PART I

Legal, scientific and policy aspects

1

Introduction

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1.01 Climate change presents to society as a whole a wide range of threats, and a narrower range of opportunities, on the political, economic and social level. It also poses questions and challenges for the law. These legal questions and challenges are relevant not just to lawyers; the law affects all members of society to a greater or lesser extent, whether as policymakers, businesspeople, campaigners of all hues or individual citizens. All of these actors are subject to a complex and much disputed matrix of rights and obligations: legal rights and obligations, political and moral rights and obligations, owed by and to individuals, corporations and States, and, in some cases, to future generations. The law is a tool; it may variously be a sword, a shield and the rock on which societies are built.

1.02 Climate change itself is multifaceted in many respects; it raises physical, scientific, economic, social, political and cultural issues along with legal ones. The web connecting the various causes and effects of climate change is complex. Possible legal solutions to climate change problems are likewise complex and difficult to classify. They encompass a wide range of international and national law. The law exists to serve society, and has accordingly evolved to meet the changing needs and challenges of society. With climate change, this evolution involves – and will, we believe, increasingly involve – both the application of existing legal concepts, including some ancient doctrines generally seen as dormant if not extinct, to new factual issues, and the development of new legal concepts.

1.03 The attempts to address climate change through international regulation are well known and ongoing. As frustration mounts in

some quarters at the perceived inadequacy or speed of this process and as the likelihood of significant climate change impacts grows, focus turns increasingly to what might be termed 'liability' for climate change. By 'liability' we mean the concept that the law may provide redress or remedy to those who are or may be adversely affected by climate change, and control (or provide compensation for) the behaviour of those public or private actors who may be directly or indirectly responsible for it.

1.04 There is no clear line between the law of 'regulation' and that of 'liability'; the two are inexorably intertwined. This book however focuses on climate change 'liability'. It is a comparative study, giving an overview of what the law is and what direction it might take in eighteen countries. We have tried to select a representative sample of countries. In some, the applicable law is less developed and less the subject of current debate; in others actions for various kinds of climate change liability have already been brought. Both categories of countries are of interest for the purposes of this volume, as their examples illustrate the potential for and barriers to liability for climate change.

1.05 The aim of this book is to provide a readable work relevant to a range of different people all over the world. In casting the net wide, we cannot make all of the book essential reading for everyone. The opening sections outline at a high-level of generality some of the problems and actual or possible legal solutions to climate change. The national chapters discuss these in more detail. The book is aimed at lawyers, both practising and academic, but also at policymakers, educators, campaigners on all sides of the climate change debate, companies, business people, NGOs and civil society at large. The focus of several of the chapters is on the developing world, where many of the effects of climate change may be most keenly felt, and where some of the most creative legal solutions to climate change problems have emerged.

1.06 We are not looking to replicate the various works on national climate change law and liability. Rather, we hope that the comparative outlook of this volume will enable a migration and cross-fertilisation of ideas across national and regional boundaries. We have tried to bring together concepts of 'liability' arising in very different contexts. These contexts include the liability of

national and local governments in relation to what they do (or do not do) about climate change, the liability of private individuals or corporations for the effects of climate change, as well as human rights law, competition regimes and some 'soft law'.

1.07 We want to emphasise that, while international law is part of the background against which climate change liability law develops, the focus of this volume is firmly on national law. We address public international law only to the extent that it impacts on relevant national law. Similarly, while our authors often draw on general environmental or liability law to tease out options for climate change liability, this book is not a textbook on environmental law as such. Whilst the chapter on the European Union gives an overview of the overall EU climate policy and describes the relevant Directives, their transposition into national law and application by the relevant national courts is discussed in the chapters on individual EU Member States.

1.08 A much debated issue is whether direct liability will be imposed on those 'responsible' for climate change to pay compensation to those who suffer its consequences. The definitive answer to this question may not appear for years or decades. If it is in the affirmative, it will have immense consequences. But it is important to bear in mind that, in the meantime, climate change liability is daily being established in less glamorous and less globally significant ways, especially in an administrative law context. The daily grind of climate change liability, in a local administrative law context or as a factor in a simple negligence claim, deserves as much attention as direct liability claims.

1.09 The debate about climate change itself remains as vigorous as ever. The overwhelming scientific consensus is that it is occurring, that it is potentially very damaging, and that its cause is largely anthropocentric in nature. But how acute will climate change be? How quickly will it occur? What will be its effect? It is obvious that the legal response to climate change will depend in very large measure on the answers to these questions, which science may enable us to predict and history will ultimately judge.

1.10 This book assumes that the IPCC's current (2007) report is well-founded. We do not consider that this background assumption renders the book irrelevant to 'climate sceptics' – those who doubt

that the climate is changing, or that climate change is caused by human activity or presents a significant problem. Regardless of one's belief in or doubts about climate change, this book shows that liability arising related to climate change is developing apace and, in some jurisdictions, on a large scale. As Chapter 20 (on the USA) illustrates, the substantial recent increase in litigation about climate change has occurred not despite but because of the highly polarised opinions on the issue. Climate change liability affects everyone, from those who suffer loss and damage that is directly related to climate change, to taxpayers, voters of all political persuasions and corporations.

1.11 It may appear paradoxical for an Editor to hope that a work to which so many have contributed so much will never be put to practical use. Still, we want to be clear that our purpose in this book is not to advocate for climate litigation. Indeed, we share the widespread belief that an international regime that involves all States and that provides for the action that science tells us is needed to avert dangerous climate change, would be the preferred approach. In the event that such a regime is agreed within the next year or so, the role of litigation lawyers will be minimal, with actions being limited to disputes over interpretation, enforcement and breach. A number of climate change court claims to date have been met with the defence that the claims are either non-justiciable, as being concerned with issues exclusively in the political arena, or are preempted by existing regulations. Such defences would increase in strength in the event of comprehensive agreement which was capable of achieving the objectives of the UNFCCC.

1.12 Such an outcome appears unlikely at present. As is well known, the current international regime reflects what is politically possible and not what is considered scientifically essential or even desirable. The gap between these different indicia is immense, and it is not clear even whether it is currently closing or opening wider (but see Chapter 4 for a discussion of the policy contexts). The world is faced with a number of other possibilities including an international agreement, but one reached only after many years and/or of relatively weak content, or the degeneration of the international regime into a series of initiatives confined to specific topics or specific States or regions. Just as the last few decades

have seen a widening, in many respects, of economic inequalities both as between developing and industrialised countries and within many countries even in the industrialised world,[1] so there is a real danger of a widening of climate change inequalities – in vernacular terms between the 'victims' and those who are 'sitting pretty' because they are unaffected by, or even benefiting from, climate change. If the central premise is accepted that the purposes of the law include serving society, reflecting its attitudes and providing redress for injustices, the prospect of a marked increase in climate change liability is a very real one. Furthermore, the class of 'victims' extends well beyond residents of Alaskan villages, Pacific Islands, and the Bangladeshi coastline (to name but a few obvious ones). The economic, social and cultural consequences of climate change are very wide-ranging.

1.13 The key commitments of this book are to be objective, balanced and rigorous in analysis. In short, it is intended as nothing more than a modest addition to the store of knowledge, with the hope that it is accessible and of interest to a wider audience than those whose bookshelves are already full of legal textbooks.

1.14 The nature and extent of the 'liability' under discussion is addressed in Chapter 3. It is sufficiently broad that knowledge of it will be a tool for many, but a different tool in different hands. We hope that campaigners on climate change, from whatever standpoint, will find it informative and of practical use. We hope that lawyers will find inspiration from the ideas and concepts developed in other States and systems of law different from their own. We hope that policymakers, and industrialists and their insurers and shareholders, will be guided by insight into the actual and potential consequences of their decisions.

[1] See, for instance, Giovanni Arrighi, Beverly J. Silver and Benjamin D. Brewer, 'Industrial Convergence, Globalization, and the Persistence of the North-South Divide', *Studies in Comparative International Development*, 38(1) (2003), 3–31 for a discussion on the continuing North-South divide.

2

The scientific basis for climate change liability

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2.01 The aim of this chapter is to provide an overview of the science of 'detection and attribution' as applied to the global climate system and explain how it relates to events that actually cause harm, such as instances of extreme weather.[1] Detection and attribution are scientific terms for tools for the lawyer's task of showing the existence, causes and effects of climate change. Lawyers do not always mean the same things as scientists do when using words such as 'evidence', 'proof' and 'cause'. Climate change lawyers need not be scientists, but they need to understand the application of science, in terms of its uses and limits. This is likely to be crucial in considerations of liability for climate change, which often entails enquiry into two closely related matters: first, 'proof' of causes of climate change itself, in terms of large-scale temperature rise; and second, 'proof' of its effects in terms of specific weather events (storms, floods, heatwaves) or localised climate changes (temperature change, precipitation, wind and so on).

2.02 The chapter discusses: the relationship between weather and climate; the nature of the evidence for external influence, both natural and anthropogenic, on large-scale average temperatures; the implications of these changes for local extreme weather events; and the kind of evidence that might potentially be available to a court should the issue of causation arise. To avoid the discussion becoming too abstract, I will use as an example a recent study[2] quantifying the role played by increased greenhouse

[1] A more detailed study, by the author and others, of the science of detection and attribution as relevant to issues of liability and the lawyers' approach to causation is 'Scientific Challenges in the Attribution of Harm to Human Influence on Climate', *University of Pennsylvania Law Review*, 155 (2007), 1353.

[2] P. Pall *et al.*, 'Anthropogenic Greenhouse Gas Contribution to Flood Risk in England and Wales in Autumn 2000', *Nature*, 470 (2011), 382–5.

gases ('GHG') in the floods that occurred in England and Wales in autumn 2000, but the emphasis is on the basic principles rather than the details of that particular study.

2.03 The relationship between weather and climate is central to the issue of liability, so it helps to begin by clarifying what they are: climate has traditionally been defined by the World Meteorological Organisation (WMO) as the average weather and the statistics of its variability over a period of thirty years.[3] This definition is clearly problematic when considering the impact of an external driver of climate (in lay terms a cause of change or potential cause of change) like rising GHGs, which current evidence suggests are causing significant changes in climate on timescales shorter than thirty years. It is even less relevant if we consider the impact of other climate drivers like anthropogenic aerosols, which could in principle cause changes on even shorter timescales, particularly if artificial aerosol injection were to be contemplated as part of a programme of deliberate geo-engineering.

2.04 In any discussion of timescales, it is worth noting that the climate responds to the levels of GHGs present in the atmosphere relative to pre-industrial levels, not to rates of change in these levels, which complicates the link between emissions and impact for the most important GHG (in terms of current and projected impact), carbon dioxide. Carbon dioxide has a very long effective atmospheric lifetime, such that emissions today will continue to affect the climate for many centuries[4] unless active measures are taken in the future to remove them.[5] Hence any reasonably foreseeable change in carbon dioxide emissions will take some decades to have any discernible effect on climate, and carbon dioxide emitted a hundred years ago is continuing to affect the climate

[3] World Meteorological Organization, *Calculation of Monthly and Annual 30-Year Standard Normals*, WCDP-No. 10, WMO-TD/No. 341 (1989); *The Role of Climatological Normals in a Changing Climate*, WCDMP-No. 61, WMO-TD/No. 1377 (2007) (Geneva: World Meteorological Organization).

[4] S. Solomon *et al*., 'Irreversible Climate Change due to Carbon Dioxide Emissions', *Proceedings of the National Academy of Sciences of the United States of America*, 106(6) (2009), 1704–9; DOI:10.1073/pnas.0812721106 (2009).

[5] Although possible in principle, active carbon dioxide removal is currently considered prohibitively expensive even if it could be done on a sufficient scale to have a global impact: see J. Shepherd *et al*., *Geoengineering the Climate: Science, Governance and Uncertainty* (London: Royal Society, 2009) (http://royalsociety.org/Geoengineering-the-climate/).

today. A second popular misconception is that, because roughly half current carbon dioxide emissions are taken up by the oceans and land biosphere, if global emissions were reduced by a factor of two or more, atmospheric concentrations would stop rising or begin to fall. This is incorrect: our current understanding of the carbon cycle is that even a very substantial reduction in emissions would simply cause atmospheric concentrations to rise more slowly.[6] Concentrations are only projected to fall after carbon dioxide emissions are reduced close to zero, and even then, it would be centuries to millennia before the climate would return to anything close to its pre-industrial state. This clearly impacts on what constitutes 'relief' of climate change: reducing emissions alleviates the rate at which the problem worsens, but does not 'solve' it in the conventional sense.

2.05 A more precise definition of climate than the traditional WMO definition is the 'expected' weather, and its variability, given the boundary conditions (in lay terms the parameters governing the climate system, including atmospheric composition, levels of solar and volcanic activity and so on) that apply to the atmosphere-ocean system at any given time. This means the statistics of weather compiled not over a long period of time but by a large number of hypothetical realisations of the atmosphere-ocean system ('possible worlds', in lay terms) with identical boundary conditions. An immediate implication of this is that climate, precisely defined, cannot be directly observed. Only in a closed stationary system, in which the boundary conditions do not change over a long period of time, would it be possible to 'observe' climate directly. In the real climate, boundary conditions change all the time, so the idea of 'pure' observations of climate or climate change is impossible in principle: its properties can only be inferred through a combination of observations, theory and computer simulation models.

