour and exaggerated health concerns, or to reckless conduct' (Chernobyl Forum 2005). A significant psycho-social impact also followed Fukushima (WHO 2013; Harada, et al 2015). In the absence of clear information putting risks into proportion, even medical and charity staff would not come to the Fukushima area to help (Pearce 2018). An estimated 1600 fatalities died after Fukushima due to evacuation and stress-induced causes, including suicide and alcoholism (Ritchie 2017). People don't want to return to the area, refusing to believe that exposure levels were insignificant. Attempts to explain how increases in health abnormalities result from increased screening interpreted as evidence of scientific collusion with the nuclear industry, following the narrative pattern (Pearce 2018). Scientific meta studies of reactions meanwhile conclude that: 'Yet all of these accidents have one main feature in common: experts regard the consequent mental health impact as the largest public health problem' (Takebayashi et al. 2017). The longer-term socio-psychological effects from fear of radiation woven into a fatalistic narrative of scientific and institutional failure needs addressing following such incidents (von Hippel 2011: 27). We have travelled from an invisibility of the victims of environmental risk to them becoming the central focus and, ironically, to arguably becoming the victims of narrative itself.

Beyond Simple Blame Narrative

A focus upon narrative is a useful addition to risk research, with its focus upon the language, content and associations of messages. A narrative focus also directs us to consider the predominant psychological and cultural biases that determine their impact rather than focus too much on hazards themselves. It also suggests greater emphasis upon the neglected historical dimension of risk research, reflecting upon the process of change in the sense we make of the risks around us. This article will hopefully stimulate further research into what is here only a general presentation, restricted to English language forms and focused on the US and UK - important as these examples appear to be in their international impact.

This review has drawn out both continuity and change in the evolution of environmental risk narratives. They share an objective of bringing a risk object to the attention of an object at risk, that

is an increasingly wider public, with the intention that the narrative process may help prevent recurrence. The historical emphasis here is fitting as narratives themselves characteristically draw upon the past to anticipate the future, providing a tool to anticipate outcomes and shape responses, like the idea of probability itself. This occurs with a growing confidence that it is within our capacity to avoid what were earlier cast as inevitable events, using new empirical tools and information, brought to life through language. Whilst broader social changes and the development of a secular, science-based culture provide the opportunity for this to occur, narratives require individuals inclined to articulate them, and prepared to challenge existing assumptions and forces.

They have played an important role in creating awareness of unrecognised or underestimated risks, from warnings of the imminence of long-forgotten plague to alerting us to the dangers of indiscriminate pesticide usage. Such a function remains significant in relation to issues such as climate change that remain publicly disconnected from both experience and knowledge and subject to counter-narrative. The empowering function of narratives is often historical, acting as an effective social memory, and has a role to play in destructive risk alarms such as over the childhood vaccine MMR, which led to plummeting rates of immunisation after the publication of a fraudulent research paper suggesting association with autism, around a narrative of unnaturally 'overloading' the immune system. Had an official counter-narrative reminding the public of the forgotten impact of measles been more successful, the alarm's impact may have been more limited (Bedford 2004).

The memory role of narrative is important in relation to scandals and tragedies in which authority is complicit and seek to downplay. Whilst now rarer in countries such as the UK where the culture of responsibility has been transformed since Victorian times, they do still occur and can be shaped by similar class prejudices, particularly against stigmatized groups. For example, it was only through a long campaign led by family members that 'justice for the 96' Liverpool football club supporters crushed to death at the Hillsborough stadium disaster in 1989 was achieved, and acknowledgement and apology for the police's role in causing and covering up the disaster established. The 'voices' of the tragedy and bereaved are captured in several narrative accounts (e.g. Sampson 2016).

At the same time, the nature and culpability for such events is typically less clear than in cases such as Hillsborough, Aberfan and thalidomide, even if the predominant cultural script is that they are a norm. And the dramatically posed and polarised nature of many narratives bears little scrutiny. Pesticides are not 'elixirs of death' and radiation comes in many forms - including the naturally occurring and as an effective cancer treatment - and is by no means synonymous with human catastrophe. Uncertainty and contestation are the truer norm of environmental risk issues; the effectiveness and desirability of the fluoridation of the water supply with which our post-war story began remains unresolved, for example.

