

1. Risk, resilience and inequality: current dilemmas in environmental regulation

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As our understandings of environmental risks develop so too do the ways we try to manage them. Over the past few decades there has been a change in our knowledge of the damaging effects we have on our environment. There has been a widening recognition that the environmental problems we face are acute and that they are not just local but national, transnational and global. Local problems can have global effects and the mass accumulation and interaction of individual instances of damage to our environment are, according to the worst case scenarios, threatening the long-term future of the planet. We also appreciate more keenly the deep inequalities attaching to both the exacerbation of environmental risks but also their ill-effects. There has also been a change in the way we see and frame problems in terms of risk. Risk narratives imply that we are able to anticipate and control the risks threatening us. Yet the environmental changes we experience challenge this social project. They suggest a level of uncertainty and even contestation about environmental problems and how to cope with them. Indeed, there is growing recognition that some of the ways we manage environmental risks have perverse and regressive effects on different populations.

These changes raise questions about how suited the law is to manage the environment in the 21st century. In the 20th century environmental law represented one of the most important regulatory regimes in modern societies but it now faces a number of significant challenges. There are issues about the compatibility of law with notions of risk and the complex conceptual apparatus of terminology and strategies that has emerged in response to our contemporary understandings of the environmental risks we face. These include questions about the ability of the law to manage transnational risks and to embrace uncertainty and change.

This chapter will first outline some of the most prominent environmental issues we face, including changes in our understandings of environmental

risks, uncertainties and damage, and the inequalities attaching to them. It will then discuss the various strategies for managing these risks that have gained traction, focusing in particular on risk and resilience perspectives and the ways in which they may relate to environmental law and its ability to act as a governance device for the environmental challenges we now encounter. The overall collection aims to develop our theoretical understanding of risk, resilience and inequality as it relates to environmental regulation. This demands that we also interrogate the conceptual murkiness surrounding some of the approaches that are emerging before we are able to theorise about how best the law can play a role in promoting environmental concerns and facilitating greater equality.

ENVIRONMENTAL RISKS¹

Very broadly, environmental risks are threats of actual or potential harm to the environment and consideration of the probability of these adverse consequences occurring. Of key importance in understanding these risks is appreciating the interdependence of the physical and social environments, in particular that risks to the physical environment have impacts on social environments and even more importantly, that risks to the physical environment are the result of human activity. It is for this reason that some commentators differentiate the Holocene, where environmental change was seen to occur naturally, from a new era, the Anthropocene, where human activity has emerged as a major force for environmental change.² It is also why existing critical social theory positions challenging the distinctions between the social and the natural have been revitalised (Chakrabarty, 2009). The focus of this collection is on the role that law can play in limiting the environmental damage we are causing.

The environmental risks we face are multiple, complex and interconnected. They affect the climate, ecology, biosphere and oceans.³ Their causes are manifold and compound. Industrial activity has resulted in atmospheric, aquatic and ecological pollution arising from the use

¹ This section is intended as a basic introduction to some of the main issues under discussion so as to give some perspective on the challenges involved in the environmental area. It is not intended to be an exhaustive or high-level discussion.

² See Crutzen and Stoermer, 2000 who introduced the term, derived from geology. Note it is still a contested term. See eg. Malm and Hornborg, 2014; Monastersky, 2015.

³ Rockström et al, 2009, Steffen et al 2015 set out some of the major risks as part of their planetary boundaries research.

of chemicals, pesticides and various kinds of industrial, radioactive and human waste. Industrial and household burning of fuel and cars are major sources of air pollution. Industrial waste is also a major contaminant of water sources and soil, as are pesticides. The depletion of the natural resources generates and exacerbates environmental risk, for example, deforestation, overgrazing, poor agricultural and water management and overfishing which are in part a result of overpopulation (eg. Royal Society, 2012). Related to this is growing urbanisation which can generate significant environmental risks: in wealthy countries where consumption of natural resources and the generation of emissions may be high and in poorer countries where there are health risks and concerns about the ability of infrastructure to keep pace with the rise in population and to do so in sustainable ways which do not add to emissions (United Nations University and Institute for Environment and Human Security, 2014). Moreover, there are complex interrelationships between different sources of risk. Rapid urbanisation for example, may result from rural migration because of droughts and land degradation, in turn this movement may increase sedimentation and place high demands on the local ecology which can lead to further resource depletion. It may also generate high levels of waste which, in turn, can affect the availability of resources and harm biodiversity and threaten to add to emissions and so on (World Economic Forum, 2015).⁴

The consequences of these risks becoming realities are stark. Water and soil contamination seriously affects biodiversity and, in turn, contaminates the food chain and renders land and water infertile. At its most extreme the risks are the extinction of species of plants and animals, and habitat destruction for plants, animals and human beings (Department for Environment, Food and Rural Affairs, 2015; Global Biodiversity Outlook 4, 2011; 2.; International Union for Conservation of Nature Annual Report, 2015: 4; World Wide Fund for Nature (WWF) Living Planet Report, 2014).

Deforestation is a particular concern, especially of the rainforests which are thought to house more than 50 per cent of the world's biodiversity. Deforestation is also a concern as forests play an important role in mitigating climate change.⁵ Indeed, the most dramatic environmental risks have been most discussed with respect to climate change which refers to

⁴ These publications emphasise the word 'risks' as they believe that with careful planning the worst effects can be averted (see below). See also Newman, 2006 who argues that the impact of cities on climate change can look very different according to how it is framed.

⁵ <http://www.worldwildlife.org/threats/deforestation>

changes in the weather, including temperatures and precipitation, of a city, region or the planet.⁶ The Intergovernmental Panel on Climate Change (IPCC) (2007: 1.1) refers to climate change as:

... a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity.⁷

The Stockholm Centre's Resilience Group identify climate change and biosphere integrity as two core planetary boundaries through which other boundaries operate (Steffen et al, 2015). Climate change is core because it refers to 'the amount, distribution, and net balance of energy at Earth's surface' which 'sets the overall conditions for life'. Biosphere integrity refers to the totality of all ecosystems and their biota and 'play a critical role in determining the state of the Earth system, regulating its material and energy flows and its responses to abrupt and gradual change . . . Diversity in the biosphere provides resilience to terrestrial and marine ecosystems.' This high-level framework is intended to facilitate an understanding of environmental risks at a scientific level. Nevertheless, it does help us gain some perspective on the nature, scale and complexity of environmental risks.⁸ Other documents help us to appreciate more the relationship with human activities.