2.06 This point is important, since the use of computer simulation models in climate research is controversial, given the acknowledged flaws in all currently available climate models. We will see the critical role played by simulation when we come to consider

[6] M. R. Allen *et al.*, 'Warming Caused by Cumulative Emissions of Carbon Dioxide Towards the Trillionth Tonne', *Nature*, 458 (2009), 1163–6.

the link between climate and weather. Critics of mainstream climate science often argue that model-based results are intrinsically inferior to 'direct observations', so it is important to understand that there is no such thing as a model-free observation of climate. What we observe is the weather, which is only one realisation of the many possible weathers that make up the distribution we call the climate. Conversely, since it is impossible to simulate climate directly purely on the basis of fundamental physical principles, there is also no such thing as an observation-free climate model. All scientific inferences about climate involve a combination of models and observations.[7]

2.07 A more subtle implication of this point is that external drivers of climate can only manifest themselves through changing probabilities.[8] When the concept of probabilistic event attribution was first proposed,[9] quantifying the contribution of human influence to the probability of an event occurring was seen as something of a novelty, whereas it should in fact be seen as a simple extension of other attribution questions, such as quantifying the impact of GHGs on the warming (or, more precisely, the increase in expected global mean temperature) observed over the past fifty years. The expected global mean temperature in a given year is one property of the so-called 'climate attractor'; the probability of a flood occurring in Oxfordshire in that year is another. The second may be harder to estimate, but there is no difference between them in principle.

2.08 It is often said that it is impossible to attribute a single weather event to human influence on climate, since all of the weather events we currently observe could have occurred at some level of probability in a pristine climate unaffected by human influence. This fact is important for the issue of liability, since actual harm is often associated with localised extreme weather events. If the only quantities for which causal attribution statements could be

[7] For an excellent deeper discussion, see P. Edwards, *A Vast Machine: Computer Models, Climate Data and the Politics of Global Warming* (Cambridge, MA: MIT Press, 2010).

[8] The law has been much troubled by causation in disease cases where the precise cause of the disease cannot be proved by science. Because of the chaotic nature of weather, it is not possible to reconstruct an exact model of past events nor to predict with precision what will happen in the future.

[9] M. R. Allen, 'Liability for climate change', *Nature*, 421 (2003), 891–2.

made were very large-scale, low-frequency variations like the trend in global mean temperature, then attribution of harm to human influence on climate would be impossible in principle, since these large-scale changes do not, in themselves, necessarily cause harm.[10]

2.09 In fact, there is no difference in principle between attributing causes for a single weather event and attributing causes for the observed trend in global mean temperature. In both cases, an event is observed (the 'event', in the latter case, being the increase in recorded temperatures over the past fifty years) that could have occurred, at some level of probability, in a pristine climate. What causal attribution means, in both cases, is that human influence on climate substantially increased the probability of occurrence of the event in question.

2.10 When assessments like that of the Intergovernmental Panel on Climate Change report,[11] for example, that it is 'very unlikely' that the global patterns of warming during the past half-century are due to known natural causes, they mean specifically that the 'null-hypothesis' that the warming is natural can be rejected at or below the 10 per cent level. This statement accounts for a range of sources of uncertainty, including in the size of the warming itself due to uncertainties in observations. A substantial contributor to the uncertainty (the fact that the null-hypothesis of no human influence cannot be ruled out entirely) is internal climate variability: the chaotic fluctuations that occur naturally in the atmosphere-ocean system. One implication of the IPCC statement, therefore, is that there is a less than 10 per cent chance of a global pattern of warming of the magnitude observed over the past few decades occurring in the absence of human influence on climate. In fact, most of the studies on which the IPCC statement was based assign a substantially lower probability to this eventuality.[12]

[10] No attempt is made here to address legal definitions of 'harm' or 'damage' in contrast to simple 'change', nor to consider as such the important issues of long-term 'damage' such as increased disease, precipitation pattern shift, desertification/salination or inundation of islands or coastal zones.

[11] S. Solomon *et al.*, *Climate Change 2007: The Physical Science Basis* (Cambridge University Press, 2007).

[12] See references in Hegerl *et al.*, Chapter 9 of Solomon *et al.*, *ibid*.

2.11 Given that the actual observed warming is very similar in magnitude to the warming expected if human influence is taken into account, it could be said (although the IPCC does not put it this way) that with human influence included there is a roughly 50 per cent chance of a warming as large or larger than that which has been observed. Hence, on this interpretation, the IPCC statement implies that human influence on climate has increased the probability of occurrence of a warming trend as large as that observed over the past fifty years by at least a factor of five (from <10 per cent to around 50 per cent). Individual studies suggest a much higher increase. This is not the standard interpretation of the IPCC statement, but it serves to illustrate how even conventional attribution statements about large-scale climate changes can be couched in probabilistic terms. Hence there is no difference in principle between the challenge of attributing causes for a flood in Oxfordshire to attributing causes for the observed trend in global mean temperature. Both represent weather events that may have been made more likely by anthropogenic changes in the underlying climate attractor, and the scientific challenge is to establish how much their probability of occurrence has changed as a result of human influence.

2.12 In discussing global temperature trends, the IPCC goes further, addressing the question of 'how much' of the warming is 'due' to human influence. It is meaningful, in the context of global temperature changes, to say that x per cent may be due to carbon dioxide, y per cent to solar variability and so on, because the impacts of these different factors add up. To a very good approximation, if a climate model is run with changing carbon dioxide alone, and subsequently run with changing solar activity alone, the sum of the impact of these two changes, imposed individually, is equal to their impact when imposed together. The concept of 'contributions from different factors' is much more problematic when we are considering a single extreme weather event. Since a weather event must be considered as a single, self-reinforcing and indivisible whole, it makes no more sense to ask 'how much of this flood was due to human influence?' than to ask, when a loaded die is thrown and lands as a six, how many of the dots were due to the loading. What can be done is to ask how different factors may have contributed to the probability of an event occurring, a point we return to below.

2.13 The evidence for human influence on global temperatures over the past fifty years provides an illustration of how all causal attribution statements rely on a combination of observations and modelling. To illustrate this point, I will present a simple analysis following Lockwood (2008) quantifying the role of natural and anthropogenic drivers in recent global temperature changes.[13] This example will also allow me to explain, incidentally, how the fact that 1998 remains the warmest year on record over a decade on does not provide any concrete evidence for a deceleration in anthropogenic warming.

2.14 The black line in the top panel of Figure 2.1 shows observed global temperatures since the 1950s (systematic monitoring only began with the 1957–58 International Geophysical Year for many regions of the globe). The grey line shows modelled temperatures assuming a very simple, but still physically coherent, empirical model in which global temperatures are assumed to be the sum of responses to individual forcing factors, with the response to each forcing represented by a simple equation representing the fact that temperatures do not respond instantly to external forcing, through the heat capacity of that atmosphere-ocean system.[14] Hence the cooling effect of a volcanic eruption may persist for several years after the volcanic ash has dissipated. Comparing temperatures directly with these potential external climate drivers would therefore be misleading. Even the simplest analysis of global mean temperatures requires some form of climate model: there is no such thing as a model-free analysis, just as there is no such thing as an observation-free model.

2.15 The contributions from the three main natural drivers of global temperature changes are shown in the next three panels: the El Niño/Southern Oscillation (ENSO) phenomenon (represented by sea-surface temperature fluctuations in the Equatorial Pacific);

[13] M. Lockwood, 'Recent Changes in Solar Outputs and the Global Mean Surface Temperature. III. Analysis of Contributions to Global Mean Air Surface Temperature Rise', *Proceedings of the Royal Society A*, 464 (2094) (2008), 1387–1404; doi:10.1098/rspa.2007.0348.

[14] The 'model' in question is given by $\tau dT/dt + T = \alpha F$ where T is the temperature departure from its long-term equilibrium value, t is the time, τ is a time-constant representing the 'sluggishness' of the response and α is a constant of proportionality, both estimated from data.

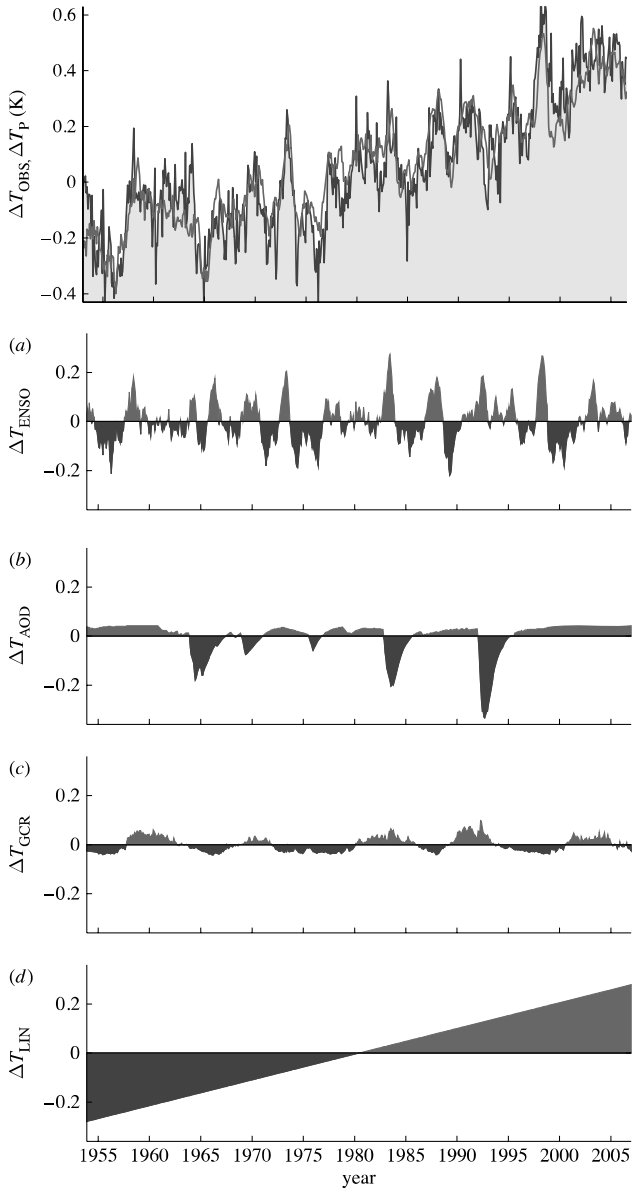

Figure 2.1: Top panel: observed global temperature changes from 1953 to 2008 (black line) and empirical reconstruction based on the sum of contributions shown in lower panels (grey line). Lower panels: estimated contributions from (a) ENSO, (b) volcanic eruptions, (c) solar variability and (d) the warming trend. Reproduced from Lockwood (2008); see source (bibliographical information at note 13) for further details.

explosive volcanic eruption (represented by stratospheric aerosol load); and solar variability (represented by fluctuations in galactic cosmic ray flux). The final panel shows the estimated trend, for which there is no explanation other than the combined effect of rising anthropogenic GHGs and sulphate aerosols. The temperature changes in the bottom four panels, when added together, give the grey line in the top panel.

2.16 This figure serves to illustrate two important points: first, these three natural factors and an anthropogenic trend of approximately 0.1°C per decade on average are sufficient to account for observed global temperature changes over the past half-century: there is no evidence for a substantial residual contribution from other modes of decadal variability such as the Pacific Decadal Oscillation. Since the timescales associated with ENSO and volcanic eruptions are relatively short, and the contribution from solar variability is relatively small, this suggests the overall picture of a sustained background anthropogenic warming trend with superimposed sub-decadal variability is likely to continue.

2.17 This brings us to the second point: a number of papers have speculated recently whether the lack of a warming trend over the decade 2000–2009 might indicate that more than previously thought of the warming prior to 2000 was due to some natural multi-decadal variation which has now reversed.[15] The figure indicates that there is no need to invoke such a process to explain the temperature changes since the exceptionally warm ENSO year of 1998: what we are seeing can be explained as the combined effect of ENSO and solar variability acting to mask the background anthropogenic trend within this decade. While it remains a hypothetical possibility that natural variability might halt or reverse the anthropogenic trend over the coming decade, we should recognise that this remains hypothetical: there is no clear evidence to suggest it will happen. On the basis of the evidence available today, average temperatures in the 2010s are likely to be warmer than the 2000s, just as the 2000s were warmer than the 1990s, the 1990s warmer than the

[15] See, for example, T. DelSole *et al.*, 'A Significant Contribution of Unforced Multidecadal Variability in the Recent Acceleration of Global Warming', *J. Climate*, 24 (2011), 909–26.

1980s, and the 1980s warmer than the 1970s. Although we will continue to see interannual temperature fluctuations within a decade, the warming trend from decade to decade is proceeding very much as expected based on predictions made back in the 1990s.[16]

2.18 So what are the implications of this warming trend? A gradual increase in global mean temperatures of 0.1–0.2°C per decade is barely perceptible. Some impacts of this warming, such as the sea level rise caused by thermal expansion of the oceans, take the form of a gradual and predictable trend. In many locations, however, the global average rise of 15–20 cm over the twentieth century is masked by local variations in relative sea level, many of which might be caused by factors such as the draining of aquifers causing land subsidence as much as by global sea level rise. In any case, instances of actual harm in coastal regions due to flooding or saline contamination of ground water are typically associated with storm surge events during which local relative sea levels might vary by metres rather than centimetres. Hence quantifying harm due to human influence on climate is primarily a matter of understanding its impact on extreme weather. This presents particular challenges for both the science of climate change and the communication of results to policymakers and the public and has so far been attempted for a relatively small number of specific events, including the UK floods of autumn 2000,[17] the European summer heatwave of 2003[18] and the Russian heatwave of 2010.[19]

2.19 Many of the most extreme and damaging weather events occur because a self-reinforcing process amplifies an initial weather anomaly. This has two important implications. First, predicting the statistics of such extreme weather events by extrapolating the statistics of less extreme events requires caution, since the governing physical processes may change in these most extreme

[16] M. R. Allen *et al*., 'Quantifying the Uncertainty in Forecasts of Anthropogenic Climate Change', *Nature*, 407 (2000), 617–20.

