THE FUTURE OF THE INTERNATIONAL CLIMATE CHANGE REGIME AND POTENTIAL IMPACTS ON STATES THAT MIGHT REQUIRE A DOMESTIC LEGAL RESPONSE: A REFLECTION BASED ON SCENARIOS

Javier de Cendra de Larragán, University College London

Available at: https://works.bepress.com/javier_decendradelarragan/1/
Abstract: (165 words)
This paper reflects on the potential usefulness of scenarios to facilitate thinking on the evolution of international climate change law in the next twenty years. One possible application of this tool is to help identify potential impacts stemming from international climate change law upon a number of key areas of interest for national governments that might require a legal response. While the paper does not build complete scenarios, it does perform a ‘state of science’ review that can pave the way for the development of scenarios. On the basis of that review, covering an analysis of scenarios prepared within other disciplines, key underlying trends in international law, international climate change law and international climate change negotiations, the paper sketches scenarios representing plausible developments of international climate law with a view to identify impacts upon key areas that may require responses within domestic law. It concludes by sketching some elements of a domestic response to the main impacts that might arise from international climate change law.

Keywords: scenarios, foresight, climate change law, impacts, domestic legal responses
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1. Thinking about the future of the climate change regime and potential impacts on domestic law through scenarios

Governments have a duty of care towards their citizens, citizens from other countries and those who will live in the future. Irrespective of the precise ethical and legal contours of that duty, for governments to be in a position to appropriately exercise it, they need to be proactive in identifying what the future might bring, so that they can prepare adequate strategies. One tool often used to think about the future is through the building of scenarios. Scenarios are stylized yet plausible representations of the future based on sets of internally consistent assumptions about key relationships in a system, processes of change or desired end-states. They can be used, e.g., to identify worst-case possibilities that demand particularly intensive public policy interventions. Scenarios can take either a normative or exploratory approach. Exploratory approaches take past trends as their starting point in order to project plausible futures. They have been dominant in the global change assessments over the last decade, including those made by the IPCC and the Millenium Ecosystem Assessments.

Scenarios are used in many contexts, including of course climate change, where they have been built to build future emission pathways and associated impacts, as well as to think about alternative policy pathways. However, scenarios prepared so far in the context of climate change have not included a legal/regulatory dimension. Likewise, legal literature exploring the development of the climate change regime does not generally use scenarios in order to think about the evolution of the regime.

A question thus arises as to whether and how scenarios could be used in order to reflect on the development of the international climate change regime. In particular, could scenarios be built better understand the consequences that could attach to each scenario, in order, e.g., to develop adequate legal and policy responses? At first sight, doing such a thing would seem useful because the way in which the international climate change regime evolves in the next years will have consequences for the rate of increase of greenhouse gases in the atmosphere, the associated impacts on human societies and on the environment, and the legal and policy responses that countries will have to formulate. The key observation here is that not only climate change will have impacts to which states need to adapt, but also legal and policy responses to climate change generate impacts that may require adaptive responses. It is becoming increasingly clear that the shape and effectiveness of the international climate change regime will generate impacts upon a number of key areas of interest for governments (i.e., people, health, physical resources and commodities, global governance, overseas infrastructure, national security, global positioning and competitive advantage of firms, knowledge, technology and skills, financial services and insurance, and social/ethics)\(^2\), and those impacts will require effective responses in law and policy. Thus, building scenarios may cast light on the evolution of the climate change regime in order to plan accordingly. Indeed, by helping to formulate ‘what if’ questions about the evolution of the international climate change, scenarios might facilitate the task of reflecting upon changes to domestic legal regimes that would be necessary to develop robust responses to that evolution. In that way consistency and coherence between the international and domestic regimes would be increased.

However, it could be retorted that building scenarios does not seem a very useful strategy to support legal analysis, since it is mainly aimed at identifying broad trends rather than at engaging with the

\(^2\) These were the areas that were covered by a project led by the UK’s FORESIGHT Programme titled ‘International Dimensions of Climate Change’ http://www.bis.gov.uk/foresight/our-work/projects/current-projects/international-dimensions-of-climate-change Last accessed 7 June 2011.
granularity of legal frameworks. Indeed, to try and determine in any detail how the law might look like twenty years from now might look heroic at best, and hopeless at worst. However, when there is a large degree of uncertainty about the possible evolution of law—in this case of the climate change regime, which is something this paper argues for—then using scenarios might offer some help in thinking in a detached manner about alternative yet plausible pathways, thereby assisting countries to develop appropriate responses. The point made here is that a scenario approach to the evolution of the international climate change regime can complement more normative approaches on the ideal features of that regime.