The IPCC Fifth Assessment Report 2014 (2015) concluded that warming of the climate systems because of human activities was 'unequivocal' and 'unprecedented' – 'The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen' (1.1). In addition, there has been an increased incidence of extreme events. The Report warns that: 'Continued emission of greenhouse gases will cause further warming and long-lasting, some irreversible, changes in

⁶ <http://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-climate-change-58.html>

⁷ The IPCC differentiates its definition from that of the UN 'where climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods' (UN 1992: 7).

⁸ The Stockholm approach is not without its critics. See for example, http://dotearth.blogs.nytimes.com/2015/01/15/can-humanitys-great-acceleration-be-managed-and-if-so-how/?_r=0 and <http://www.stockholmresilience.org/21/research/research-news/7-2-2012-addressing-some-key-misconceptions.html>

all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks' (2). Moreover, the Report predicts that in addition to exacerbating the existing risks, new risks will be generated for the physical and human environments. In particular, they identify high levels of species extinction during and beyond the 21st century, risks to coastal and low-level areas because of sea-level rises and a serious threat to food security.

We should not convey the impression that the risks we are discussing are universally agreed. There is contestation of the evidence of environmental risks. The debates about environmental risks are multidisciplinary and complex. Different disciplines and authors use similar terms in slightly different ways, there are debates about definitions and methodologies, and of course interpretation of the results.⁹ Put another way, there are debates about the definitions of risk, the probabilities and overall risk assessments.

The contestation of the evidence partly relates to debates about whether we are referring to environmental risks or discussing environmental uncertainties, where the risks are not calculable (Knight, 1921). Part of the reason for the uncertainty is that the past is no longer such a good predictor of the future. For example, climate change is altering the patterns and the incidence of environmental damage and disasters. It is resulting in new environmental uncertainties which raise basic questions about the status of historical data and whether or not it is a sound basis on which to identify risks and plan for the future (Cox, 2012; Morgan and Stallworth, 2013). This centralises the relationship between learning from past events and being open to the unexpected questions crystallised in the juxtaposition between resilience and anticipation. It also poses particular challenges for law and its ability to cope with uncertainty and play a meaningful role in managing the complex environmental risks and uncertainties that confront us (see below).

Overriding the 'fine print' and detail of the precise parameters of the environmental risks we encounter, there is more general agreement that the implications of these changes are potentially drastic and catastrophic. We have already seen the potential risks to food security, habitation and the availability of water, there are also serious health and energy effects and these are unequal in their effects.

⁹ The footnotes above have noted some of these points of contention.

INEQUALITY AND ENVIRONMENTAL RISKS

Cutting across all of these issues are deep inequalities between nations, different social groups and between individuals in their contributions to climate change and the extent to which they become victims of the environmental risks it generates.

Environmental inequalities intersect with social inequalities (Blowers and Leroy, 1994; Pellow et al, 2005). Much work has been generated arguing that the poor, ethnic minority groups and women are disproportionately exposed and vulnerable to environmental risks (Downey, 2005; David and Enarson, 2012; Leichenko and Silva, 2014). Health and social impacts have been related to social inequalities both in terms of experiencing the harms associated with environmental hazards and not having access to the benefits of the production and consumption processes generating the harms (see Downey, 2005). Inequalities have been related for example to industrial and noise pollution, access to transport, housing and access to green spaces and biodiversity (Sustainable Development Research Network, 2004). Moreover, these inequalities are reproduced within¹⁰ and also between nations. A recent report by the IPCC (2015: 13) explains that while climate change is affecting the globe 'Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development' (2.3).

The health effects generated by environmental risks are discussed in a report by the World Health Organization (WHO, 2014) which identified air pollution as the world's biggest environmental health risk, linked to nearly one in eight deaths in 2012. It reported differential effects, with the Western Pacific and South East Asia experiencing the highest number of deaths followed by Africa and the Western Mediterranean areas of Europe. High-income countries were less affected although the report stresses that air pollution is still a major problem in these countries. Household pollution was identified as a greater problem for rural areas and ambient pollution a greater problem for urban areas.

Social inequalities are also significant in disasters when the most marginalised have been found in repeated studies to be the most vulnerable to harm and the least able to recover in the aftermath of disasters (Elliot and

¹⁰ Downey 2005 summarises some of this work; other research identifies environmental inequalities within different regional areas, for example, in the USA eg. Clark et al, 2014; Downey and Hawkins, 2008. Asia eg. Bardsley and Hugo, 2013; Lung et al, 2014; Rubin, 2014. Latin America eg. Carruthers, 2008; Collins, 1986; Painter and Durham, 1995. Africa eg. McDonald, 2002; Heerink et al, 2001. Europe eg. Bolte et al, 2010; Chalmers, 2005; Pedersen, 2011.

Pais, 2010; Neumayer and Plümpner, 2007; Reid, 2013). It is at these times that the burdens on women are seen to be especially acute as they take on a primary responsibility in supporting roles (Peek and Fothergill, 2008; Reid, 2013).

Exposure to risks and harms is differentially experienced, so too is the contribution to these risks. There has been a shift over the past decade with regard to the highest polluting countries to include the major emerging economies of China and India (McEldowney and McEldowney, 2014).¹¹ So the developing world is starting to pose a major challenge in this respect. It is also the case that overpopulation is particularly marked in less developed countries and among the poorest in these societies. This has implications for the consumption of natural resources, for urbanisation and for migration (Royal Society Science Policy Centre, 2012).

Newman (2006: 277ff) discusses the differential environmental impact of cities in developed and developing countries explaining that cities in the USA and Australia have far greater impact than similarly sized cities in India. Moreover, he argues that in some respects this can have positive environmental impacts, the key is careful planning. As Satterthwaite and Dodman (2013) argue cities need to build resilience to the effects of climate change into infrastructure investments, development plans and disaster risk management but most city governments lack the capacity to do so.