[17] Pall *et al*., *ibid*.

[18] P. A. Stott *et al*., 'Human Contribution to the European Heatwave of 2003', *Nature*, 432 (2004), 610–14.

[19] R. Dole *et al*., 'Was there a Basis for Anticipating the 2010 Russian Heatwave?', *Geophysical Research Letters*, 38 (2011), L06702.

cases. Second, it will often be impossible in principle to say how much human or any other external influence on climate contributed to the magnitude of a particular event, in the sense of trying to quantify how much smaller the event would have been in the absence of human influence. Instead, it is necessary to consider the event as a single, self-reinforcing whole, and ask how external drivers contributed to the probability of that event occurring.[20] No regional weather event has yet been reported that was only made possible by human influence on climate, in the sense that there was only a negligible chance of it occurring in the absence of human influence.[21]

2.20 Quantifying the absolute probability of an event occurring in a hypothetical world without human influence on climate is necessarily very uncertain: hence studies have tended to focus on quantifying relative probabilities, or specifically the Fraction Attributable Risk (FAR), defined as the FAR = 1 – P0/P1, where P0 is the probability of an event occurring in the absence of human influence on climate, and P1 is the corresponding probability in a world in which human influence is included. The ratio between P0 and P1 is generally better known than either of these quantities individually.

2.21 Much of the informal discussion of the role of human influence in specific extreme weather events focuses on the question of whether an event may have a precedent in the early instrumental or paleo-climate record before a substantial human influence on climate occurred. Under this probabilistic approach to event attribution, it is clear that this discussion is beside the point: if an

[20] D. A. Stone and M. R. Allen, 'The End-to-End Attribution Problem: From Emissions to Impacts', *Climatic Change*, 71(3) (2005), 303–18; and D. A. Stone *et al.*, 'The Detection and Attribution of Human Influence on Climate', *Annual Reviews of Resources and the Environment*, 341 (2009), 16–40.

[21] C. Schär *et al.* (2004) assigned an extremely long return-time to the temperatures observed in summer 2003 under pre-industrial conditions (that is they estimated that it would happen only once in a very long period). Fischer *et al.* (2008) show how, in a regional climate modelling study, warm temperatures in central Europe in the summer of 2003 were amplified by dry soil-moisture conditions. In a normal European summer, rising temperatures increase the evaporation of soil moisture, which absorbs energy, providing a negative feedback. In 2003, the soil became so dry this process was suppressed along with the usual vertical mixing by clouds, allowing surface temperatures to rise rapidly. This is an example of a self-reinforcing event for which estimated return-times based on the distribution of normal summer temperatures are irrelevant.

event occurred in a pre-industrial climate, we can conclude that human influence was not necessary for that event to occur (so P0 is non-zero, and FAR is not unity), but human influence may still have increased the probability of that event occurring (P1 greater than P0, so FAR greater than zero).

2.22 For events that occur relatively frequently, or events for which statistics can be aggregated over a large number of independent locations, it may be possible to identify trends in occurrence-frequency that are attributable to human influence on climate through a single-step procedure, comparing observed and modelled changes in occurrence-frequency.[22]

2.23 For events with return-times of the same order as the timescale over which the signal[23] of human influence is emerging (thirty to fifty years, meaning cases in which P0 and P1 are of the order of a few per cent or less in any given year), such single-step attribution is impossible in principle: it is impossible to observe a change in return-time taking place over a timescale that is comparable to the return-time itself. For these events, attribution is necessarily a multi-step procedure. Either a trend in occurrence-frequency of more frequent events may be attributed to human influence and a statistical extrapolation model then used to assess the implications for the extreme event in question; or an attributable trend is identified in some other variable entirely, such as surface temperature, and a physically based weather model is used to assess the implications. Neither approach is free of assumptions: no weather model is perfect, but statistical extrapolation may also be misleading for reasons given above.

2.24 Pall *et al.* (2011) provide a demonstration of multi-step attribution using a physically based model, applied to the floods that occurred in the UK in the autumn of 2000. The immediate cause of these floods was exceptional precipitation, this being the wettest autumn to have occurred in England and Wales since records began. To assess the contribution of the anthropogenic increase in GHGs

[22] This is the approach taken, for example, in S. K. Min *et al.*, 'Human Contribution to More-Intense Precipitation Extremes', *Nature*, 470 (2011), 378–81.

[23] 'Signal' and 'noise' are used to denote the 'noise' in terms of background non-human factors influencing climate and the ability to detect over a specific period the 'signal' of a specific factor such as human activity.

to the risk of these floods, the period April 2000 to March 2001 was simulated several thousand times using a seasonal-forecast-resolution atmospheric model with realistic atmospheric composition, sea-surface temperature and sea-ice boundary conditions imposed. This ensemble was then repeated with both composition and surface temperatures modified to simulate conditions that would have occurred had there been no anthropogenic increase in GHGs since 1900. The change in surface temperatures was estimated using a conventional detection and attribution analysis using response-patterns predicted by four different coupled models, allowing for uncertainty in response amplitude. Simulated daily precipitation from these two ensembles was fed into an empirical rainfall-runoff model and severe daily England and Wales runoff used as a proxy for flood risk.

2.25 Results are shown in Figure 2.2, which shows the distribution of simulated runoff events in the realistic autumn 2000 ensemble in dark grey, and in the range of possible 'climates that might have been' in various shades of lighter grey. Including the influence of anthropogenic greenhouse warming increases flood risk at the relevant threshold by around a factor of two in the majority of cases, but with a broad range of uncertainty: in 10 per cent of cases the increase in risk is less than 20 per cent. This is significant in the context of legal doctrines, discussed elsewhere in this book, to the effect that in appropriate cases if factor X more than doubles the risk of event Y occurring, it may be said that Y has been proved to be 'caused' by X.

2.26 Pall *et al.*'s conclusions pertained to the particular flood diagnostic they considered. Kay *et al.* (2011),[24] analysing the same ensembles but using a more sophisticated hydrological model with explicit representation of individual catchments, found that GHG increase has more likely than not increased flood risk in the October to December period, with best-estimate increases also around a factor of two for the risk of peak daily runoff exceeding the relevant threshold. The increased noise resulting from smaller catchments and the impact of re-evaporation of rainfall, however, increased uncertainty to the extent that the null-hypothesis of no

[24] A. Kay *et al.* (2011), 'Attribution of Autumn/Winter 2000 flood risk in England to anthropogenic climate change: a catchment-based study', *J. Hydrology*, 406 (2011), 97–112.

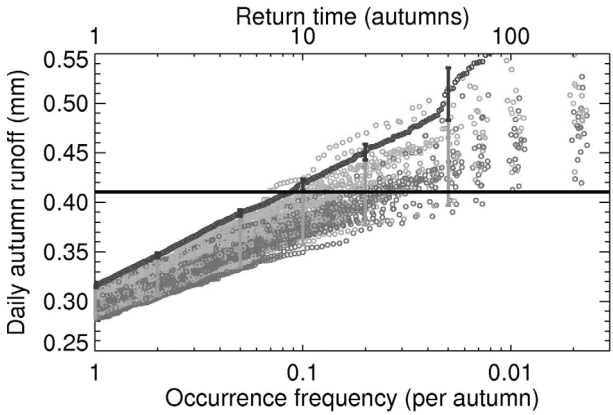

Figure 2.2: Return times for precipitation-induced floods aggregated over England and Wales for conditions corresponding to October to December 2000 with boundary conditions as observed (dark grey) and under a range of simulations of the conditions that would have obtained in the absence of anthropogenic greenhouse warming over the twentieth century (lighter shades) – different shades correspond to different climate models used to define the greenhouse signal, black horizontal line to the threshold exceeded in autumn 2000. Reproduced from Pall *et al.* (2011); see source (bibliographical information at note 2 above) for further details.

attributable increase in risk could no longer be rejected at the 10 per cent level for any individual catchment.

2.27 More significantly, Kay *et al.* also showed that the change in flood risk over the entire October to March period was substantially lower, due to a reduction in the risk of snow-melt-induced flooding in spring, such as occurred in 1947, compensating for the increased risk of precipitation-induced flooding in autumn. This illustrates an important general point: even if a particular flood event may have been made more likely by human influence on climate, there is no certainty that all kinds of flood events have been made more likely.

2.28 With the science of event attribution still confined to isolated case studies, no systematic survey exists of the impact of human influence on the risk of damaging weather events across the world. Many, perhaps the majority, of observed extreme weather events currently remain in the category of the 2010 Russian heat-wave: not made substantially more nor less likely by human

influence on climate.[25] Rising GHGs are likely to have contributed substantially to an increased risk of some events, such as precipitation-induced flooding in autumn 2000 in the UK, while others, such as snow-melt-induced spring UK floods, may have been made less likely.

2.29 In our 2007 article (see note 1 above) we concluded by asking a number of questions of lawyers. As these questions remain relevant in facilitating the meaningful interaction of lawyers and scientists on these issues, I repeat some of them here, in summary form. First, what is the 'natural' climate against which the actual climate should be compared: the climate of 200 years ago, or the climate that would have obtained today in the absence of human influence? Second, in evaluating actual and potential harm and what constitutes 'relief' of climate change, are we primarily interested in impacts over the next quarter-century or so, or longer timescales? Third, if one accepts that 'proof' of causation is likely to be in terms of probability and risk, is the Fractional Attribution of Risk model discussed above the most useful approach for the lawyers and courts who are charged with questions of liability for climate change? The answer to these questions and others discussed above will be vital in addressing 'liability' in various different forms, whether this is in terms of alleged 'responsibility' of one State or group of corporations for damage caused by climate change, the scientific justification for regulatory action (or inaction) when challenged in the courts, or otherwise.

[25] R. Dole *et al.*, *ibid*.

3

Overview of legal issues relevant to climate change

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(A) Introduction

What is 'climate change liability'?

3.01 By its nature, climate change gives rise to myriad potential forms of liability. It is global in geographic terms. Arguments rage about its extent, causes and effects. It potentially affects nearly everyone, and may do so for tens or hundreds of years. It requires addressing at State, regional and individual levels. All feasible responses are complex and costly. It is hard to conceive of a more effective recipe for spawning liabilities of all kinds.

3.02 What do we mean in this book, by 'climate change liability'? The concept of legal liability is well understood. Liability is not usually an absolute, intransitive concept. Liability is usually 'to' or 'in respect of' another person, so whenever a liability is under discussion one must also consider the corresponding rights. In this book, in one sense we focus on 'liability' as something narrower than any obligation arising as a matter of law or legal principle. This book is not about liability arising under treaties or public international law, neither is it concerned with contractual obligations, such as those that might arise under emissions trading schemes or clean development mechanism projects under the Kyoto Protocol. We do however use 'liability' in a broader sense than litigation, and also consider 'liability' which may fall short of enforceable legal liability. It includes liability to do something or refrain from doing it, as well as liability for compensation. We have sought to focus on liabilities arising from or directly related to climate change and its effects, and not from all activities which may themselves have

an impact on, or be impacted by, climate change. This is not a book on environmental law more generally.

Who will use the law?

3.03 Those most obviously interested in questions of climate change liability are those who may be under such a liability, or those who assert corresponding rights as a result of being adversely affected by climate change. But an increasingly important category of liability is that said to arise as a result of responses to climate change. The regulatory responses to climate change, whether international, regional, national or local, are often controversial and costly. As discussed in Chapter 20 (on the USA), it is not only environmentalists and civil society who bring claims relating to climate change. Increasingly, industry is challenging attempts to regulate climate change. For example, the US Environmental Protection Agency (EPA), mandated by the seminal *Massachusetts* v. *EPA* Supreme Court decision to regulate greenhouse gas (GHG) emissions under the US Clean Air Act,[1] now faces numerous legal challenges to its attempts to do so. Furthermore, it is artificial to classify people into those for and against responses to climate change or into industry or environmental lobbies. Projects intended to combat climate change, such as dams constructed or Reducing Emissions from Deforestation or Degradation (REDD) measures, may be highly controversial in terms of effect on the local environment or indigenous peoples.

3.04 The likely effects of climate change are summarised in the IPCC Fourth Assessment Report (FAR).[2] The physical effects are those on people, property and ecosystems, as a result of global mean increase in temperature, and associated effects in terms of regional climate variation. These include change in weather events within the climate such as changing patterns of precipitation, changes in frequency of extreme weather events (temperature, wind, precipitation) and sea level rise. Some physical effects are obvious, such as inundation of coastal areas, or subsidence of buildings constructed on previously frozen ground. Others are less so, such as

[1] See Chapter 20 (on the USA), para. 20.23.

[2] *IPCC Fourth Assessment Report: Climate Change 2007*, available at: www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml.

floods caused by the collapse of dams which have been weakened by subsidence caused by drought. Personal 'injury' may involve increased exposure to disease. In short an almost limitless set of permutations of causal chains can be envisaged.

3.05 These physical phenomena have economic effects, not only on those physically affected, but more widely, extending to those whose livelihoods and financial wellbeing depend on those who are directly affected. It is the type of loss and not its amount, which is likely to be relevant to liability, but it is notable that on any mainstream view the figures are very large. Whilst methodology and quantification are controversial, the Stern Review considers costs of 5, 10 or even 20 per cent of GDP[3] and an August 2009 report by the IIED and the Grantham Institute[4] suggested that the 2007 FCCC estimates of adaptation costs of $40–170 billion per annum were significant underestimates.[5] Even if only a fraction of these sums are the subject of disputes over liability, the stakes are high.[6]

3.06 Even where there is no physical damage or direct economic loss, adverse effects may be suffered in terms of loss of security, enjoyment amenity or national identity, and one of the ongoing legal debates is the extent to which climate change engages human rights, whether economic, social or cultural as enshrined in various laws, declarations, charters and constitutions.