In doing this kind of scenarios based work, a number of challenges immediately arise which will also shape the content of this paper:

First, the development of scenarios is a very resource intensive task, which goes beyond the scope of this paper and the capacity and expertise of this author. Luckily, there is a research tool that caters for this limitation. Generally, in the work leading towards the development of scenarios, a prior step is to undertake ‘state of science’ reviews, which aim at exploring specific areas in advance of future work\(^3\), and which seek to identify key underlying trends and how they might play out in terms of future impacts.\(^4\) One aim of this paper is precisely to conduct this type of state of science review.

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\(^3\) The FORESIGHT website defines a State of science reviews as a tool to ‘explore specific areas in advance of futures work. They are written by experts in each field and address developments that inform the chosen futures topic. The reviews can be brief and used as an aid to select areas of investigation’.

\(^4\) These state of science reviews, as well as the formal development of scenarios, are something that can be entrusted to experts in the field, which will use different techniques, including literature reviews, interviews and expert judgment to assess which future scenarios might be thinkable, which might be more realistic, which impacts might arise, and which governmental responses might be adequate. However, it is necessary to be clear that expert judgment, while useful in scoping quickly the issues, should aim at finding and highlighting the areas of knowledge, the areas covered by
Second, to the extent this paper uses scenarios, it relies upon scenarios developed within other scientific disciplines, and will use them to inform thinking about plausible legal developments that would be in consonance with the findings generated by those scenarios.

Third, in thinking about the impacts that the future international climate change regime might have upon key areas of governmental interest that might require a legal response, it is necessary to think to what extent that future can be influenced by the strategy of any country acting individually. To the extent that this is not a likely possibility, then those developments may have to be considered as an independent variable, to which countries have to adapt. This is the approach that will be taken in this paper, which will take England as the country of analysis.\footnote{This choice was included in the terms of reference of the FORESIGHT project. Nevertheless, much of the analysis and the conclusions could apply to other countries. I would like to thank Prof. Catherine Redgwell for making this observation.}

Fourth, it is beyond of the scope of this paper to carry out a thorough analysis of potential impacts on all the areas mentioned above. Rather, the paper will highlight those impacts that are considered to be the most important (or less understood) ones. The key impacts generated by developments in international climate change law will require associated (legal) responses from countries, which will however not be considered in detail here. In addition, this paper will not assess in detail how other areas of international law, e.g. trade law, the law of the sea, space law and humanitarian/refugee law, might evolve to cope with developments in international climate change law and with the impacts of climate change itself. This is nevertheless an important issue that should be subject to further research.

uncertainties, and the possibility that there are unknown unknowns. Ultimately, it is for policy makers to make decisions about what to do in respect of each of the scenarios laid out by the experts.
In sum, this paper is an attempt to identify, on the basis of what we know about the current international climate change regime, of its likely evolution, and of certain other relevant variables within the international policy and law domain, some of the potential impacts generated by the international climate change regime upon key sectors, with the aim of assisting policy making therein. At the same time, it is hoped that, by developing a conceptual framework that encourages systematic thinking about the future of the climate change regime and its potential implications for domestic (climate) law and more generally for issues of (environmental) equity and justice, the paper will be of use for academics and practitioners.

The reminder of this paper is organized as follows. After this introduction, section 2 will start by briefly discussing the core findings arising from the emissions scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report (4AR), as well as potential impacts of selected subsequent developments, in order to better assess the nature and extent of the challenges that climate change law will have to confront in the next years. Then it will look in more detail to global scenarios, including scenarios on global governance, in order to ascertain global trends that may affect the evolution of international climate change law. Section 3 will examine underlying trends within international law generally and international climate law more in particular, in order to allow for the sketching of a number of scenarios on possible future pathways of the international climate change regime. Section 4 will sketch five such scenarios. Section 5 will consider the main impacts that legal developments under those scenarios could have upon the key areas of concern. Section 6 will highlight possible elements of a domestic (UK response) to each of the scenarios depicting possible futures of international climate change law. Section 7 will conclude by providing a number of recommendations.
2. Existing scenarios relevant for the international climate change regime

In order to reflect about the future of the climate change regime, it is useful to start by summarizing what we know from the development of scenarios within other disciplines that are relevant for lawmaking processes regarding climate change. This includes chiefly the work done by the IPCC, several UN agencies, governments and research institutions.