Transnational inequalities relating to the effects of deforestation reveal that there is not a one-way traffic from rural areas to cities. The effects are of course contingent upon the dependence on forests for hunting, gathering, resources such as rubber and small-scale agriculture (eg. Koop and Tole, 2001; Sant'Anna, 2016) and they are linked not just to rural migration to urban setting but rural migration to forest frontiers, moves that contribute to the overall environmental risks to ecology and biodiversity (Carr, 2009). An important aspect of understanding these effects is more interrogation of the social relations that incentivise greater land use (Painter and Durham, 1995). The World Wildlife Organization details one example, namely deforestation in the Greater Mekong in South East Asia, where land tenure systems are weak and deforestation has contributed to social conflict and migration (<http://www.worldwildlife.org/threats/deforestation>).

Predictions are that climate change will exacerbate inequities between rich and poor. Indeed, a report in the UK medical journal *The Lancet*

¹¹ Data from the US Department of Energy ranked countries according to their carbon dioxide emissions in 2011. The top four polluters were: 1. China; 2. USA; 3. Russia; 4. India. http://www.ucsusa.org/global_warming/science_and_impacts/science/each-countrys-share-of-co2.html#.VperKV9FDGg

pronounced climate change as much a health issue as an environmental issue. It detailed the effects of climate change on insect-borne infection; malnutrition because of growing food shortages; rising heat-related respiratory and cardiovascular illnesses; and changing patterns of disease, for example related to decreasing supplies of clean water and access to sanitary conditions (Costello et al 2009: 1694). The IPCC (2015) report similarly identified increased levels of poor health among those in developing countries, particularly severe impacts of increasing temperatures and extreme weather events on those 'lacking essential infrastructure and services or living in exposed areas' (2015: 16) and greater poverty, especially in urban areas and areas already suffering hunger. Eventually the report anticipates the displacement of people especially affected, for example by drought or infertile areas where the ecosystem has collapsed and, in turn, this could contribute to conflict and violence.

There are strong links between the notions of environmental inequality and environmental justice.¹² Indeed, the concept of environmental inequality arose in the late 1980s and 1990s around environmental activists challenging the notion that environmental risks affect everyone equally and arguing for environmental justice (Downey, 2005; see also the aims of the charity the London Sustainability Exchange).¹³ A blurring of the concepts of inequality and injustice has been criticised in discussions of life chance and class (Abbott, 2015). The difficulties in the environmental case in part centre on a focus on outcomes rather than processes and mechanisms of inequality (Downey, 2005; Pellow et al, 2005). For example, Walker et al (2005: 372) evidenced a socially unequal distribution of industrial pollution sites in the UK but they explain that these patterns of proximity do not always demonstrate patterns of pollution impact and nor do they explain why these patterns exist. There is a need here to consider the political and ethical decisions made about the location of industrial plants (Walker et al, 2005: 373), and the processes, histories and mechanisms by which these decisions are made (Pellow et al, 2005). Some commentators have noted that the ability to defend one's locality may be related to socio-economic status with some groups rendered peripheral to the processes involved and thus central to the environmental risks incurred (Blowers and Leroy, 1994). Moreover, there are concerns that some of the strategies in place to counter environmental risks may further exacerbate

¹² See Schlosberg, D. and Collins, L. B. 2014 for an overview of the discourse of environmental justice from its development, through the range of principles and demands of grassroots climate justice movements, to more recent articulations of ideas for just adaptation to climate change.

¹³ <http://lsx.org.uk/aboutus/default.aspx>

human inequalities through strategies which unevenly burden those in the poorest and most vulnerable positions. For example, these groups may be excluded from political processes that shape the political economy (see for example, Adger, 2006; Marino and Ribot, 2012). It is therefore important to evidence the risks and harms caused by environmental inequalities but also to research the mechanisms by which this happens: the role of economic and political decision-making (Tierney, 2014) and the influence of this on the framing of risk decisions (Clarke, 1989) and at local, national and transnational levels of analysis (Newell, 2005). Of particular importance to this collection are the ways in which the law may reinforce these inequalities and the potential it may have to alleviate them. The whole area of the inequalities attaching to environmental risks underlines the importance of researching the social, political and economic contexts which give rise to these risks, frame their definition and the prioritisation they are given.

WHAT NEEDS DOING?

As we can see the scale, volume and complexity of the environmental challenges we face are considerable. Anticipating the risks and managing them is bedevilled by a lack of reliable data, contestation about this and how to interpret the data and forecasts that do exist. There are multiple areas which need managing and because the vulnerabilities are multi-level they need action at multiple levels from the individual through to community, organisational, societal, transnational and, ultimately, global levels (Adger, 2006).

The broad areas demanding attention fall into a number of broad categories. These include, first an urgent need to lower carbon dioxide emissions. For example, to decrease the use of fossil fuels and cut back transport emissions. Second, a focus on the protection of natural resources, for example, the protection of fish stocks and improved water management. A related third category centres on measures to control population growth, although some authors caution that this is a long-term solution and that it is vital that we also find innovative ways of conserving biodiversity and ecosystems through less consumption (Bradshaw and Brook, 2014). The fourth category is again related to the previous ones as it focuses on urban planning and the need to find positive ways of planning without depleting resources (Newman, 2006). Reducing the inequalities generated by environmental risks is a fifth broad category while a sixth overarching task is to find ways to effect the above, for example, through education, accountability mechanisms and governance systems.

Discussions of environmental equity emphasise the point that issues of intergenerational and intragenerational equity are at stake. The environmental risks we encounter have implications for present but, most importantly, future generations (Boyce, 2007; Gaba, 1999; Weiss, 1992). The balancing of present against future risks presents ethical dilemmas as does the need to balance decreasing emissions and decreasing consumption while improving standards for the poorest and not decreasing environmental standards for the richest. Achieving this without unacceptable coercion also poses challenges. For example, attempts to curtail population growth in the poorest nations needs to be consensual rather than coercive (Royal Society Science Policy Centre, 2012).