But there are also important differences in the nature of narratives, as they evolved. Among others, Defoe's early warnings did not attempt to critically assign responsibility, amidst no expectation that this could be worthwhile. This only changed more systematically amidst a more visible and less deferential public, and greater expectation of equal treatment and redress as a more combative media and civil society pushed against entrenched institutional denial of responsibility, characteristically in specific cases where this was clear, and harms demonstrable. More fully formed environmental risk narrative develops firstly in the United States where the notion of systemic and man-made manufactured risk linked to progress first emerges, most fully in relation to nuclear accidents. Targets then tend to become wider than single institutions and failures, as does an assumption of complicity, even conspiracy of the range of scientific, political and corporate authority. In a crude sense the demand for responsibility and accountability passes into blame, though the boundaries remain unclear.

The narrative themes of originally American environmental risk narrative are no longer particular to it. What was once a radical counter-cultural, anti-corporate narrative suspicious of science has been

universalised and become mainstream. In the process, narratives formed around single, scandalous events such as the exposure of the harms of tobacco in the 1960s - and how industry sought to create uncertainty around known harms - have become a narrative template assumed to have wider application. At its core is the routinisation of the idea that something once naively assumed to be an everyday, innocent pleasure will turn out to be a deadly risk, previously masked by corporate greed, institutional collusion and scientific inertia. There have been various iterations of the narrative trope, 'the new/next smoking/tobacco', with the most significant current targets being sugar and meat (e.g. Malhotra 2016; Charlebois 2018). The language of risk here is really that of only *danger* signalling complete avoidance (Douglas 1994).

Risk narratives today continue to alert us to danger, but in circumstances where these are less clear, and calculations involve complex issues of considering alternatives and managing unintended consequences. The simplicity and stark posing of blame characteristic of dominant contemporary risk narrative are not easily suited to the complex task of communicating risk within which interest in narrative has emerged. Risk communication in a world facing impacts such as of climate change also involves the difficult task of encouraging recognition and even the acceptance of risk at the heart of risk management, without simple blame. If narrative is to be used as another risk communication tool it needs to be more sophisticated and targeted. As Sellnow et al (2018) conclude in their reflection on the use of narrative for communicating emerging disease risk: 'an effective crisis narrative should focus not only on what protective actions to take, but also on a clear explanation regarding the nature of the crisis. Moreover, such explanations must be translated intelligibly to diverse non-scientific publics and provide a compelling rationale for why the recommended actions are vital.'

In the important case of nuclear reactions discussed here, a narrative of resilience, or even simply calm, rather than risk would be more empowering. It seems appropriate to end with a story. Shunichi Yamashita is dean of the Graduate School of Biomedical Sciences at Nagasaki University, who's devoted his life to understanding the impact of nuclear incidents upon survivors, from Nagasaki onwards. His knowledge was used by local authorities after Fukushima and in creating a survey of the 150,000 evacuees. But he became a public pariah because of his contesting of 'radiophobia' and an 'epidemic of fear', the message that this was as much an information as nuclear disaster and his optimistic statements on radiation exposures - even advising people to smile and relax, as part of a positive coping strategy (Yamashita 2017). The subject of conspiratorial accusation and derogatory nicknames such as 'damashita' (who tricked), he was forced to resign as head of the survey in 2013 and remains marginalised. Sending clear and positive messages is difficult and even dangerous if it runs counter to the prevailing norms and assumptions that animate today's risk narratives.

Bibliography

Allan, S., Anderson, A. and Petersen, A. 2010 Framing risk: nanotechnologies in the news, *Journal of Risk Research* 13(1): 29-44.

Austin, T. 1967. *Aberfan: the story of a disaster*. London: Hutchinson

Beck, U. 1992. *Risk society: towards a new modernity*. London: Sage.

Bedford, H. 2004. Measles and the importance of maintaining vaccination levels, *Nursing Times* 100(26): 52-58.

Beer, D. 2018. Chernobyl review: Europe nearly became uninhabitable, the *Guardian* (9 May).

Blumenberg, H. 1996. *Shipwreck with Spectator: Paradigm of a Metaphor for Existence*. Cambridge MA: MIT Press.