2.1. Climate change related scenarios

The relevance of scientific findings in the evolution of (international) environmental law is well documented. In the context of climate change, the reports of the IPCC have had an increasing importance in the tone and content of the negotiations that states carry within the auspices of the United Nations. The IPCC has developed emission scenarios to try and estimate the volume of greenhouse gas emissions that would arise from different developmental paths. It has then developed a ‘reference’ scenario of future emissions that assume no policy interventions to reduce emissions, in order to determine the magnitude of additional emissions reductions needed to stabilize atmospheric carbon-dioxide concentrations at various levels (the latter are called stabilization scenarios). It is on these ‘additional’ reductions and stabilization levels that policy-makers have focused most attention. Table 1 describes those scenarios, which describe future possible worlds, and which the IPPC considers equally sound. Table 2 shows alternative stabilization scenarios.

Table 1. Emission scenarios from the IPCC Special Report on Emission Scenarios
Table 2. Post-TAR Stabilization scenarios

<table>
<thead>
<tr>
<th>Category</th>
<th>Radiative forcing (W/m²)</th>
<th>CO₂ concentration (ppm)</th>
<th>CO₂-eq concentration (ppm)</th>
<th>Global mean temperature increase above pre-industrial at equilibrium, using “best estimate” climate sensitivity (°C)</th>
<th>Peaking year for CO₂ emissions</th>
<th>Change in global CO₂ emissions in 2050 (% of 2000 emissions)</th>
<th>No. of assessed scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2.5-3.0</td>
<td>350-400</td>
<td>445-490</td>
<td>2.0-2.4</td>
<td>2000-2015</td>
<td>-85 to -50</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>3.0-3.5</td>
<td>400-440</td>
<td>490-535</td>
<td>2.4-2.6</td>
<td>2000-2020</td>
<td>-60 to -30</td>
<td>18</td>
</tr>
<tr>
<td>III</td>
<td>3.5-4.0</td>
<td>440-485</td>
<td>535-590</td>
<td>2.8-3.2</td>
<td>2010-2030</td>
<td>-30 to +5</td>
<td>21</td>
</tr>
<tr>
<td>IV</td>
<td>4.0-5.0</td>
<td>485-570</td>
<td>590-710</td>
<td>3.2-4.0</td>
<td>2020-2060</td>
<td>+10 to +40</td>
<td>118</td>
</tr>
<tr>
<td>V</td>
<td>5.0-6.0</td>
<td>570-660</td>
<td>710-855</td>
<td>4.0-4.9</td>
<td>2050-2080</td>
<td>+25 to +85</td>
<td>9</td>
</tr>
<tr>
<td>VI</td>
<td>6.0-7.5</td>
<td>660-790</td>
<td>855-1150</td>
<td>4.9-6.1</td>
<td>2060-2090</td>
<td>+90 to +140</td>
<td>5</td>
</tr>
</tbody>
</table>

Total: 177

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a) The understanding of the climate system response to radiative forcing as well as feedbacks is assessed in detail in the AR4 WGI Report. Feedbacks between the carbon cycle and climate change affect the required mitigation for a particular stabilization level of atmospheric carbon dioxide concentration. These feedbacks are expected to increase the fraction of anthropogenic emissions that remains in the atmosphere as the climate system warms. Therefore, the emission reductions to meet a particular stabilization level reported in the mitigation studies assessed here might be underestimated.

b) The best estimate of climate sensitivity is 3°C [WG I SPM].

c) Note that global mean temperature at equilibrium is different from expected global mean temperature at the time of stabilization of GHG concentrations due to the inertia of the climate system. For the majority of scenarios assessed, stabilization of GHG concentrations occurs between 2100 and 2100.

d) Ranges correspond to the 10th to 90th percentile of the post-TAR scenario distribution. CO₂ emissions are shown so multi-gas scenarios can be compared with CO₂-only scenarios.
On the basis of different scenarios for the evolution of mitigation, the IPCC has worked out the impacts associated to each one of them for each system, sector and region. The IPPC concludes that magnitude of the impacts will vary with the amount and timing of climate change and, in some cases, the capacity to adapt. Whilst all regions of the world will be affected by climate change, the worst affected regions will be the Arctic, Africa—in particular the sub-Saharan region due to their low adapting capacity—small islands due to high exposure to risk of sea-level rise and increased storm-surges, and Asian mega-deltas, due to large populations and high exposure to sea-level rise, storm surge and river flooding. In general, the higher the concentration levels, the higher and more widespread the impacts.\(^6\)

**Table 3. Key impacts as a function of increasing global average temperature change**

Of course, scenarios are built on a number of assumptions, which can be—and are in fact—challenged over time. Whilst changes in the underlying assumptions do not necessary change the scenarios, they nevertheless highlight the nature and limitations of scenario-building exercises. For instance, relevant developments which have taken place after the release of the 4 AR of the IPCC include: (i) Recent revisions to stabilization scenarios suggest that substantially lower stabilization levels would seem to be required to avoid dangerous climate change; (ii) increasing doubts about the assumptions employed by the IPCC on the rate of ‘spontaneous decarbonization’, which are

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considered by some as unrealistic at best and dangerous at worst; (iii) increased skepticism among the public at large about the credibility of climate change science after the scandals regarding the behavior of scientists at the university of East Anglia and the mistakes of the IPCC in its 4AR; doubts about the usefulness for policymaking processes of low carbon and energy scenarios.