Managing these issues is an intensely political process and it is also one in which economics can play a significant role. The economic costs of adaptation and mitigation have not yet been established (see below) but the ethical costs are clear – preventing tens of millions of deaths and misery (Costello et al, 2009: 1,700). The rest of this chapter will set out some of the tensions besetting environmental control with a particular focus on the role of law. We will next consider the role of law in more detail and then map out some of the broader strategies which contemporary environmental approaches have adopted, paying particular attention to risk and resilience strategies.

ENVIRONMENTAL LAW

Environmental law has changed significantly since the early environmental statutes appearing in Western societies first in the 19th century and then in the 1960s and 1970s. Initially the focus was on state-centred statutes to, for example, regulate emissions, the disposal of waste and water quality. The focus was on the source of the pollution and its effects which were thought to be local. Over the past four decades, notions of environmental law have expanded to include broader regulatory approaches many of which were unwritten by, or have taken place in, the shadow of the law. Over time this expanded to include much broader notions of regulatory governance embracing a range of state and beyond the state organisations and actors (Gunningham, 2009). This accompanied, as we have seen above, changing conceptions and understandings of environmental risks in the 20th century. Environmental law became more joined up, holistic and it was also recognised that the law was dealing with greater uncertainty (Hutter, 1999; Fisher, 2013a). There has been a growing recognition that environmental risks are global risks requiring global co-operation and the focus of environmental law broadened further to include transnational laws,

treaties and conventions. Alongside these changing concepts has been an expanding institutional regime for environmental regulation.

At a national level in developed countries we have also witnessed a growing portfolio of tools and approaches to environmental regulation. Traditional approaches aimed to prevent or limit emissions through command and control techniques but during the 1980s and 1990s there was a move to incorporate different tools and methods to environmental regulation. These included approaches that targeted different organisational motivations to comply with the law. For example, there has been the use of various market-based instruments, trying to incentivise compliance through economic motivations. For example, tradeable permits, subsidies, taxes and emission caps (see eg. Stavins, 2003). These approaches have been tried in various parts of the developed and developing world (Arsel and Büscher, 2012; MacKenzie, 2009; Stavins, 2003; Swingland, 2003). Likewise, informational strategies have also been tried (André et al, 2011).

Regulation has also moved beyond the state. In some forms this has retained state involvement in the form of state co-option of other sources, for example, forms of co-regulation, enforced self-regulation and meta regulation. The intention here is often to encourage voluntary rather than coercive compliance. There has also been the greater incorporation of beyond the state organisations and actors into state decision-making processes. Beyond this there has been a move from government to governance with other actors increasingly playing and being seen to play a regulatory role, for example, environmental NGOs and financial institutions such as insurance and also consumers through the creation of so-called 'green markets' (Grabosky, 1994; 2013; Hutter, 2011; Prakash, 2001).

The use of additional strategies was in part a response to what some perceived to be a failure of the command and control approach of regulation. The effectiveness of this and of the law is disputed – some believe it has made no difference (Ebbesson, 2010), others believe there has been limited success (Gunningham, 2009). There has been growing agreement that regulation across all sectors demands a combination of different strategies and tools and also the involvement of multiple sources of governance (Gunningham et al, 1998). As McEldowney and McEldowney (2014) observe with regard to the UK:

Regulating the environment is conceptually complex, involves a diverse range of institutions, techniques and methodologies, and crosses geographical and national boundaries.

The changes we have witnessed have been labelled the 'new environmental governance' by Holley (Holley, 2008; Holley et al, 2012). This denotes an approach marked by greater collaboration between different stakeholders,

greater participation and deliberation in decision-making, decentralised and flexible approaches to environmental regulation and ones which incorporate learning (Holley et al, 2012: 4).¹⁴ These changes have taken place across much of the developed world and there are signs that the changes identified in developed countries are emerging in parts of the developing world, especially the major emerging economies of China and India. Work here has underlined a key finding of socio-legal research on regulation in developed countries, namely that a proliferation of laws is not enough, it is effective enforcement that really matters (Agrawal et al, 2014; Stern, 2010; Stuligross, 1999; Van Rooij, 2010; Van Rooij et al, 2013). It has also identified greater participation in regulation, albeit embryonic (Johnson, 2014b; Lee, 2010; Li et al, 2012) and the use of informational disclosure strategies (Zhang et al, 2015). The research evidence that exists suggests that forms and styles of regulatory governance differ between countries (Vogel, 1986; Weale et al, 1996). Moreover, there may be cultural differences, for example with respect to the rule of law, that influence the availability of different regulatory strategies and regimes to the developing world. These may include, for example, differences in political regimes, for instance between authoritarian regimes and democratic ones; cultures where corruption and bribery are more the norm than others thus with the potential to undermine the rule of law; or differing values placed upon environmental management. The important questions for environmental law and regulation are where is law most useful and where does it not help (Gunningham 2009: 20ff).

INTERNATIONAL ENVIRONMENTAL LAW

The growing recognition that environmental risks are global has resulted in increased effort to manage these risks at a transnational level. This has included environmental laws, international treaties and transnational agreements (Coleman, 2012). It has also embraced a variety of players, for example, nation states, multinational businesses, industry associations, standards organisations, social movements and individuals (Braithwaite and Drahos, 2000; Falkner, 2003).

A number of key reports, protocols and transnational institutions have emerged over the past four decades, many of them under the auspices of the United Nations which has emerged as a major facilitator of transnational

¹⁴ As we will see below this definition is remarkably similar to some definitions of resilience.

discussions and activities. This role really crystallised with the founding of the United Nations Environment Programme (UNEP) in 1972 to undertake a coordinating and promotional role in the UN for environmental initiatives and activities.¹⁵ A detailed history of transnational environmental developments and the UN is neither possible nor desirable here but a number of key developments are of relevance to our focus on environmental law. Of key importance is the establishment in 1984 of the World Commission on Environment and Development (WCED) under the auspices of the UN and the chair of Gro Harlem Brundtland, then Prime Minister of Norway. The WCED is now popularly known as the Brundtland Commission and its product the Brundtland Report *Our Common Future* (1987), is important in the context of this book as it explicitly addresses issues of global inequalities in environmental development and the need to acknowledge economic and social well-being. The notion of sustainable development refers to 'development which meets the needs of current generations without compromising the ability of future generations to meet their own needs'. The Report not only places the recognition of inequalities and the poor at its heart it also sets out a case that sees the world as a whole, connecting the ecological, social and economic. Moreover it is premised on the idea that it is possible to act in order to protect the environment for future generations.