3.07 As also indicated in the FAR, the effects are not uniform. Some States or regions will at least in direct terms benefit from climate change. Instances of adverse impacts are summarised in the national chapters of this book, but by way of examples only, from different parts of the world:

(1) The allegations in the celebrated and ongoing US case of *Connecticut* v. *AEP* include heatwaves, smog, coastal erosion,

[3] Global GDP being currently of the order of US$ 70 trillion (i.e. 70×10^{12}). See www.cia.gov/library/publications/the-world-factbook/geos/xx.html.

[4] Martin Perry *et al.*, *Assuming the Costs of Adaptation to Climate Change* (August 2009). See http://pubs.iied.org/pdfs/11501IIED.pdf.

[5] In a similar vein, a few months later the International Energy Agency estimated that the cost of failing to curb emissions so as to limit temperature rise to 2°C would cost $500bn per annum.

[6] The cost of relocation of the 400 villagers of Kivalina in the eponymous case was estimated at $95–$400m (*Native Vill. of Kivalina* v. *Exxon Mobil Corp.*, 663 f. Supp. 2d 863 (N.D. Cal. 2009). See Chapter 20, para. 20.63).

droughts, fires, harm to hardwood forests and a reduction in biodiversity.

(2) The Inuit Circumpolar Conference Petition of 2005 to the Inter-American Commission on Human Rights alleged 'slumping, landslides, coastal erosion, loss of sea ice, loss of igloo quality snow, loss of wetlands, inability to pursue traditional hunting and food gathering, change in precipitation, increasingly violent storms, changes in animal and plant species, and health problems due to increased temperatures and sun intensity'.

(3) The 2009 report of the Bangladesh and UK All Party Parliamentary Climate Change Groups[7] referred to effects of climate change including coastal erosion and inundation leading to displacement of up to 30 million people, salination, change in Himalayan glacier melt leading to floods and droughts, change in precipitation patterns and intensity, and reduction in wheat (32 per cent) and rice (8 per cent) crops.

(4) Micronesia has commented:[8] 'We are not certain if our biggest threat is from ocean acidification that will erode our islands from underneath, or from sea level rise that could submerge our islands under the sea, or from changes in weather and typhoon intensity that could make inhabiting our islands impossible. But we know that our continued peaceful existence is totally at risk.'

3.08 Climate change is often seen as an environmental issue, but it is not easy to classify, and differs from many classic environmental problems in a number of respects that are relevant to liability. Specifically: (i) GHGs, and especially CO_2, are not pollutants in the conventional sense, with CO_2 being an inert gas with little direct effect on the environment other than acidification of water; its effect is indirect in terms of radiative forcing; (ii) the effect of CO_2 is not localised so that, on the one hand, every tonne of CO_2 contributes to every instance of climate change anywhere in the world

[7] *Climate Change Equity: is it a Plan, an Aspiration or a Fashion Statement? A Report of a Joint Inquiry by Bangladesh Parliament's All Party Group on Climate Change and Environment and The UK All Party Parliamentary Climate Change Group* (December 2009). See http://www.gci.org.uk/Documents/APPCCG%20Climate%20Change%20Equity%20Report.pdf.

[8] In the address of its President Mori to COP 15 in Copenhagen in December 2009: http://climatepasifika.blogspot.com/2009/12/fsmcop15-seal-deal-to-save-humanity.html.

and, on the other hand, the contribution of that tonne is very small; (iii) a consequence of this delocalised effect is that physical proximity between emission source and 'victim' is neither a necessary nor a sufficient condition in terms of showing causal connection; and (iv) CO_2 has a long-term effect and there is a significant time lag between emission and its effect in climate change terms.

3.09 Thus a wide range of claimants may seek to invoke rights or allege liabilities. They include:

(1) Individuals who are adversely affected by a decision of a public body or who have allegedly suffered loss or damage of one or more of the above kinds, or an infringement of their rights. Individuals may in certain circumstances join together to bring 'class' or 'collective' actions where claims of persons with common or similar interests may be heard in one action.

(2) Corporations are likely to suffer many of the same types of damage (especially to property) as individuals. Indeed because of the longevity and wealth of large corporations compared to ordinary individuals, corporations who suffer several instances of damage, perhaps to different properties and over a long period, may most easily be able to prove damage arising from climate change.

(3) NGOs and charities may also have claims. Some, such as the (English) National Trust or the 'land trust' plaintiffs in *Connecticut* v. *AEP*,[9] may do so as property owners. Others may do so from political motivations, and be able to show sufficient interest to bring actions. It is not a surprise to find that a large number of public law actions are brought by environmental organisations such as Friends of the Earth, Greenpeace, and the Sierra.

(4) Local and national governmental bodies may be claimants for the same reasons as corporations. Their actions may also have an added 'public interest' element, and they may sue on behalf of their citizens (e.g. public nuisance cases).

(5) All of the above are likely to have 'first party' insurance, against property damage and/or business interruption. Insurers who have paid such claims are often subrogated to the rights which their insureds have against third parties,

[9] *AEP* v. *Connecticut*, 10-174, 2011 WL 2437011 (US June 20, 2011), discussed in Chapter 20 (on the USA), paras. 20.64ff, and in section C below.

'stepping into their shoes' to act as claimants. The insurance industry has enormous economic power, and a strong vested interest in climate change. It represents to it both a threat and an opportunity. The opportunity is primarily seen by the industry in commercial terms, but an effective insurance mechanism is important in the range of measures that enable adaptation to climate change.

(6) All of the above potential claimants are legal personalities in the usual sense. However, climate change is not limited in its impact to humans, but on the contrary poses a serious threat to animal and plant species, biodiversity and ecosystems. This fact raises the possibility of certain legal systems either allowing 'the environment' or some aspect of it access to justice in itself, or allowing interested bodies to represent natural resources, flora and fauna affected by climate change.[10] Thus the 2008 Ecuador constitution grants rights to Nature or 'Pacha Mama' itself, and in April 2010 Bolivia hosted the making of a 'Universal Declaration of Mother Earth Rights'.[11]

(7) A concept which resonates with the public law concept of 'intergenerational equity', which is a key principle in the FCCC process,[12] is that of the rights of future generations. For example, this right, potentially relevant in public trust/global commons type claims, was recognised in the *Oposa* v. *Factoran* case.[13]

Who may be liable in relation to climate change?

Public bodies

3.10 State and public bodies are likely to face allegations of legal liability in relation to climate change, over and above those made in a political context of 'responsibility' for past GHG emissions and 'climate debt'. They include national governments and

[10] See also Christopher Stone's classic 'Should Trees Have Standing? Toward Legal Rights for Natural Objects', 45 S. Cal. L. Rev. 450 (1972).

[11] World People's Conference on Climate Change and the Rights of Mother Earth, People's Agreement of Cochabamba (April 2010). See http://pwccc.wordpress.com/2010/04/24/peoples-agreement/.This document has however no legal status, although at Bolivian instigation debate is currently taking place in the UN General Assembly on these issues (see www.un.org/en/ga/64/meetings/).

[12] See for example Article 3.1 of the FCCC itself.

[13] *Oposa* v. *Factoran*, Philippine Supreme Court (1993) G.R. 101083.

departments/ministries, as well as equivalent bodies at local level. Two types of potential liability must be distinguished, which might be termed 'public law' and 'private law' liability. Under the domestic public (or administrative) law branches of most national systems of law, decisions of public bodies or of bodies performing a public function are reviewable by the courts in specified circumstances. The private law liability of public bodies may arise where they fail to discharge a duty to take appropriate steps to avoid loss or damage (for example to construct flood defences in a specific area) and are held liable to compensate those affected. These liabilities are separate from the possible public international law liabilities of a State for being the source of GHG emission and contributing to climate change, and are also separate from those which may attach to a State in its capacity as owner of State industries (see below).

Industry

3.11 Anthropogenic GHG emissions are caused largely by activities carried out in certain industry sectors. The most important are: (i) what is loosely termed the 'energy' sector, responsible for provision of fuel, power, heating etc; (ii) the transport sector; and (iii) the agriculture/forestry sector. Other manufacturing sectors (such as cement) are also important. As most significant industrial activity is carried out through corporations, these are obvious targets for actions claiming that they are responsible for climate change. The distinction between government and industry is blurred where, as in some countries, the relevant industries are owned or controlled by the State.[14] This factor may cut both ways in legal terms, as a State-controlled industry may claim a species of sovereign immunity from liability for some purposes, but (for example) utility companies may be regarded as public bodies or agents of the State for others (for example judicial review, human rights and 'public trust' purposes).

Ancillary commercial entities

3.12 Whilst corporations are the most obvious targets for private law actions, liability may also attach to those who promote, support and advise them, including their shareholders, lenders and

[14] As in the case of China where the State controls much of the coal industry; China is by some way the leading producer of coal in the world.

professional advisers (auditors, lawyers, actuaries) and liability as between these entities in relation to climate is also a possible scenario.

Insurers

3.13 Insurers' status in a commercial context is discussed briefly in Chapter 4. They have been mentioned as potential claimants above. However, insurers are also potentially liable in respect of climate change in their capacity of liability insurers of other potentially liable parties and their officers or directors. Even where the allegation against the insured is unsuccessful, insurers (who typically pay costs of the underlying legal action) are exposed. Usually their liability is in direct terms under the policy and to indemnify the insured, although in some jurisdictions direct action by an injured third party against the insurer of the party liable is possible. The liability of insurers in this way depends in part on the liability of the insured and in part on what risks are underwritten, and on what basis. Depending on policy terms, the risks potentially have a 'long tail' where, as with asbestos, liability arises long after the action or inaction complained of. An exploration of policy wordings and coverage arguments is beyond the scope of this book,[15] but the issue of coverage for liability alleged in the *Kivalina* case (see Chapter 20 (on the USA) and section C below) has already been litigated in *Steadfast* v. *AES*, in which on 2 August 2010 the Supreme Court of Virginia denied coverage on the grounds that there was no 'occurrence' as required by the policy. Argument on appeal took place in April 2011. The seriousness with which insurers take the possibility of liability of all kinds in relation to climate change is demonstrated by the volume of material on it published by them and alluded to in Chapter 4.

TYPES OF LIABILITY

3.14 In this book types of liability are divided broadly into 'public', 'private' and 'other'. These types of liability potentially overlap.

[15] But see Jeffrey W. Stempel, 'Insurance and Climate Change Litigation' in William C. G. Burns and Hari M. Osofsky (eds.), *Adjudicating Climate Change* (Cambridge University Press, 2009) for a full discussion.

(B) 'Public' liability

3.15 Most national laws provide for the review of decisions of public authorities. The principles of course vary from country to country but some themes emerge. Inaction or omission is generally reviewable as well as 'positive action and decisions', as exemplified in the *Massachusetts* v. *EPA* case, where the EPA was compelled to regulate CO_2 as a pollutant within the meaning of the Clean Air Act. Common grounds of review of a decision include: (i) unlawfulness; (ii) excess of powers, jurisdiction or 'vires'; (iii) unreasonableness or irrationality; and (iv) procedural deficiency. In addition, it is ordinarily necessary for the applicant in such case to show that: (i) the decision is of a type amenable to review; and (ii) he/she has sufficient interest or 'standing' to be allowed to bring the application. Remedies may include the quashing of the decision or a positive order compelling specific action. The breadth of the potential review of this kind is illustrated by the national law chapters, but the cases fall into two broad types. The first concerns laws or regulations themselves, and specifically whether, in making these, the body concerned has complied with its obligations under some superior legislative or constitutional provision. Thus if a law requires the Minister of the Environment to draw up plans to reduce GHG emissions in a certain sector, a failure to do so may be reviewable, as may be plans which do not comply with the relevant statutory duty. The second type is concerned with administrative decisions made under a regulatory scheme, and typically concerns decisions to grant or refuse licences or permits for a particular activity.

3.16 National administrative law can only be considered properly in the context of the relevant substantive national law. Thus the scope of public law action depends not simply on the administrative law, but on the extent to which the law provides for climate change and its consequences. Such law may be found in the constitution, possibly in human rights legislation, and possibly in national environmental law generally. A number of countries have legislated specifically for climate change, either in direct terms (such as in the UK) or indirectly in terms of regulations to reduce GHG emissions and/or increase energy efficiency.

3.17 Climate change liability may be engaged in relation to laws or regulations which do not have climate change control as their primary object. As the national chapters illustrate, administrative decisions on planning and permits for projects of many kinds, from mines to dams to power plants, may be subject to litigation on the grounds that climate change considerations have not been taken into account. An innovative example is the case of *FSM* v. *Prunerov* where the Federated States of Micronesia compelled the undertaking of an environmental impact assessment of a Czech coal-fired power plant by initiating a complaint in January 2010.[16] Other examples are challenges in the USA under Acts such as the Endangered Species Act in relation to species threatened by climate change, for example the polar bear.[17]

(C) 'Private' liability

3.18 Private law claims envisage one person, C, who alleges he/she has suffered damage from climate change, suing D, who is allegedly responsible in part for it, for compensation, or for an order to make D change his/her behaviour. C might be a person who suffered in a heatwave, or had his/her house flooded. D might be an oil company or power generator. The claim will be brought in 'tort' or 'delict'. In common law systems a specific tort has to be alleged, and those most commonly discussed in this context are 'nuisance' and 'negligence'.[18] Establishment of this type of liability has been seen as a kind of holy grail by

[16] A summary in English of the claim is at www.pohodacez.cz/press/english-summary-of-the-prunerov-case-53.

[17] Chapter 20 (on the USA), paras. 20.37ff.