- Boholm, Å and Corvellec, H. 2011. 'A relational theory of risk' *Journal of Risk Research*, 14(2): 175-190.
- Burgess, A. 2011. Public Inquiries in the (Risk) Regulatory State, *British Politics* 6(1): 3-29
- 2012. Media, Risk and Absence of Blame for 'Acts of God': Attenuation of the European Volcanic Ash Cloud of 2010, *Risk Analysis* 32(10): 1693-1702.
- 2018 Individualization Revisited: Global Family Developments, Uncertainty and Risk, *Journal of Risk Research* 21(1): 83-95.
- Carson, R. 1962. *Silent Spring*. New York: Houghton Mifflin Co.
- Carstairs, 2015. Debating Water Fluoridation Before Dr. Strangelove, *American Journal of Public Health* 105(8): 1559–1569
- Charlebois, S. 2018. Meat is not the new tobacco, The Conversation (January 8) Available at: <https://theconversation.com/meat-is-not-the-new-tobacco-and-shouldnt-be-taxed-89673>
- Douglas, M. 1994. *Risk and Blame: Essays in Cultural Theory*. London: Routledge.
- Douglas, M. and Wildavsky, A. 1982. *Risk and Culture*. University of California Press.
- Edelstein, M. 2001. Crying over spilled milk: Contamination, Invisibility and Expectation in Environmental Stigma, in Flynn, Slovic and Kunreuther (eds.), *Risk, Media and Stigma*, London: Earthscan: 41-68
- Eidinow, E. 2018. Oracles and Models: Ancient and Modern Ways of Telling the Future, The Conversation (24 February). Available at: <https://theconversation.com/oracles-and-models-ancient-and-modern-ways-of-telling-the-future-90124>
- Erikson, K. 1991. The Lingering Dread of Radiation, *Bulletin of Atomic Scientists* 42(2):34-39.
- Evans, H. 2014. Thalidomide: how men who blighted lives of thousands evaded justice, Guardian (16 November) Available at: http://www.simonemangos.com/Thalidomide_how_men_who_blighted_lives_of_thousands_evaded_justice_Society_The_Guardian.pdf
- Exner, F. and Waldbott, G. 1957. *The American Fluoridation Experiment*. New York: Devin Adair.
- Freudenburg, W. R. 1993. 'Risk and Recreancy: Weber, the Division of Labor, and the Rationality of Risk Perceptions.' *Social Forces* 71: 909-932.
- Gamson, W. A. and Modigliani, A. 1989. Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology* 95: 1–37.
- Garland, D. 2002. *Culture of Control*. Oxford: Oxford University Press.
- Gray, M. and Rosen, I. 1982. *The Warning: Accident at Three Mile Island*. New York: WW Norton.
- Flynn, J., Slovic, P. and Kunreuther, K. 2001. *Risk Media and Stigma: Understanding Public Challenges to Modern Science and Technology*. London: Earthscan.
- Freeman, B. 2017. Claims, Frames, and Blame: Coverage of Climate Change in ASEAN's English-Language Newspapers, 2002-2012. *Sage Open* 7(1)
- Fuentes, M. and Fuentes, C. 2015. Risk Stories in the Media: Food Consumption, Risk and Anxiety, *Food, Culture and Society* 18(1): 71-87.

- Grossmann, K. 2013. Chernobyl Death Toll: 985,000, Mostly from Cancer. Global Research. Available at: <https://www.globalresearch.ca/new-book-concludes-chernobyl-death-toll-985-000-mostly-from-cancer/20908>
- Hall, A. 2011 The Rise of Blame and Recreancy in the United Kingdom: A Cultural, Political and Scientific Autopsy¹ of the North Sea Flood of 1953, *Environment and History* 17(3): 379-408
- Hampton, W. 2001. *Meltdown: A Race Against Nuclear Disaster at Three Mile Island: A Reporter's Story*. New York: Candlewick.
- Harada, N., et al 2015. Mental health and psychological impacts from the 2011 Great East Japan Earthquake Disaster: a systematic literature review, *Disaster and Military Medicine* 1: 1-17.
- Hargreaves, I, Lewis, J. and Speers, T. 2003. *Towards a Better Map: Science, the Public and the Media*. Swindon: ESRC.
- Holton A., Weberling B., Clarke C., Smith M. 2012. The blame frame: media attribution of culpability about the MMR-autism vaccination scare. *Health Communication* 27(7): 690-701.
- Hutter, B. 2001. *Regulation and risk: occupational health and safety on the railways*, Oxford: Oxford University Press.
- Janku, A, Schenk, G. and Mauelshagen, F. (eds.) 2012. *Historical Disasters in Context: Religion, Science and Politics*. London: Routledge.
- Johnson, S. no date. Inside Three Mile Island: Minute by Minute. Available at: <http://insidetmi.com/index.php/narrative>
- Jones, L. 2018. In 1703 Britain was struck by possibly its worst storm ever, BBC Earth. Available at: <http://www.bbc.com/earth/story/20170309-in-1703-britain-was-struck-by-possibly-its-worst-ever-storm>
- Lytle, M. 2007. *The gentle subversive Rachel Carson, Silent spring, and the rise of the environmental movement*. New York: Oxford University Press
- Mairal, G. 2011. The History and the Narrative of Risk in the Media. *Health, Risk & Society* 13(1): 65–79.
- Malhotra, A. 2016. Sugar is the new tobacco, so let's treat it that way, Medscape (October 31) Available at: <https://www.medscape.com/viewarticle/871064>
- Margolis, H. 1996. *Dealing with Risk*. Chicago: University of Chicago Press.
- Martin, D. 2014. The Victorians and Risk, *Victorian Review* 40(2): 47-54.
- Mohun, A. 2013. *Risk: Negotiating Safety in American Society*. Baltimore: John Hopkins UP.
- Neal, W. 1992. *With Disastrous Consequences: London Disasters, 1830-1917*, London: Hisarlick Press.
- Nerlich, B. 2015. Metaphors in science and society: the case of climate science and climate scientists, *Language and Semiotic Studies* 1(2): 1-15.
- Pearce, F. 2018. *Fallout: Disasters, Lies and the Legacy of the Nuclear Age*. London: Portobello.
- Pidgeon, N. et al. 2003. *The Social Amplification of Risk*. Cambridge: Cambridge UP.
- Plokhy, S. 2018. *Chernobyl: History of a Tragedy*. London: Allen Lane.
- Prins, R. Avraamidou, L. and Goedhart, M. 2017. Tell me a Story: the use of narrative as a learning tool for natural selection, *Educational Media International* 54(1): 20-33.