Sustainable development is an approach that has underpinned much environmental policy ever since but this does not mean that it is without its critics.¹⁶ The concept is regarded as vague and the most obvious difficulty is one running through environmental debates, how to translate the high ideals of the Report into action, especially action that can deal with the underlying tensions between economic development, environmental protection and reducing social inequality (Lee, 2005; Magraw et al, 2015). Notwithstanding these difficulties the Report has had enduring influence. Subsequent meetings and protocols developed the concept and addressed the implementation of a sustainable development approach. For example, the 1992 Rio Earth Summit, involving governments and NGOs, produced among other things, a plan for achieving sustainable development (Agenda 21) and also conventions on climate change and biodiversity. The climate

¹⁵ It currently describes its mission as:

- Assessing global, regional and national environmental conditions and trends.
- Developing international and national environmental instruments.
- Strengthening institutions for the wise management of the environment.

<http://www.unep.org/About/>

¹⁶ See for example, http://www.unece.org/oes/nutshell/2004-2005/focus_sustainable_development.html

change convention eventually led to the Kyoto Protocol 1997 which set internationally binding emission reduction targets for signatories. Since 1992 there have been regular Earth Summits (New York, 1997; Johannesburg, 2002; Rio 2012) all with the intent of progressing international efforts towards addressing sustainable development. Each of these has maintained a focus on inequalities and a desire to address these. For example, the Kyoto Protocol was based on the principle of common but differentiated responsibilities in order to try and avoid placing unfair burdens on developing nations in contrast to developed nations that had already caused much environmental damage. The ambitions of these transnational efforts are not really in dispute but their implementation is, as several major players have refused to ratify treaties or agreements or failed to comply with their conditions (Koehn, 2010).

Alongside these developments there has been a dramatic growth in international environmental law as a distinct field (Bodansky et al, 2015). The history of this expanding field in many respects reflects our general discussion of greater awareness of the holistic effects of environmental risks and the need for collective action but simultaneously a specialisation and fragmentation around different risks and regions of the world (ibid). There has been a marked growth in transnational organisations such as the UN-led institutions, sometimes in co-operation with other organisations. For example, in 1988 The World Meteorological Organization and UNEP established the Intergovernmental Panel on Climate Change (IPCC), essentially to provide scientific evidence on climate change and its social and economic effects. Yet these institutions have limited powers of implementation, the nation state is still central here and many of the protocols and laws are essentially voluntary to the extent that they rely on state-level enforcement and compliance. There are also concerns that these transnational laws and institutions do little to alleviate inequalities and may indeed reflect them along a North–South dimension and also with respect to future generations (Bodansky et al, 2015). Just as much as beyond state regulation at a national level takes place in the shadow of the law so does much transnational environmental governance take place in the shadow of the state (Falkner, 2003).

One approach which has been more recently advocated to try and clarify the principles and obligations of states to their citizens and also to other states, has been a human rights approach to environmental risks, the argument being that climate change, for example, is a violation of human rights (Bodansky, 2010; Knox, 2009; Rajamani, 2010). It is seen as a way of stressing the rights of disadvantaged individuals, communities and states who so often suffer a coincidence of human rights inequalities and poor resourcing with respect to the environment (Humphreys, 2009).

This is a difficult and emerging territory as emission rights (which it is argued have traditionally been privileged) are juxtaposed against human rights. This raises issues around questions such as is there a human right to emissions in order to secure subsistence (Hayward, 2007). It also generates familiar difficulties attaching to other areas of international efforts to manage environmental risks, namely the lack of strong national and international enforcement institutions (Humphreys, 2009).

Beyond this it is also important to consider what the law tries to exclude. As Fleur Johns (2013) argues what the law excludes is as important as what it includes. Some areas of transnational environmental activity are deemed extralegal, some supra legal or infra legal. Johns discusses the IPCC as an example of an organisation which is treated as supra legal, as dealing with science rather than law, science rather than politics. But as science and technology studies demonstrate these apparently different areas are mutually constitutive and in order to understand better the role of law in managing environmental risks we need to take a broader social science view (see eg. Jasanoff, 2004; Mackenzie, 2009).

The environmental domain exemplifies many of the core tensions of regulation writ large across a global stage. Let us now turn to consider how risk and resilience strategies fit into this picture and how they might further our understanding of key questions about the role law can play in managing the global risks associated with the environment.

RISK AND RISK MANAGEMENT

We have already conceptualised the environmental threats we face as risks but an important governance approach has been to use technical risk management approaches to structure governance. Thus we witness risk-based approaches coming to dominate scientific and economic assessments of climate change (Pidgeon and Butler, 2009). This is in line with more general increases in the growth of risk discourses in regulation (Power, 2004; Rothstein et al, 2006). The approach does have many attractions in the regulatory field not least because it is seen as a way of helping to set priorities and also resolve some of the tensions inherent in regulation through apparently objective and scientific methods. As Everson and Vos (2008) observe with respect to Europe, a strengthening of risk management approaches gives science a central role in the framing of problems and the separation of risk assessment from risk management acknowledges the role of values in acting on these assessments.

The precautionary principle was an early precursor to the more widespread popularity of risk-based approaches in the environmental area.