[18] The possibilities of this type of claim are discussed in the national chapters, but also in greater depth in the following: David A. Grossman, 'Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation', *Colum. J. Envtl. L.*, 28(1) (2003); David Hunter and James Salzman, 'Negligence in the Air: The Duty of Care in Climate Change Litigation', 155 *University of Pennsylvania Law Review* (2007); Burns and Osofsky (n. 15 above), Ch. 9; Roda Verheyen, *Climate Change Damage and International Law* (Martinus Nijhoff, 2005); Giedré Kaminskaité-Salters, *Constructing a Private Climate Change Lawsuit under English Law* (Kluwer Law International, 2010); James Burton, Stephen Tromans QC and Martin Edwards, 'Climate Change: What Chance a Damages Action in Tort?', *UKELA e-law*, 55 (2010), 22; and Joseph Smith and David Shearman, *Climate Change Litigation* (Presidian, 2006). A very recent addition to this collection is Michael Faure and Marjan Peeters (eds.), *Climate Change Liability* (Edward Elgar, 2011) focusing on tort in European law.

environmental campaigners and as an unacceptable disaster scenario by sectors of industry which might have to bear the cost. The numbers of potential claimants and defendants in this type of action, and the scale of potential compensation, are all huge, and indeed the very wide scope of such claims is one policy factor against their being permitted. No action of this type has yet succeeded. Few have been brought, almost all in the USA. The four most important US cases to date, including the recent decision of the Supreme Court in *AEP* v. *Connecticut*, are analysed in Chapter 20. The prospects of success of any private law claim are of course heavily dependent on the facts and on the relevant law, but a number of themes have emerged in litigation.

Damage

3.19 A claimant will normally have to prove that he/she has actually suffered damage, and that the damage is of a type which the law regards as recoverable. A simple definition of damage is adverse change, but proof of this will not necessarily suffice for the purpose of establishing liability. In some cases, where an injunction is sought as well as or instead of compensation, it may be sufficient to prove that he/she will suffer future harm.

Causation

3.20 This is often seen as the most serious obstacle to private law claims. The claimant must first prove that any damage results from an event or situation caused by climate change. For the reasons discussed in the national chapters, this proof may not be difficult in the case of damage caused by mean temperature rise, or sea level rise, or other long-term climate change, but is more difficult for damage caused by specific extreme weather events, although a statistical approach may still provide sufficient proof in some cases. As discussed in Chapter 17 (on English law), recent studies have suggested that anthropogenic climate change has at least doubled the risk of certain events occurring, which may be legally significant. In any case, even greater difficulties arise in attributing climate change or its effects to a specific defendant or group of defendants. This attribution problem arises partly

because damage occurring now is a result of emissions in the past and particularly because any individual emitter will only be responsible for a very small percentage of overall GHGs. The claimants in the US direct liability cases have countered this point both with arguments of law on 'material contribution' and 'traceability' and with evidence that a relatively small number of corporate groups are 'responsible' for a disproportionately large share of emissions.[19] The figures of course depend on methodology, but in the *Connecticut* v. *AEP* litigation it is said that the five defendant power company corporate groups were together responsible for about 10 per cent of all anthropogenic GHG emissions in the USA, and it has been alleged by environmental groups that Exxon Mobil alone is 'responsible' for about 5 per cent of post-industrial global anthropogenic CO_2 emissions.[20]

Fault

3.21 Some torts require C to show that not only did D cause damage, but that D acted wrongly or unreasonably.[21] This requirement engages the debate as to whether emitters could have carried on business in a different way, whether it was unreasonable for them not to do so, and what difference this would make or would have made. This debate arises since GHG emissions are a necessary consequence of the basic way of life of the majority of people, especially in developed countries, the main question being whether alternative technologies could or should have been adopted.

Foreseeability

3.22 A closely related question is whether a GHG emitter can foresee or could have foreseen that a particular conduct would or might have an effect on climate change. Whilst foreseeability could not be seriously denied in relation to a period after (say) 1990, it is

[19] In English law there has been much recent debate about causation and statistical evidence, albeit not in a climate change context (see Chapter 17, section C).

[20] Friends of the Earth International, *Exxon's Climate Footprint: the Contribution of Exxon Mobil to Climate Change since 1982* (January 2004). See www.foe.co.uk/resource/reports/exxons_climate_footprint.pdf.

[21] Others impose 'strict' liability regardless of fault. There is also a trend towards strict liability (the polluter pays) in the imposition of liability by law such as in the European Environmental Liability Directive 2004/35/EC.

open to debate how much earlier the possible consequences of GHG emission could be foreseen. The complaint in the *Kivalina* case gives a detailed chronology of the alleged state of knowledge on GHG emission risks, starting in 1896.[22]

Justiciability

3.23 In the USA there are ongoing arguments about whether this type of claim is 'justiciable' at all, on the basis that some issues, which involve questions of policy and international relations, are exclusively the preserve of the executive or legislature and not subject to adjudication in the courts.

Pre-emption, displacement and statutory authority

3.24 A related question is that of pre-emption or statutory authority. A defendant may raise as a defence to any claim a national law or international treaty which he/she alleges authorises, explicitly or implicitly, his/her conduct. Such a defence might invoke national laws directed at climate change on emission standards generally,[23] or multilateral environmental agreements, such as the FCCC or the Kyoto Protocol.[24]

Long-term view

3.25 It is difficult to form a view as to the prospects of this type of liability being established. There are many obstacles to bringing a successful suit. The recent decision of the US Supreme Court in *AEP* v. *Connecticut* presents a major setback to claimants in the US courts but has not altogether killed off the prospect of liability being established in the USA or elsewhere in

[22] See *Kivalina*, n.6 above, para. 134ff.

[23] For example the basis on which the claim in *AEP* v. *Connecticut* was dismissed by the US Supreme Court (10-174, 2011 WL 2437011 (US June 20, 2011)) was that federal common law nuisance claims were displaced by the *Clean Air Act* which authorised the EPA to regulate GHG emissions, because the statute 'speaks directly to the question at issue' (see Chapter 20).

[24] However the emission limits under the Kyoto Protocol are expressed not to be a licence or permit to emit up to those amounts. Decision 2/CMP.1 provides: 'Further recognizing that the Kyoto Protocol has not created or bestowed any right, title or entitlement to emissions of any kind on Parties included in Annex I …'.

a private law tort claim. In the opinion of the Editors, much depends on developments on two potentially related fronts. The first is the evolving regulatory framework, whether national, regional or international. Few would dispute that regulation is a more appropriate response to climate change than litigation. At present, however, there is a huge gap between what is politically possible to deliver and what science tells us is necessary to avoid significant and long-term damage. The more progress is made on the regulatory front, the less need and the less scope for private liability. The second factor is how climate change and consequential damage actually develops. One can envisage a failure of the regulatory approach and a 'business as usual' scenario over ten, twenty or fifty years, with major emitters carrying on in the knowledge of likely consequences in terms of contribution to climate change, and serious progressive climate change damage becoming manifest. In such a case, the defences discussed above against private law claims based on well-established tort principles may turn out to be ineffective against arguments made in the second half of this century that: (i) serious damage has occurred; (ii) it was known that it would occur (as per the IPCC reports) and could have been prevented (as per the Stern review); and (iii) the principal emitters chose not to act effectively, primarily for reasons of short-term economic benefit.

Secondary/ancillary liability

3.26 Although of less general public interest than the direct liability cases exemplified by the *Kivalina* and *AEP* v. *Connecticut* type cases, the ancillary type of private liability described above is likely to be of increasing practical importance. This is where a defendant is found liable for failing to take into account climate change factors in a variety of contexts, resulting in damage, or more damage, than would have been the case had the defendant acted with due care and diligence.[25]

[25] So for example the US Army Corps of Engineers was found liable in November 2009 for damages of over $700,000 suffered by five plaintiffs as a result of Hurricane Katrina, on the basis of negligence in relation to maintenance of the New Orleans flood defences, with: *In Re Katrina Canal Breaches Consolidated Litigation*. New Orleans is on a part of the US coastline generally acknowledged to be vulnerable to the effects of climate change,

3.27 Commercial entities that may be held to be under liabilities in respect of climate change, albeit in a less direct manner, are those responsible, whether under the general law of tort, a statutory duty, or otherwise, for preventing its effects. Typically, these entities will be architecture, engineering or similar firms that design, build and maintain infrastructure which is either designed to reduce the effects of climate change or is vulnerable to its effects. Buildings which crack, flood or blow over, dams, flood defences and firebreaks which fail, roads or railways which buckle in extremes of heats or droughts – these are all likely to be sources of climate change liability.

3.28 Another potentially important source of private law liability arises from the increasing requirement, discussed in Chapter 4, for businesses to make disclosure of climate change related information. A failure to do so properly may incur liability to related parties such as shareholders, lenders or insurers, or to independent third parties.

(D) 'Other' liability

3.29 There are a number of other respects in which climate change liability may be engaged. They fall into numerous disparate categories and are not mutually exclusive.

Constitutional rights

3.30 An increasing number of countries, especially developing countries, are providing in their constitution or otherwise the right of citizens to a clean and/or healthy environment.[26] This right may be used as a means of alleging a liability on the part of those who fail to ensure such an environment. Whether such liability arises is highly dependent on the facts and the national law concerned,

and the essence of the unsuccessful claim in *Comer* v. *Murphy* was that GHG emitters had contributed to the ferocity of Hurricane Katrina (see Chapter 20, para. 20.63).

[26] These include India (see Chapter 7) and, according to the *AIDA Environmental Defense Guide* (2010), twenty Caribbean and Latin American States. Examples in Africa include Kenya and South Africa (see Chapter 12 and Chapter 13). The constitutional right to this effect in the Philippines was relied upon in the classic case of *Oposa* v. *Factoran* in the Philippine Supreme Court (1993), n.13 above, which held that rights extended to future generations (see also Chapter 7 at para. 7.20).

but issues which will be relevant are: (i) whether climate change damage which is different in cause from traditional environmental problems, comes within the scope of the right at all; and (ii) whether the right, even if infringed, is amenable of corresponding remedy. This is primarily because (iii) a right may only be exercisable against public bodies. Despite these difficulties, activities which might contribute to or increase the effect of climate change may fall foul of such rights.

Human rights

3.31 The issue of human rights has a place in a discussion of 'liability' because of the potential liability on relevant persons or bodies to prevent or abate, or provide compensation for breaches of them. Climate change has obvious human rights implications and so what Stephen Humphreys describes as 'the silence' on human rights may at first sight appear puzzling.[27] Humphreys suggests five reasons: (i) difficulty of enforcement; (ii) difficulty of establishing extraterritorial responsibility; (iii) difficulty of establishing local accountability; (iv) difficulty caused by emergency conditions; and (v) conflict with other rights. To this one might add that environmental rights have only recently moved to centre stage as 'third generation' rights.[28] It is perhaps no coincidence that modern constitutions (such as Ecuador (2008) and Kenya (2010)) almost invariably contain references to environmental rights and there is a close link between human rights and domestic constitutional law.

3.32 Increasing attention is now being paid to the idea of climate change being a Human Rights ('HR') issue, with the effects of climate change infringing HR.[29] This follows from the nature of damage that may directly result from climate change (see above), whether on individuals or whole sectors of society. In addition to

[27] In Stephen Humphreys (ed.), *Human Rights and Climate Change* (Cambridge University Press, 2009).

[28] After first generation political rights and second generation economic and social rights, third generation rights may include environmental rights and rights to natural resources (see Burns and Osofsky, n. 15 above, p. 181).

[29] See, for example, Lavanya Rajamani, 'The Increasing Currency and Relevance of Rights-Based Perspectives in the International Negotiations on Climate Change', *Journal of Environmental Law*, 22(3) (2010), 391–429.

national human rights laws, addressed in the national chapters, there are important international and regional human rights regimes, and rights under national, regional and international regimes may overlap.[30]

3.33 At an international level the key instruments are the United Nations Declaration on Human Rights of 1948, the International Covenant on Civil and Political Rights and the International Covenant on Economic Social and Cultural Rights (both adopted in 1966). Neither of these, however, gives a specific environmental right. The issue of climate change was raised expressly in the UN Human Rights Council Resolutions 7/23 of March 2008 and 10/4 of January 2009,[31] after a request to this effect by the Maldives.[32] Also relevant is the UN Declaration of the Rights of Indigenous Peoples, adopted by General Assembly Resolution 61/295 on 13 September 2007.

3.34 At a regional level, regimes include: (i) the European Convention on Human Rights (discussed in the national chapters); (ii) the Inter-American System for Promotion and Protection of Human Rights; the San Salvador Protocol (to which some twenty-six American States but not including the USA are Parties) provides a right to a healthy environment in Article 11; and (iii) the African Charter on Human and People's Rights which provides (by Article 24) for a right to a satisfactory environment favourable to development.[33]

3.35 A right is only of use if there is a corresponding duty on another person or body to respect or enforce that right, an effective tribunal and a remedy. Despite the difficulties faced in these respects

[30] For detailed studies of HR issues in relation to climate change, see Humphreys (n. 27 above), *Climate Change in the Work of the Committee on Economic, Social and Cultural Rights* (CIEL, 2010), *Environmental Defense Guide* (AIDA, 2010), and Burns and Osofsky (see n. 15 above), Ch. 8.

[31] With this resolution being expressly referred to in the Cancun text on long-term Cooperative Action.

[32] See John H. Knox, 'Linking Human Rights and Climate Change at the United Nations', *Harvard Environmental Law Review*, 33 (2009), 477.