- Ritchie, H. 2017. What was the death toll from Chernobyl and Fukushima? Our World in Data. Oxford. Available at: <https://ourworldindata.org/what-was-the-death-toll-from-chernobyl-and-fukushima>
- Robertson, G. 2011. *The Politics of Protest in Hybrid Regimes*. Cambridge University Press.
- Roth, A. 2018. Russian protesters kick up a stink about landfill – but not against Putin, the Guardian (30 March), available at: <https://www.theguardian.com/world/2018/mar/30/russian-protesters-kick-up-a-stink-landfill-putin>
- Sampson, K. 2016. *Hillsborough Voices: The Real Story Told by the People Themselves*. London: Ebury Press.
- Sapolsky, H. 1990. The Politics of Risk, *Daedalus* 119(4): 83-96.
- Schiff, B, McKim, E. and Patron, S. 2017. *Life and Narrative: The Risks and Responsibilities of Storying Experience*. Oxford University Press.
- Sellnow, T., Sellnow, D., Helsel, E., Martin, J. and Parker, J. 2018. Risk and crisis communication narratives in response to rapidly emerging diseases, *Journal of Risk Research* DOI: 10.1080/13669877.2017.1422787
- Shipton, M. 2016. The ‘terrifying tale of bungling ineptitude that led to the Aberfan disaster, Wales Online (18 October) Available at: <https://www.walesonline.co.uk/news/wales-news/terrifying-tale-ineptitude-aberfan-disaster-12025544>
- Stephens, M. 1980. *Three Mile Island*. New York: Random House.
- Takebayashi, Y. et al. 2017. Risk Perception and Anxiety Regarding Radiation after the 2011 Fukushima Nuclear Power Plant Accident: A Systematic Qualitative Review, *International Journal of Environmental Residential Health* 14(11): 1306.
- Tomkins, P. et al. 2018. *Boom! How Jurgen Klopp’s Explosive Liverpool Thrilled Europe*. Tomkins Times.
- Toner, J. 2013. *Roman Disasters*. Oxford: Polity.
- Von Hippel, F. 2011. The radiological and psychological consequences of the Fukushima Daiichi accident, *Bulletin of Atomic Scientists* 67(5): 27-36.
- Waldbott, G. 1965. *A Struggle With Titans: Forces Behind Fluoridation*. Carlton Press, New York.
- WHO. 2005. Chernobyl: the true scale of the accident. Geneva: World Health Organisation, available at: <http://www.who.int/mediacentre/news/releases/2005/pr38/en/>
- WHO. 2013. Global report on Fukushima nuclear accident details health risks. Geneva: World Health Organisation, available at: http://www.who.int/mediacentre/news/releases/2013/fukushima_report_20130228/en/
- Yamashita, S. 2017. An Epidemic of Fear, *New Scientist* 234(3125): 40-41.
- Zinn, J. and MacDonald, D. 2018. *Risk in the New York Times*. London: Palgrave.