Its focus is on how to act in situations of uncertainty. The approach subjects uncertainty to the apparently rational technical approaches of science for one important subset of uncertainties, namely those where harms could result in irreversible damage (Everson and Vos, 2008). The importance of the precautionary principle is therefore to facilitate action to prevent possible extreme harms in the face of uncertain scientific evidence. It appears in national and regional legislation and also transnational agreements.¹⁷ Its use has led to much debate, with claims that it is incoherent and subject to multiple interpretations (Sunstein, 2005 cf Harremoes et al, 2013). The main difficulties lie with its implementation in particular determining the levels of proof needed in the face of uncertainty and establishing fair processes for making such determinations.¹⁸ Implementing risk-based approaches can also be highly problematic. As we have seen, environmental law is dealing with contested territories and problems where knowledge is unstable and socio-political conflicts and interests are central. Framing environmental law can thus be especially problematic (Fisher, 2013) particularly in terms of determining the costs, benefits and risks involved. Moreover, the templates of law may not fit with those of science (Smith and Wynne 1989). The distinctions between risk and uncertainty pose challenges for law especially when the distinctions are blurred and contested. This has caused some to call for a new dialogue between science and law to meet the challenge (Fisher, 2010; McEldowney and McEldowney, 2011).

Risk-based approaches are wide ranging, there is no single approach. They may be all-encompassing frameworks which orient resources and practices or a more narrowly defined focus on risk techniques (Black, 2005; Hutter, 2004). The notion of risk and associated risk techniques vary between disciplines, for example, economics favour cost-benefit approaches and engineers risk assessment. The ambiguities they embrace may be simplified and glossed over (Wynne, 2002). Moreover, they may be differentially interpreted between different cultures. In practice the difference between risk and uncertainty may be blurred. For example, the necessary data to input to the technical risk assessments may not be available and the skill sets to analyse the information that is available may be lacking (Hutter, 2004). When this happens there is a danger that there may be a move to frame environmental uncertainties as risks so as to render them governable. Governmentality theorists maintain that such

¹⁷ For example, at a national level the precautionary principle is generally seen to have its origin in West Germany, it has been widely adopted in EU legislation and also appears in transnational agreements such as the Rio Declaration.

¹⁸ See Fisher et al, 2006 for an excellent discussion of the problems associated with implementation.

processes render risk a technology of governance. O'Malley (2001: 467–8), for example, argues that when combined with notions of 'reasonable foreseeability' risk approaches facilitate the regulation of foreseeable expectations as compared to calculable predictions of the future (see also Joseph, 2013). These approaches arguably help to constitute inequalities as they follow a market logic embedded in their cost-benefit foundations (Adler, 2012). Moreover, they may have a legitimating effect which is partly why Beck (1992) criticised the use of risk approaches in relation to environmental issues. Indeed, the Stern Review on the economics of climate change (2007) gained the subject serious political attention precisely because it was couched in economic language and working within existing rationalities. Pidgeon and Butler (2009) explain that language was essentially the language of risk-based approaches, based in cost-benefit analysis but adapted to try and take into account intergenerational equity. But working within economic rationalities, rather than suggesting radical reform is also regarded as one of the Review's weaknesses.¹⁹

It is partly for these reasons that some commentators call for the explicit regulation of uncertainty to improve strategy and policy options (Ragas et al, 2008; see below). Others commend much more radical solutions. Heyvaert (2011), for example, argues that notwithstanding the difficulties attaching to conventional risk regulation it is unsuitable for regulating the risks associated with climate change. With reference to the EU she argues that the concept of risk has been narrowly construed to refer to the risks to the environment balanced against the risks to economic considerations. But such an approach has not been applied to climate change, rather the EU has seen climate change as posing risks that are so serious as to render trade-offs inappropriate. This is demanding much more radical and innovative regulation, one which Heyvaert sees as signalling a new radical paradigm for risk regulation. In part this is about facing the harsh political and ethical risks climate change presents. It also relates to humanising the apparent cold dictates of bureaucratic and scientific approaches to decision-making. A popular route here has been to greater openness and participation in the decision-making processes surrounding risk-based approaches (Everson and Vos, 2008). Again these are not without serious difficulties in terms of implementation, nevertheless we have witnessed a growth of attempts to increase democracy in decision-making (Sexton,

¹⁹ The Stern Review had a mixed reception. Its critics contested the costs and science used in the Review and it was criticised by both those pro-climate change action for being too modest and those who were sceptical for being alarmist. See for example Ackerman, 2007; Nordhaus, 2007.

2013; see below). And it is partly in relation to this that some have turned to alternative strategies that focus around the notion of resilience.

RESILIENCE

The concept of resilience emerged in the late 1960s/early 1970s in relation to the resilience of ecosystems (Batabyal, 1998; Folke, 2006; Holling, 1973) where the focus was upon the ability of systems to cope with change and still persist (Petak, 2002). From the mid-1980s resilience referred increasingly to human environmental interactions, exemplified in discussions of sustainability (Lélé, 1998) and in the late 1970s/early 1980s it appeared in behavioural studies where it referred to an individual's ability to withstand and rebound from crisis (Rutter, 2000; Walsh, 1996). The concept was first used with respect to organisations by Wildavsky in 1988 but it was not until the late 1990s that the application of resilience to organisations gained in popularity (Weick and Sutcliffe, 2001).

Resilience has become increasingly prominent in the 21st century as a strategy for disaster risk reduction (Tierney, 2014: 160). For example, resilience in the face of earthquakes (Petak, 2002) and specific case studies, for instance, relating to Hurricane Katrina (Campanella, 2006), and 9/11 (Gittel et al, 2006; Kendra and Wachtendorf, 2003; O'Brien and Read, 2005). A related development has been an emphasis on urban resilience and the capacity of cities to recover from disasters (Vale and Campanella, 2005) and also social resilience which focuses much more on the capacity of communities to stay together in the face of disaster (Kendra and Wachtendorf, 2003; Manyena, 2006). Urban resilience and disaster resilience relate to organisational resilience in so far as they look at risk and adversity to complex systems, and the ability of these systems to face challenge. Likewise, social and ecological approaches have been combined to develop our understanding of complex social-ecological systems (Berkes et al, 2002; Folke, 2006), the emphasis being upon the importance of understanding the interactions of social and ecological systems and how the former may affect the resilience of the latter (Janssen and Ostrom, 2006). There has also been broader discussion of resilience in relation to health-care systems (Mallak, 1998), business supply chains (Christopher and Peck, 2004), information systems (Comfort et al, 2001) and resilience engineering (Hollnagel et al, 2006; Woods and Wreathall, 2003).²⁰

²⁰ This section is partly based on Hutter, 2010 Chapter 12.