[33] In the *Ogoni* case it was held by the Commission that Nigeria was in breach of Article 24 (amongst others) in relation to Shell gas flaring and other activities in the Ogoni delta (155/96 (2001)). See also the *Endorois Community* case where the Commission found breaches of rights of indigenous people by the Kenyan government when the complainants were displaced for the purposes of creating a game reserve (276/2003 (2009)).

by many climate change 'victims', human rights jurisprudence and the related issue of liability for breaches of human rights are likely to become increasingly important. Apart from the continued development of rights expressly cast in terms applicable to climate change, more traditional rights may be interpreted as covering climate change consequences:[34]

- the right to life/survival may be engaged, especially in the cases of increase in frequency or severity of extreme weather events;
- the right to health is potentially very relevant with the potential for increased incidence of disease as well as many other problems;
- the right to subsistence/adequate standard of living;
- the right to peace and security (with possible implications for the engagement of the Security Council);
- the right to private and family life (as in Article 8 ECHR) as interpreted broadly in cases such as *López Ostra* v. *Spain* (see Chapter 17 on English law);
- the right to information (for example under Article 10 ECHR or Article 19 of the ICESCR);
- cultural and social rights as expounded in Chapter V of the petition of the Inuit Circumpolar Conference;[35]
- the rights of indigenous peoples generally (see the African Commission *Endorois* case (above) and the Inter-American cases of *Yanomami*[36] and *Saramaka*,[37] as well as the Inuit Petition).

Public trust

3.36 There is a well-established common law doctrine, of considerable antiquity, of 'public trust', under which national resources may be regarded as trust property, held on trust by the State for the people as beneficiaries.[38] The State as trustee would be liable for breaches of trust. Though traditionally applied to resources

[34] See Humphreys (n. 27 above), pp. 76–83.
[35] http://inuitcircumpolar.com/files/uploads/icc-files/FINALPetitionICC.pdf.
[36] *Yanimami* v. *Brazil*, Report No. 12/85, Case 7615, March 5, 1985.
[37] *Saramaka People* v. *Suriname*, Series C, No. 196, November 28, 2007.
[38] For full discussion of this doctrine and its resurgence and potential application in a climate change context, see Burns and Osofsky (n. 15 above), Ch. 5.

such as fishing or water rights, it could be applied to the atmosphere or the environment more generally, especially in the context of the atmosphere as public goods or global commons or 'a common heritage of mankind'.[39] A revival of use of the doctrine has occurred in Canada and India,[40] as well as in the Philippines where in *Oposa* v. *Factoran* the Supreme Court stated that the government's obligation to protect natural resources for present and future generations was said to exist 'from the inception of humankind'.[41] It remains to be seen however if the renaissance of this ancient doctrine will extend to climate change, and how its application might conflict with other rights and obligations.[42] It has however been argued that it could extend beyond a purely domestic citizens/government arena, on the basis that all nations are co-trustees of global commons, and potentially liable as such, at least to other co-trustees for breach of that duty. A possible aspect of this doctrine that has been suggested is actions, against States or public utilities to be regarded as agents of the State, based on committing or procuring breaches of fiduciary duty. However to date there has been no successful invocation of the doctrine in a climate change context.

Competition/supply chain

3.37 As discussed in Chapter 4, in political and scientific terms the real debate on climate change policy is not so much as to the nature or cause of the problem, or even the nature of the remedy, but more as to who pays for it, both geographically (who pays and how much now?) and temporally (should current generations pay to save future ones?). Competition and anti-trust law operate at a number of levels to attempt to eliminate anti-competitive practices, and include the WTO regime and US and EU competition laws, which may offer scope for imposition of liability on States or corporations who continue to operate in a carbon-intensive environment and thereby gain an unfair competitive advantage.

[39] See Humphreys (n. 27 above), p. 199.

[40] See Chapters 7 and 19.

[41] G.R. No. 101083, 30 July 1993, Supreme Court of the Philippines, para. 1.

[42] In May 2011 there was coordinated filing, by 'Youth' in fifty states of the USA, of legal and administrative actions against the states invoking the public trust doctrine in order to compel action to reduce GHG emissions, as detailed at www.ourchildrenstrust.org/.

These issues resonate with considerations in relation to trade underlying the FCCC negotiations.

3.38 Humphreys suggests that the failure of States to honour FCCC obligations might be viewed as a subsidy.[43] Lord Stern has suggested in an interview that 'nations that were taking strong action on emissions could start imposing restrictions on "dirty" US exports by 2020'.[44] On a different aspect of this issue, the Committee on Economic Social and Cultural Rights in 1999 urged the WTO to undertake a review of the full range of international trade and investment policies which would address as a matter of the highest priority the impact of WTO policies on the environment.[45]

3.39 Although not directly connected with climate change, the US Lacey Act[46] provides an interesting illustration of 'long-arm' legislation, seeking to legislate in State A to address a problem in State B which may have laws but be unable or unwilling to enforce them. The Act, passed in 2008 to combat illegal logging, essentially makes illegal, as a matter of US law, trade in plants and plant products which were harvested or produced in breach of the laws of the country of origin (or any US law).

Criminal law

3.40 This area merits only passing mention for present purposes. Nonetheless, in many jurisdictions acts which contravene laws or policies on the environment generally or climate change specifically may attract criminal liability, for example on the part of public officials or directors or officers of private corporations.

Soft law – non-legal 'liability'

3.41 Lawyers often underestimate the importance of 'soft law' or non-legal forms of liability. As a result, they may miss the enormous potential effect, in political, reputational and other terms of a

[43] See Humphreys (n. 27 above), p. 56.
[44] As reported in the UK *Times* and *Guardian* on 19/20 November 2010.
[45] *CESCR Statement to the Third Ministerial Conference of the WTO* (E/C.12/1999/9 26, November 1999).
[46] Passed in 1900, Ch. 53 of Title 16, USC, but amended in May 2008, inserting s. 8204.

finding of breach of standards, codes or rules even if those standards were not 'law' in the conventional sense. Examples from the great variety of processes that might lead to such findings include:

- Complaints that may be brought for breach of OECD guidelines on the conduct of business, as discussed in Chapter 15 (on German law).
- The World Heritage Convention 1972 provides an obligation on States to protect World Heritage sites, many of which are potentially vulnerable to climate change. Further, the World Heritage Committee is obliged to list sites which are in danger from various threats.[47]
- Receipt and dissemination of information is vital. Access to information is discussed below, but an adverse finding by a body overseeing advertising (such as the UK Advertising Standards Authority), in relation to claims about climate-related products or services may have significant impact. At a time when pressure from regulators, investors and advocacy groups requires disclosure by corporations and public bodies of an increasing amount of information on climate change, the ability to challenge the adequacy or accuracy of disclosure is important. A recent example is the two complaints filed in 2010 by Client Earth to the UK Financial Reporting Review Panel about the annual reports (required under the UK Companies Act) of BP and Rio Tinto in relation to climate change related information.[48]
- There are a large number of codes, guidelines and panels of varying status, regarding conduct of business. Breach of these codes or guidelines, or adverse findings by a relevant body may be said to constitute a kind of liability, and climate change considerations are potentially relevant to the World Bank Inspection Panel, the Equator Principles,[49] the United Nations Principles for Responsible Investment,[50] and the UN Global Compact (Principles 7–9).[51]

[47] See generally Burns and Osofsky (n. 15 above), Ch. 11.

[48] ClientEarth – Justice for the Planet. See www.clientearth.org/testing-the-law-and-the-regulator.

[49] Equator Principles. See www.equator-principles.com/.

[50] United Nations Global Compact, The Ten Principles. See www.unpri.org/principles/.

[51] Principles for Responsible Investment. See www.unglobalcompact.org/AboutTheGC/TheTenPrinciples/index.html.

(E) Ancillary matters

Founding jurisdiction

3.42 One of the features of climate change is that the most serious damage caused is often in developing countries whereas potential defendants are generally corporations in developed countries. Thus the ability of claimants to found jurisdiction for their claim is fundamental – a right is of little use unless a tribunal can be found to uphold and enforce it. Each nation or region (for example the EU) has its own regime and rules as to the basis on which a defendant can be sued. These are usually based either on presence of the defendant within the territory concerned or other factors connecting the claim with that territory. There has been widespread dissatisfaction with the lack of an appropriate international tribunal to address environmental claims, and consequent attempts to set up an International Court of the Environment.[52]

Applicable law

3.43 It is sometimes assumed that because climate change is an international problem, 'international law' governs climate change liability. In fact, this is rarely likely to be the case and in nearly all public and private liability cases the court or tribunal seised of the matter has to determine, as well as its own jurisdiction, what the applicable law is. For private claims, all States have their own 'conflict of law' rules for this purpose. In tort cases, the rules usually focus on which system of law the claim has the closest connection with, which may be where the act complained of occurs, or where the damage complained of occurs, or some other place.

Remedies

3.44 Public law remedies usually involve 'quashing' an order or decision, or requiring a government body to act. In private law claims,

[52] Led by the English lawyer Stephen Hockman QC (see his article of January 2011 at www.6pumpcourt.co.uk/publication/publicationList.aspx).

the remedy sought is usually compensation or damages, but may be an injunction or declaration. Courts are well used to assessing the value of conventional claims based on personal injury, property damage or economic loss. Courts may also have to engage in the climate change context with the 'new metrics' of human, social and natural capital (as well as financial and manufactured capital)[53] and valuation of ecosystems and human rights.

Obtaining information

3.45 Many legal battles are won or lost not on the substantive law but on the ability of one side to obtain information which the other wants to be kept secret. A fundamental requirement of a fair legal or political system is an appropriate process for obtaining (or resisting) disclosure of information, and the practical importance of this in terms of a study of climate change liability can hardly be overstated. A great deal of national law (discussed in the national chapters) has developed on the rights to information, whether in the context of litigation or in the broader context of a right to information which is held by public bodies and/or in relation to the environment. A related issue is the existence and enforcement of any duty (which is statutory, imposed by professional/regulatory bodies or otherwise) on holders of information to retain it. Again the scope of this duty is dependent on national laws, but it is a trite observation that many successful attempts to establish liability might have foundered but for the retention and ultimate disclosure of documentation of other information.

Enforcement

3.46 Enforcement of judgments and awards is in theory easy in many international contexts, under various bilateral agreements, domestic laws and, in the case of arbitrations, the 1958 New York Convention.[54] In practice this is often more difficult, either because the right to enforce a judgment from a court in State A is resisted on various legal grounds in State B, or simply because the

[53] See Jonathon Porritt, *Capitalism as if the World Matters* (Earthscan, 2006).
[54] The 1958 Convention on the Recognition and Enforcement of Foreign Arbitral Awards.

defendant has no assets to enforce against where the judgment can legally be enforced.[55]

Costs/access to justice

3.47 The cost of establishing or resisting liability may be a significant barrier to an effective legal system. In addition to costs issues specific to national laws, two matters of more general importance merit brief reference.

3.48 The first is the 2001 Aarhus Convention on Access to Justice in Environmental Matters. Whilst only of European application it is important in its imposition of a requirement on States to ensure access to justice in such matters which is 'fair, equitable, timely and not prohibitively expensive'.[56]

3.49 The second is the use of 'collective redress' or class actions which enable large numbers of people who individually lack resources to bring (they are invariably claimants, not defendants) legal actions which they could not otherwise do. Class actions are well established in the USA. Where one action can be brought on behalf of many claimants, it both spreads the cost and risk of proceedings among many claimants, and multiplies the potential exposure of the defendant. The potential power of collective redress has led to the leading insurance company Swiss Re: publishing (with specific reference to climate change liability) a report in 2009 entitled *The Globalisation of Collective Redress – Consequences for the Insurance Industry*,[57] which surveys on a global basis the current and possible future provisions for such class actions.

Relationship between private and public international law

3.50 A discussion of public international law is outside the scope of this book. One of the notable features of climate change liability

[55] The paradigm recent example is the Ecuadorian court judgment in February 2011 in the *Ecuador* v. *Chevron* litigation, where it remains to be seen whether all or any of the judgment for over US$ 18 billion against Chevron will ever be satisfied.

[56] Article 9(4).

[57] See http://media.swissre.com/documents/Globalisation_of_Collective_Redress_en.pdf.

is the degree of convergence and crossover between public international law and private international law, and private law liability may increasingly borrow from public law principles, including for example the precautionary principle and the 'no harm' principle. Some commentators have raised the possibility of liability as between claimant (C) and defendant (D), on the basis of C and D both as States (pure public law), C and D both as private entities (usually seen as pure private law) and C as a State and D as a private entity (or vice versa).[58]

(F) Concluding thoughts

3.51 Drawing together some of the threads woven in the national chapters, what conclusions can be drawn about overall trends in climate change liability? The Editors have no crystal ball but suggest the following possible developments:

- An overall rise in importance of climate change liability, both in terms of types of liability and numbers of cases. This is illustrated by the national chapters, and especially Chapter 20 (on the USA).[59]
- A hiatus in private law damages claims. The Supreme Court decision in *Connecticut* v. *AEP* by no means signals the end of the concept of private law liability, but it may well end the run of cases on this issue in the USA.
- A sharp rise in domestic public law claims, both in terms of cases seeking to require regulatory action on climate change and of cases seeking to restrain it.
- A rise in 'indirect' or 'ancillary' private liability cases. These arise not from any development in the law but in the increase in incidence of damage actually or allegedly caused or exacerbated by climate change.

[58] See, for a discussion of these issues, Michael Faure and Andre Nollkaemper, 'International Liability as an Instrument to Prevent and Compensate for Climate Change' (2007) at http://ssrn.com/abstract=1086281, the FIELD report of October 2010 and Peter Roderick and Roda Verheyen, 'Beyond Adaptation' (WWF, 2008).

[59] See also the review by Professors David L. Markell and J.B. Ruhl of all 201 climate change liability cases filed in the USA in 2010, 'An Empirical Assessment of Climate Change in the Courts: A New Jurisprudence or Business as Usual?' (February 2011). See http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1762886.