Defining Resilience

There are multiple definitions of resilience and of course difficulties in transferring the concept between different disciplines and domains (Adger, 2000). This has become a multi-disciplinary area with varying genealogies and meanings attaching to the concept of resilience. It has also become a fast moving and highly topical area. At the core of most definitions relating to the environment is the ability of ecosystems, societies, cities, communities, organisations and individuals to survive disturbances, shocks and surprises to reorganise and reassemble so as to persist and maintain core systems, function and identity. Folke (2006: 259) also observes that resilience is also about opportunities and renewal and thus related to adaptive capacity which copes with change and develops with it. His suggestion that 'resilience is an approach, a way of thinking for guiding and organizing thought' (2006: 260) is helpful given the definitional quagmire surrounding the concept of resilience. Nelson (2011) similarly presents resilience as a perspective which helps us to think about the longer term and enhances our understanding of how changes take place. The emphasis is very much upon 'humans in the environment' (Folke, 2006: 263) and enhancing the ability to survive and bounce back rather than aim to try and control nature (Ebbesson, 2010).

Tierney (2014: 169ff) identifies four common characteristics of definitions of resilience, namely: notions of robustness, resistance and strength; redundancy so there is provision of alternatives, options and diversity; resourcefulness; and rapidity, that is how quickly a system can restore. She usefully differentiates two types of resilience: inherent resilience which the law can contribute to, for example, through engineered structures with building codes; and adaptive resilience which is a mix of pre-planned and novel activities including responsiveness to surprise and decentralisation.

An important perspective on resilience is offered by Nelson (2011: 116) who stresses that resilience is about explaining persistence and change, it is essentially about adaptation (see below). It provides a way of thinking about many contemporary environmental challenges and their implications.

RESILIENCE AND RISK REGULATION²¹

The relationship between risk regulation and resilience is much debated. Classic approaches discuss the relationship with respect to policy choices

²¹ This section draws on Hutter, 2010 Chapters 1 and 12.

depending on levels of certainty. Risk strategies are advocated where the risks are known and calculable and resilience where there is uncertainty. Wildavsky's classic work (1988) juxtaposes anticipation and resilience. He urges caution in the use of anticipatory strategies, arguing that anticipation can lead to unnecessarily wasted effort and wasted resources because of the high volume of hypothesised risks, many of which are exaggerated or are false predictions. Anticipatory strategies, argues Wildavsky, reduce the ability of organisations and societies to cope with the unexpected. Indeed, many preventive programmes have their own unexpected risks attached to them. He argues that more attention should be paid to enhancing resilience and warns against focusing too much on the dangers of risk and not benefiting from the opportunities.

Other authors caution against drawing too sharp a distinction between risk regulation and resilience. Macrae (2010) for example, argues that regulation and resilience may in practice have much in common especially at the level of what he terms 'regulatory work', that is, the micro-level of practical, everyday risk management. Here regulatory resilience is continuous and formalised and both regulatory and resilience regimes penetrate deep into organisations and try to become constitutive of them: both are to some degree future-oriented; and both are precautionary. The similarities between a decentred (rather than narrow state-based) definition of regulation and resilience strategies are especially close. Of particular relevance here is that they are democratised, encouraging participation throughout an organisation, thus highlighting the need for coordination, and learning from risk occurrences. But some normative debates around resilience caution that while there is a tendency to regard resilience as 'a good thing' this may not necessarily be so. Rogers (2013) advises that there are positive and negative articulations of resilience: the positive emphasising participation and empowerment and the negative stressing experts, technology and individual responsibility. This negative view is prominent among governmentality commentators who warn that resilience is also a form of governmentality as it shifts responsibilities from the state to society and to individuals (Chandler, 2014; Rogers, 2013; O'Malley, 2010).

Another theme in the literature is that the relationship between risk, regulation and resilience is a dynamic processual one. Park et al (2013) for example see resilience as 'the outcome of a recursive process that includes: sensing, anticipation, learning, and adaptation' and they see this as complementary to, but distinct from, risk analysis. Comfort et al, (2010: 273) similarly emphasise that resilience is a long process – 'it needs to be institutionalized, involves social collaboration and involves a balancing act between risk and resources, between vulnerabilities and escalating or unmanageable catastrophe'. It is partly for these reasons that some

commentators are not convinced by claims the resilience is transformative or a radical democratic alternative. Nelson (2011) argues that resilience works within the current system and needs to be considered in light of social goals and how benefits and risks are distributed (see also Tierney, 2014). Nelson (2011: 117) argues that the promotion of resilience is just as rife with issues of power, access and political decisions, as other strategies such as adaptation (see below). Leach (2010) similarly argues that resilience is inherently a matter of social framing by actors with different preferences and resources (see also Duit et al, 2010). These accounts challenge the notion that resilience is more democratic, egalitarian and bottom-up than other strategies. The relationships between risk, resilience and inequality demand greater empirical interrogation so that the circumstances which might facilitate their effectiveness in relation to their environmental goals and achieving greater social justice and equality might be better understood. Moreover, these need to be examined in relationship to the ways in which the law can facilitate change.

RISK AND RESILIENCE: RELATIONSHIP TO EACH OTHER AND ALSO OTHER STRATEGIES

Risk and resilience approaches have emerged as two popular approaches in the environmental field, with resilience emerging as especially popular in recent years. But it is important to appreciate that they are two recent arrivals in a fairly overcrowded space and while we are not able to discuss in any detail the full array of strategies it is important to map out/introduce some of the other main approaches and their relationships to risk and resilience-based strategies. There are definitional issues: relational ones, a lack of empirical data in addition to the normative and ethical issues that beset the area. Smit and Wandel (2006: 286) suggest that notwithstanding the variable usage of terminology in the literature there is a basic model. This model considers the vulnerability of systems (whether they be global, local, physical or social) as being reflective of: the exposure of the system to risks; and the sensitivity of the system to hazards in addition to the ability/capacity/resilience of the system to cope/adapt/recover from the effects of the hazards. Risk management and resilience strategies aim to enhance the ability of the system to cope with the risks and hazards with which it is confronted, their differences, as we have seen, are their differing relationships to notions of uncertainty: risk management approaches are deemed most suitable where there is some certainty about the risks and resilience approaches being more suitable where there is uncertainty.