- An increased use of lateral thinking and legal innovation, whereby laws or regulations existing for primary purposes other than in relation to climate change are used in an attempt to impose or avoid liability in respect of it or its effects. Examples to date include the *FSM* v. *Prunerov* case discussed above and The Endangered Species Act cases in the USA, as well as the 'Rainwater Collection' case filed in 2010 in the Philippines. In this case the claimants relied on a twenty-one-year-old law, largely forgotten and ignored, to compel the government to take action to address the flooding risk said to be seriously increased due to climate change.[60]
- An increasing flexing of the muscles of developing country courts in terms of findings of liability for climate change.
  - This could well occur for a number of reasons, including the increase of damage in such countries, the changes in the law in those countries to facilitate findings of liability and the increased willingness of the courts to meet the challenge of climate change with appropriate legal responses. These may include enactment of specific laws directed to climate change or more general rights to a clean environment. For clues as to the future one only has to look towards India. Whilst there is no current trend there specifically as far as climate cases are concerned, there is the potentially potent combination of the following: (i) well developed law and activist judiciary; (ii) its status as a potentially serious 'victim' of climate change; and (iii) at the same time its large population, economic power and growth rate, and status as a 'top ten' (in cumulative terms) GHG emitter.
  - The effect of such a trend is of course not confined to the States in which the courts pronounce. The nature of climate change adds a strong international dimension. The traditional view in some quarters was that 'victims' of environmental damage in developing countries look to sue transnational corporations in the USA or Europe and that in a developing country court a claimant would suffer from lack of developed law and/or a low level of damages and/or an inability to enforce any judgment. A number of factors suggest that this may change. Whilst it remains to be seen

[60] *Oposa and others* v. *Philippine Government* (action 191806).

whether the Ecuadorian court judgment in the well-known claim against Chevron can be enforced, the history of this case to date may provide a pointer to the future, and one to which both developed and developing countries need to pay close attention.

4

Policy considerations

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Context

4.01 This chapter examines briefly the political, economic and regulatory contexts in which liability for climate change may be relevant, and seeks to provide a short summary of key national and international policy considerations, in so far as these are relevant to the existence of various bases for climate change liability.

4.02 Climate change liability does not exist in a vacuum. There are two related aspects of context. The first is the inherent nature of climate change, which has come in little more than twenty years from political obscurity to occupy centre stage as 'the defining human development challenge for the 21st century'.[1]

4.03 The second is that climate change is a 'cross-cutting' issue. The complexity of climate change as an issue in its own right, as outlined in Chapter 3, is compounded by its interrelationship with other contemporary issues and phenomena. These (which are not homogenous in type) include: (i) population growth; (ii) economic development and increased resource consumption; (iii) patterns of land use; (iv) food, water and energy security, including 'peak oil'; (v) the imperative for sustainability in its various senses; (vi) human rights, including rights to life/survival and health, a clean environment, peace and security, and culture; (vii) the struggle between States and 'blocs' for economic and political supremacy or advantage, and concerns over competition issues

[1] UNDP, Human Development Report 2007–8, *Fighting Climate Change: Human Solidarity in a Divided World*.

between low- and high-carbon economies; (viii) the blurring of the lines between North/South or developed/developing countries, with the growing political and economic power, relative to the traditionally 'developed' OECD States, of countries such as Brazil, China and India; (ix) the renewable or clean-energy debate, including the debate as to the roles of carbon capture and storage, nuclear power and biofuels respectively, the technical and economic viability of renewable sources of energy and the question of whether this debate is a threat or opportunity for business and its interrelation with existing competition regimes; and (x) the problems of intragenerational and intergenerational equity and the balance between them.

4.04 There is thus considerable scope for overlap and interaction between measures addressing climate change and those addressing other contemporary issues. A study of these is beyond the scope of this book, but the UN Framework Convention on Climate Change ('FCCC') and its underlying policy cannot properly be considered in isolation from other declarations or multilateral agreements, and the policies underlying them or bodies overseeing them. Examples include the UN Convention on Biodiversity, the UN Convention to Combat Desertification, the UN Convention on the Law of the Sea, the Montreal Protocol on Substances that Deplete the Ozone Layer, the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights, the UN Declaration on the Rights of Indigenous Peoples, the UN Security Council, and (in a different category) the World Trade Organization.

4.05 Positioned within this contextual matrix are the actors at international, regional, national, sub-national and individual levels:

- States, which may have a conflict between international legal/ethical obligations and national economic interest, as well as conflicts between national development and resource conservation imperatives, especially in developing countries.
- Cities, municipalities, and local governments.
- Civil society, including environmental advocacy groups, prospective 'victims' of climate change damage, or citizens in neither camp but who consider action to address climate change desirable for ethical and environmental reasons.

- Indigenous peoples and local communities.
- Industry and business, for whom climate change can be a threat or an opportunity, and sometimes both. Businesses are subject to the same physical risks of climate change as others, and business models and strategy may need to adapt to assess and address them. Industry faces increasing pressure from a number of different sources, including: (i) regulators/legislatures;[2] (ii) lenders and shareholders, including investors who push climate change up the corporate agenda for social responsibility or economic reasons;[3] and (iii) environmental activists. For much of industry, certainty of regulatory environment is as important as the substance of regulations.
- Insurers, who have a key role. Some leading companies, such as Swiss Re, Munich Re and Zurich have put climate change high on their agenda.[4] As for other businesses, for insurers too climate change can be a threat and an opportunity, and they will bear the economic consequences of much of the loss and damage from climate change.[5] The insurance industry has enormous power and is uniquely positioned to drive behavioural change. It is exposed to climate change damage both as a 'first party' property insurer and as a 'third party' liability insurer.

[2] For example, on 2 February 2010 the US Securities and Exchange Commission issued interpretive guidance on the need for corporations to make climate change related disclosure in required regulatory filings. Whilst this did not introduce any actual new disclosure requirements, it was widely seen as a wake-up call for industry as to the costs and risks of climate change and the need to assess these.

[3] Such as Carbon Credit Rating, Carbon Disclosure Project, Investor Network on Climate Risk (www.incr.com); IIGCC (www.IIGCC.org).

[4] There is a vast body of literature on insurance and climate change, but in a liability context see particularly: Carol Zacharias, *Climate Change is Heating Up D&O Liability* (ACE Insurance, 2009); *The Insurance Industry and Climate Change – Contribution to the Global Debate* (The Geneva Association, 2009); and *The Globalisation of Collective Redress – Consequences for the Insurance Industry* (Swiss Re, 2009). This last report drew comparison between climate change litigation and asbestos litigation and predicted that climate change related liability could develop more quickly than asbestos related liability did.

[5] With the caveats first that much property, especially in developing countries, is uninsured, and second that the cost is ultimately borne by industry, not the insurers, who are private profit-making corporations, and reflect risk in premiums charged. The role of insurers in adaptation and in addressing long-term damage through 'Cat Bonds' and other innovative devices is a topical issue but one beyond the scope of this book.

International climate change law and policy: the FCCC, 1992 and Kyoto Protocol, 1997

4.06 It is less than twenty years since the FCCC came into being in 1992. One hundred and ninety-four States, including all major States, are Parties. The Convention's preamble acknowledges both the right of States to exploit their own resources and the responsibility of States not to cause damage to the environment of other States or areas beyond their boundaries ('no harm' principle).

4.07 The objective of the FCCC is to prevent 'dangerous anthropogenic interference with the climate system' (Article 2). The FCCC does not determine what constitutes 'dangerous anthropogenic interference', leaving it instead to be determined politically. The key principles that guide the achievement of this objective are set out in Article 3 and include inter- and intra-generational equity, common but differentiated responsibilities ('CBDR'), the precautionary principle, and the right of developing countries to develop and the requirement to do so in a sustainable manner.[6] All Parties are charged under Article 4.1 to take action to mitigate climate change, and cooperate in preparing for adaptation. Article 4.2 obliges Parties listed in Annex I to the Convention (developed countries and economies in transition) to do so by limiting and reducing anthropogenic emissions of greenhouse gases ('GHGs'). It further requires Parties listed in Annex II (broadly, OECD countries) to provide financial and technological assistance to developing countries. The FCCC endorses the value of targets set to timetables and requires developed countries to take the lead on mitigation. The burden-sharing arrangement underpinning this division of responsibilities, and the nature, content and extent of CBDR in the climate regime, has been disputed since the ink dried on the FCCC. These disagreements led, in part, to the US rejection of the subsequent Kyoto Protocol.

4.08 The philosophy underpinning the FCCC is that appropriate action would mitigate (i.e. avoid) most or all 'dangerous' climate change and that what cannot be mitigated could be adapted to.

[6] Neither 'developing' nor 'developed' countries are categories that are defined in the Convention. The latter, however, are often equated with OECD countries.

Since the adoption of the FCCC, it is becoming increasingly evident that such mitigation may not in fact be possible. For example, according to a recent assessment,[7] the mitigation pledges under the Copenhagen Accord,[8] even if fulfilled, would probably lead to a global mean temperature rise significantly in excess of the 2°C limit referred to in the Copenhagen Accord and reiterated in the Cancun Agreements.[9] Hence, increasingly, attention has been focused on adaptation and, looking beyond adaptation, on how to address unavoidable long-term damage.

4.09 The mitigation battleground was (and in part remains) how much reduction Annex I countries will commit to. But the debate has moved increasingly to issues of mitigation by large developing countries and, specifically, to nationally appropriate mitigation actions and related measurement, reporting and verification obligations for these countries.

4.10 The adaptation battleground was (and remains) funding, and specifically who should provide it and in what shares, but there is also a developing battle between most vulnerable countries for their respective share of the cake.

4.11 These issues are inextricably linked with the battleground on finance issues. Although there is emerging agreement on the scale of finances required, there is little agreement on whether finances will be 'provided' or 'mobilised', where the finances will come from, how much of a role the market will play, and on the governance structures and accessibility of the new financing bodies. The current commitment by developed countries to provide finance of $30 billion in the period 2010–12 and mobilise $100 billion per year by 2020 to address adaptation and mitigation issues in developing countries is

[7] United Nations Environment Programme (UNEP), *The Emissions Gap Report* (November 2010), available at http://hqweb.unep.org/publications/ebooks/emissionsgapreport/ (estimating a rise of between 2.5 and 5°C).

[8] Decision 2/CP.15, 'Copenhagen Accord', FCCC/CP/2009/11/Add.1 (30 March 2010), 4.

[9] Decision 1/CP.16, 'The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention', FCCC/CP/2010/7/Add.1 (15 March 2011); and Decision 1/CMP.6, 'The Cancun Agreements: Outcome of the Work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its Fifteenth Session', FCCC/KP/CMP/2010/12/Add.1 (15 March 2011).

ambitious and, despite progress in Cancun, short on detail for implementation.[10]

4.12 The positions of the various States and groupings in the FCCC negotiations are neither static nor simple. The position of vulnerable States, such as small island nations, is readily comprehensible – maximum mitigating and adaptation action. The position of the USA, the largest developed GHG emitter, is often seen as equally simple – a refusal to commit to more than limited unilateral emission reductions in the absence of what it perceives as necessary action by certain developing countries. There are a large number of groupings in the negotiations, some of which have member States that are not at first sight natural bedfellows. For example, the 'G-77 + China' includes the small island States, the least developed countries and the OPEC (oil producing) States. Recently emerged groups include BASIC (Brazil, South Africa, India and China) and ALBA (Bolivarian Alliance for the Americas – Bolivia, Cuba, Ecuador, Nicaragua and Venezuela). Space does not permit a detailed discussion of these groupings. Suffice it to say that the diverse range of interests and ideologies represented across these negotiating coalitions has made for intractable and laboured negotiations. So much so that, in Cancun, the Chair was compelled to redefine 'consensus' and overrule an objection by one State to enable the adoption of the Cancun Agreements.[11]

4.13 As implicit in the preceding discussion, the main milepost after the FCCC was the Kyoto Protocol of 1997, which committed Annex I countries to quantified reduction of GHG emissions in a first commitment period of 2008–12. Market mechanisms, including emissions trading between Annex I countries and the clean development mechanism between Annex I and non-Annex I countries, were provided for to assist Parties in reaching their commitments. The Kyoto targets represent the first and thus far only legally binding commitments to GHG emission reductions.[12]

[10] Decision 1/CP.16, *ibid*., paras. 95–101.

[11] See L. Rajamani, 'The Cancun Climate Change Agreements: Reading the Text, Subtext and Tealeaves', *International & Comparative Law Quarterly*, 60(2) (2011), 499–519.

[12] Both the FCCC and the Kyoto Protocol are legally binding. Decisions taken by Conferences of Parties, absent explicit treaty authorisation, are not legally binding; but they have significant operational and political importance. See J. Brunnée, 'Coping with

The Kyoto Protocol, however, has numerous shortcomings. First, the Kyoto targets are inadequate in themselves to achieve the objective of the Convention. Current Kyoto commitments, even if met, will not limit temperature increase to acceptable levels. In addition, the targets are inadequately implemented in a number of jurisdictions. Emissions decreases thus far in evidence are linked to countries' economic fortunes, such as, for example, economic decline in countries of the former Soviet Union ('hot air'), rather than to rigorous GHG mitigation policies and measures. In addition, the targets do not extend to non-Annex I countries, such as China, India and Brazil, that are among the top ten emitters in cumulative terms.[13] Further gaps include: (i) the omission of sectors including aviation and shipping; (ii) problems with 'hot air', 'leakage' of emissions-intensive activities to non-parties, and the accounting rules on land use, land-use change and forestry ('LULUCF');[14] and (iii) inadequate protection of forests. Although Russia joined the Protocol, the USA did not, which left the treaty weakened, perhaps fatally, as the flagship international instrument to combat climate change.