Notions of risk and risk management imply that risks can be anticipated

and managed (Hutter, 2010). There are dangers to this, for example, the incentives for governments, policy-makers and organisations to give the illusion that they have transformed uncertainties into risks through the preparation of, for example, contingency plans (Clarke, 1999). The area of environmental risk is however one where there has been a relatively early step back from the expectation that all risks can be managed. This is signalled in two complementary strategies related to the basic model underlying the vulnerability of systems, namely mitigation and adaptation strategies. Both strategies refer to the ability of a system to respond to new challenges and typically they are discussed in relation to climate change.

Mitigation strategies attempt to slow down or reduce the system's exposure to change but it is generally accepted that this is not fully possible (Nelson et al, 2009: 397) hence the need for complementary adaptation strategies. Like many of the other strategies and concepts in this area, adaptation has its roots in the social and physical sciences and is a concept open to multiple interpretations (Gallopín, 2006: 293; Janssen and Ostrom, 2006: 237). At the core of most definitions is the notion of a system's ability to cope and respond to change. While some authors discuss this adaptation as something that may be inevitable and naturally occurring, it is most useful in the context of this discussion to stay with those authors who regard adaptation as a process of deliberate change (Nelson et al, 2007). The decision then rests on whether the adaptation strategies that are adopted adapt to maintain the status quo or to manage change to a new system. Some authors see the attraction of resilience being that whereas adaptation works to maintain the current system, resilience opens up the possibility of adapting to new systems: where adaptation is aimed at preserving the status quo is where it can be seen to be undermining resilience for these authors (Nelson, 2011: 116). But again authors divide on this issue; some discuss resilience as being about the 'preservation of the behavior of the system as expressed by its state remaining within the considered domain of attraction' (Gallopín, 2006: 301).

The important point here is that in discussing these different strategies it is important to be clear about what it is assumed their objectives are. The higher level aim is to proactively reduce the vulnerabilities of people to environmental risks (Smit and Wandel, 2006: 289). Adaptation and resilience are both about the capacity of a system to respond, about how the system reacts when exposed to risks. But there can be tensions between the two strategies. Nelson et al (2007: 407ff) argue that adaptation research tends to focus on specific risks whereas resilience research focuses on complex systems. There can be trade-offs between the two, for example adaptation in one location may reduce resilience elsewhere (see also Adger et al, 2011). Resilience perspectives offer, claim Nelson et al, a perspective

on evaluating the implications of adaption strategies on the system and into the future. Moreover, resilience approaches stress the need to conceptualise social and ecological systems as related coupled systems.

It is a matter of social decision-making and value priorities whether adaptation and resilience strategies seek to maintain or change the system. As several authors indicate, there may be real vested interests in maintaining the current system and hence its existing inequalities and power relations (Nelson, 2011: 116). Adaptation is not just about decision-making but also about the power to implement those decisions (Adger, 2006: 268). What is also clear is that governance plays an important role. For example, governance can play an important role in influencing the adaptive capacity of a system alongside economic development, technology and human capital (Nelson et al, 2007: 399). For some commentators the law and the legal system have an important role to play in this. McDonald (2011) for example, argues that the legal system can provide a 'principled foundation' for change and also the protection of the socially disadvantaged. This may be through regulating for anticipatory adaptation, facilitating fair liability and compensation schemes for when harms are caused and also for ensuring accountability for actions taken in emergency situations.

As we have seen there is a plethora of different concepts occupying environmental discussions. In part these are a response to changes in our understandings of environmental risks, uncertainties and damage. This collection focuses on risk and resilience strategies and their relationship with law and the promotion of greater equality. In particular, it considers if there are ways that environmental law can facilitate improvements to the environment without exacerbating existing inequalities and preferably improving them. Part II of the book considers the changing environmental landscape with reference to environmental law. It offers two contrasting views of the existing legal systems and the potential of the law to build resilience to climate change impacts and to effect transformations in environmental control. Chapter 2 draws on the Australian experience to discuss the role that the law might play in rethinking legal rights and responsibilities towards the natural world. Chapter 3 considers environmental law in the UK and the limitations attaching to calls for resilience both with respect to the uncertainties about the risks we face and also the extent to which public participation, as an important dimension of resilience, is facilitated by law.

Part III focuses on inequality and the social and economic consequences of environmental law. Chapter 4 analyses how inequalities relating to climate change impact on the life chances of individuals. It does this through the prism of resilience, arguing that this is especially revealing of key inequalities and the transformations necessary to improve the

conditions of the least advantaged. Chapter 5 discusses the extent to which collective environment-related property law contributes to equity and how human rights approaches might be helpful in facilitating this. It uses data from Latin America to explore these questions. Chapter 6 focuses on inequalities in urban settings with a focus on transnational data and also the ways in which local governance issues, some involving the law, can contribute to these inequalities.

Issues of governance are taken up more directly in Part IV. Chapter 7 considers experiments in the new environmental governance and how able environmental law is to contribute to adaptive governance. Chapter 8 turns to what some commentators have hailed as a new governance structure, namely insurance, and it discusses how the tensions around science and law impact on insurance contracts. Chapters 9 and 10 consider different aspects of risk, resilience and environmental law in China. Chapter 9 discusses government strategies to enhance resilience through wider governance tools such as information disclosure and public participation. Chapter 10 offers a different perspective on these issues, arguing that environmental risks are inextricably linked to political risks as environmental risks pose a significant political threat to the authorities. It discusses how government suspicion of beyond the state actors may be an obstacle to efforts of greater inclusion of the public in environmental regulation.

In Part V, Chapter 11 pulls together what we have learned from the collection. It draws out the main theoretical and analytical themes identified in the volume and discusses what we can learn and take away from the collection. It considers which themes demand greater examination and which help us to expand our theoretical understanding of risk resilience and inequality as it relates to environmental regulation. The chapter also reflects on what we can say about more pragmatic policy concerns on the basis of these chapters, in particular the experiments discussed in different chapters and their applicability to different social and economic contexts of environmental regulation.