4.14 The IPCC published its Fourth Assessment report in 2007. This report, with its conclusions on the existence,[15] likely effects[16] and likely causes[17] of climate change, gave new impetus to the negotiation process.[18]

4.15 The Bali Action Plan ('BAP') is a further milestone, but also marked a fork in the road, with the possibility, on some interpretations, of moving away from a Kyoto-style approach with its

Consent: Law-Making under Multilateral Environmental Agreements', *Leiden Journal of International Law*, 15 (2002), 1–52.

[13] According to UNEP: see http://maps.grida.no/go/graphic/top-20-greenhouse-gas-emitters.

[14] With the effect that certain GHG 'reductions' were more apparent than real.

[15] Warming is 'unequivocal'.

[16] Including impacts on Water, Ecosystems, Food, Health and Coasts.

[17] Very likely that most of the observed increase since the middle of the twentieth century is caused by the increase in anthropogenic GHG emission.

[18] The previous year the 2006 Stern report, commissioned by the UK government, concluded that prompt action on CC, at a cost of about 1 per cent of GDP, could prevent much larger future costs of CC, perhaps up to 20 per cent of GDP. It thus made an economic case for action in CC, and was instrumental in securing support for the 2008 UK Climate Change Act. See also for data leading to similar conclusions the United Nations Development Programme 2007/8 Human Development Report.

quantified legally binding reductions.[19] The BAP launched a process to advance the climate change regime through long-term cooperative action on climate change, with the aim of reaching an 'agreed outcome' by Copenhagen, 2009. This process is one of two parallel negotiating tracks in the negotiations. The other is the process that was launched under the Kyoto Protocol in Montreal, 2005, to negotiate Annex I targets for the second commitment period. The BAP initiated discussions on Nationally Appropriate Mitigating Actions ('NAMAs') for developing countries, Measurement, Reporting and Verification ('MRV'), Reduced Emissions from Forest Deforestation and Forest Degradation ('REDD'), response measures, and long-term damage. Paragraphs 1(b)(i) and (ii) were especially significant, providing for a potentially fundamental realignment in the balance of commitments between developed and developing countries, with a number of possible tools to achieve the objective of the climate regime other than legally binding quantified emission reduction commitments.

4.16 As is well known, COP 15 in Copenhagen in December 2009 failed to achieve a legally binding outcome. It merely resulted in the aforementioned 'Copenhagen Accord', which was reached among only twenty-eight nations, at the heads of State level, and then 'noted' by the COP.[20] The COP suffered from problems of process and procedure as well as from more fundamental divisions, especially between the US and China, over substantive issues, including the developed/developing country balance of responsibility in mitigation, and related issues of MRV. Progress on mitigation and adaptation was very limited, although reference was made to developed countries providing US$ 30 billion funding in 2010–12 and mobilising $100 billion per year by 2020. Despite the weaknesses and limitations of the Accord, it is significant that none of the major players disputed the essential IPCC conclusions on the need for urgent action on both mitigation and adaptation. One hundred and forty-four States have associated themselves with the Accord, and many of these States have submitted targets and actions under its appendices.[21]

[19] Decision 1/CP.13, 'Bali Action Plan', FCCC/CP/2007/6/Add.1 (14 March 2008).

[20] Decision 2/CP.15, n. 8 above.

[21] A list of associated States is available at http://unfccc.int/meetings/cop_15/copenhagen_accord/items/5262.php.

4.17 COP 16 in Cancun in December 2010, in sharp contrast to COP 15 in Copenhagen, started from a low base of expectation and garnered praise for the effective management of the process, restoring some trust in the utility of multilateral environmental agreements as a solution to a global environmental problem. However, in substantive terms, Cancun's main achievement was to provide a significant stepping stone towards a comprehensive, agreed outcome, in particular by integrating the compromises contained in the Copenhagen Accord into the FCCC process, and by operationalising the institutional promises of the Accord.[22]

4.18 The LCA and KP tracks remain alive with ingenious use of a bridging device to link the two, in the form of an information document containing targets and actions noted by the COP. There was also deliberate ambiguity as to whether this document was referable to the LCA or KP tracks. Across the LCA and KP tracks, the Cancun Agreements effectively took note of documents that did not exist at the time, as pledges on mitigation had been provided under the Copenhagen Accord, and they had yet to be compiled into the information documents that the COP took note of. The pledges so far received fall well below what is necessary to limit temperature rise to 2°C (the so called gigatonne gap).[23]

4.19 There were also some process concerns at Cancun. The COP decision was arrived at on a rather strained use of the term 'consensus'. Bolivia objected strenuously and expressly to the decisions but was overruled. The decisions themselves do little to resolve the three fundamental questions left after Copenhagen: (i) the fate of the Kyoto Protocol; (ii) the legal form and architecture of any future regime; and (iii) the extent of differential treatment between developed and developing States. Many see the system of pledge and review, that now appears to have been endorsed, as markedly less effective in achieving the FCCC objective than legally binding commitments.

4.20 Positive achievements included scaled-up Adaptation Finance (Adaptation Framework and Adaptation Committee), the launch

[22] For the Cancun Agreements, see n. 9 above.
[23] See UNEP, n. 7 above.

of the Green Climate Fund, the launch of REDD+ and the inclusion of CCS in CDM.

4.21 Issues for COP 17 in Durban will thus include:

- The future of the Kyoto Protocol, with Japan, Canada and Russia likely to join the USA outside any future commitment period.
- The extent of differentiation between developed and developing States in relation to mitigation, and related issues on MRV.
- The legal form of any agreement – whether it will be legally binding, and whether it will replace or complement the Kyoto Protocol.
- The architecture of the new agreement – whether it should embody a Kyoto-style prescriptive architecture setting targets to timetables, backed by a compliance system for developed countries, or a Copenhagen Accord style architecture permitting all States to select targets and actions, but requiring transparency in relation to those targets and actions.
- The ambition of the new agreement, given the 'gigatonne gap' between actual pledges and those needed to achieve a rise of only 2°C, let alone 1.5°C.
- A host of other issues, such as:
  - REDD between market mechanisms and human rights/ UNDRIP issues.
  - Agriculture.
  - Bunkers.
  - Finance for adaptation.
  - Loss and damage.

Regional and national initiatives

4.22 The failure to reach any international agreement to address climate change, let alone in a timely manner, has inevitably led to much activity outside the FCCC process. The existence of regulatory or voluntary schemes outside the international framework may at the same time weaken the development of a comprehensive global agreement[24] and be valuable initiatives in their own right.

[24] This may resonate, however, with those who believe the appropriate approach is one that focuses on incremental steps in multiple fora in the right direction. In the words of Harvard economist Robert N. Stavins, 'smaller, practical steps – some of which are

Numerous initiatives exist at regional, national, sub-State and local levels, some complementary to the FCCC and some independent of it. Most interest has been focused on the USA, partly because of its global significance as an emitter, partly because it did not join the Kyoto Protocol and partly because of the intense political and legal battles over the legality or appropriateness of attempts to regulate GHG emissions, exacerbated by deep political policy divisions between the Presidency and Congress.

4.23 Examples of regional or similar schemes include:

(1) The Asia Pacific Partnership on Clean Development.[25] Its focus is expanding private sector investment in clean technology and its partners are the USA, Australia, Canada, India, China, Japan and Korea.

(2) The Regional Greenhouse Gas Initiative ('RGGI'),[26] whereby ten northeastern and mid-Atlantic States of the USA seek to use a cap-and-trade market mechanism to reduce emission in the power sector.

(3) The Western Climate Initiative,[27] involving Canadian provinces and states in the west of the USA, seeking to implement climate change policies at regional level.

(4) The EU Emissions Trading Scheme ('ETS'),[28] which will continue to address climate change even in the absence of an international legally binding agreement.

(5) Of a rather different nature, the Mexico City Pact,[29] a voluntary initiative between 180 cities with a combined population of over 300 million, seeking to implement city-appropriate climate change measures.

The role of markets

4.24 Debate remains intense about the role of markets in the response to climate change, and in particular mitigation. Kyoto provided

occurring outside the United Nations climate process – are going to be more easily achievable, and thus more effective, than holding out for some overarching thunderclap in a global accord'. See Robert N. Stavins, 'Why Cancun Trumped Copenhagen: Warmer Relations on Rising Temperatures', available at http://belfercenter.ksg.harvard.edu/analysis/stavins/?p=913.

[25] www.asiapacificpartnership.org/english/default.aspx.

[26] www.rggi.org/home.

[27] www.westernclimateinitiative.org/.

[28] See Chapter 14, para. 14.08.

[29] www.worldmayorscouncil.org/the-mexico-city-pact.

for market mechanisms as a means to achieve emission reduction, under the clean development mechanism, joint implementation and emissions trading mechanisms. The ETS, which the EU developed around the requirements of the Kyoto Protocol and which is discussed in some detail in Chapter 14, has been beset with difficulties, including in the use of a baseline methodology that created the temptation of overstating past emissions and that, at the first verification date, then created a market crash in May 2006. Recently, the issues have been more about the security and hence integrity of the system in the wake of cyber attacks on national registries. In turn, in the USA, the recent and ongoing battle over the legality of California's cap-and-trade scheme[30] is symptomatic of underlying policy battles over whether regulation is needed at all, and if so whether a carbon tax, trading schemes or other options are the better approaches. The involvement of the market in other aspects of climate change regulation, such as REDD, is opposed by some environmentalists.[31] Nonetheless, the market is generally recognised as having an important part to play in the field of climate change, which has itself been described as 'the greatest and widest-ranging market failure ever seen'.[32]

4.25 The approaches of 'markets' and 'regulation' are highly interdependent. One of the main drivers underlying policy differences on mitigation in the FCCC negotiations are fears that transition to a low-carbon economy in developed nations will give high-carbon economies in developing countries an unfair competitive advantage. The question of incentives for 'clean' technology has as its reverse side the issue of subsidies for fossil fuel use. Whilst the distinction between an investment and a subsidy lies largely in the eye of the beholder, authorities such as the IAEA have advocated the saving of up to $300 billion per annum by abolishing

[30] On 18 March 2011, the San Francisco Superior Court issued its decision in *Association of Irritated Residents* v. *California Air Resources Board*, setting aside and enjoining implementation of the Scoping Plan developed by the California Air Resources Board (CARB) under California's landmark Global Warming Solutions Act of 2006 (AB 32). New Hampshire and New Jersey are just two examples of states which have in 2011 seen legal battles over GHG reduction measures.

[31] Essentially on the grounds that REDD does not adequately protect either forests or indigenous peoples dependent upon them: see 'Forests and REDD', Friends of the Earth, November 2010, available at www.foe.co.uk/resource/briefings/climate_justice_brief_9.pdf.

[32] Stern Review 2006.

fossil fuel subsidies, said to be on course to reach $600 billion by 2015.[33]

4.26 It is sometimes thought that industry as a whole is opposed to climate change regulation on grounds of cost; this is however an over-generalisation. Many sectors of industry and many individuals and corporate players see change to a low-carbon economy as not only a moral imperative but a business opportunity. In this sense their time horizons and ability to innovate and react are much more conducive to change than those of politicians in developed countries. Industry is however generally united in its desire to have a clear and long-term regulatory framework on the basis of which its strategy and investment policy can be shaped.[34] In this it has to date been sorely disappointed.

4.27 It should be noted that trading schemes are not limited to developed countries. For example, in April 2011 China announced plans to introduce emissions trading schemes in six regions by 2013, expanding to a national scheme in 2015 as it attempts to control its rapidly increasing emissions.[35]

Technology cooperation and transfer

4.28 Technology is for obvious reasons key in terms of both mitigation and adaptation, and technological progress is clearly dependent on a number of policy driven factors such as: (i) incentives to invest in relevant technology; (ii) public funding for or investment in such technology; (iii) financial incentives for use of the technology (including renewable energy sources); and (iv) the regulatory 'playing field'.

4.29 A key element in the international negotiations is technology transfer and in particular cooperation and facilitation of transfer from developed to developing countries, although the more 'developed' developing countries are themselves in the forefront

[33] IAEA World Energy Outlook 2010.

[34] See for example *Business Leadership on Climate Change – Encouraging Engagement and Action* (PwC, December 2010).

[35] Reuters, 11 April 2011, citing Sun Cuihua, the vice-director of the climate change department at China's National Development and Reform Commission. Kenya opened Africa's first carbon exchange in March 2011 and Taiwan reportedly intends to launch a carbon trading platform in September 2011.

of technological progress. The main barriers to transfer are funding and intellectual property rights.

The thesis of this book

4.30 'Time and Tide wait for no man'; and neither will they, nor the world's lawyers, await the results of the ponderous FCCC process.

4.31 Of much potential significance is the so-called risk quadrant, whose axes are the future extent of climate change damage and the effectiveness of regulatory response, which may determine whether climate change liability continues to increase in importance. The quadrant is itself 'iterative', as liability or the prospect of liability will drive behaviour and thus influence the content of the risk quadrant. In this regard, 'liability' looks both backwards for redress and forward in terms of its effect on future behaviour.

4.32 Climate change liability has many uses and is relevant to many players. Though in traditional manner it is seen as either a financial liability for industry or a string to the bow of environmentalists, knowledge of liability is a corporate and policy tool, relevant to risk management, valuations and business planning. It is relevant to policymakers as they strive for an informed view of consequences of action or inaction on various issues. And, to conclude this policy chapter with a celebrated legal quote, applicable to all the actors referred to above: 'Be you ever so high, the law is above you.'[36]

[36] Thomas Fuller, as quoted in *Gouriet* v. *Union of Post Office Workers* [1977] QB 729, per Lord Denning (decision reversed on appeal).