2.2. Putting climate change scenarios in a broader context

2.2.1. Global environmental assessments

Climate change is just one of the challenges which the international community will have to confront in the 21st century. In the last few years, a large number of global environmental assessments have been produced to assess other challenges for sustainable development. The picture painted by these assessments is rather grim, with all goals set by the international community (on issues such as reduction of extreme hunger and poverty, loss of biodiversity, and avoidance of dangerous anthropogenic climate change) likely to be missed. An important unanimous conclusion arising from these assessments is that rapid action is needed on all these fronts, and that it will have to come from global coalitions. However, none of these assessments

11 These include: UN Environmental Programme, ‘Global Environment Outlook 4: Environment for Development (2007); IPPC Climate Change 2007: Fourth Assessment Report (2007); OECD, ‘The Environmental Outlook to 2030’, 2008; IAASTD, ‘International Assessment of Agricultural Science and Technology for Development (2008). The IAASTD is supported by amongst others the UN Food and Agriculture Organisation (FAO), the UN Development Programme (UNDP), the UN Environment Programme (UNEP) and the World Bank.
provide any insights on how such coalitions should be developed and how they could look like. For some insights on these questions we need to turn to other type of scenarios.

2.2.2. Policy-based scenarios and the place of climate change therein
Many scenarios have been built to think about the evolution of global governance in the next twenty years, and these are also relevant for legal thinking on climate change. At the same time, the impact that climate change can have on the development of global governance scenarios has received increased attention. Both issues will be considered here:

In relation to the future of global governance, there is some agreement in the literature on the fact that the international system as constructed following the second world war will be almost unrecognizable by 2025 owing to the rise of emerging powers, a globalizing economy, an historic transfer of relative wealth and economic power from West to East, and the growing influence of non-state actors. First, the current transfer of global wealth and economic power from West to East is without precedent in modern history, as a result on the one hand of the continued economic growth in Brazil, Russia, India and China (the BRIC countries—and on the other hand of the loss of relative power by Europe, which will remain much richer in per capita terms than BRIC countries. Second, the transnational agenda will be strongly dominated by concerns over the


14 Which suggests that they will match the original share of G-7’s share of global GDP by 2040-2050. In particular, China will have more impact on the world over the next 20 years than any other country, and if current trends persist, it will have the world’s second largest economy by 2025 and will be a leading military power, the largest importer of natural resources and the biggest polluter. India will also enjoy rapid economic growth and will strive for a multipolar world in which it is one of the poles. Hence, the relations between China and India are crucial in determining the future global order. Second,
availability of natural resources such as energy, food and water, mainly due to unprecedented global economic growth. According to the International Energy Agency (IEA) the world is in the midst of a fundamental energy transition away from oil toward natural gas, coal and other alternatives, which is independent from climate change considerations (although the latter considerations make it even more urgent\textsuperscript{15} and which will have profound and lasting consequences for countries heavily reliant on oil and gas exports. The National Intelligence Council has cautioned that, while new technologies might be able to provide solutions, they will not be fully deployed to the scale needed until to 2025.\textsuperscript{16} In relation to food, it is considered that demand will rise by 50 percent by 2030, as a result of growing world population, rising affluence, and the shift to Western dietary preferences by a larger middle class\textsuperscript{17}; lack of access to stable supplies of water will reach critical proportions, particularly in poor countries and for agricultural purposes, with more and more states facing food and water shortages by 2025; terrorism, nuclear proliferation and conflict will remain key issues even as resource issues move up on the international agenda. Nevertheless, ideological conflicts akin to those that existed during the cold war are unlikely. Third, it is very likely that the ongoing global trend toward greater diffusion of authority and power will accelerate due to the emergence of new global players, the worsening institutional deficit, potential expansion of regional blocs, and enhanced strength of non-state actors and networks. The multiplicity of actors on the international scene could add strength—in terms of filling gaps left by aging post-World War II institutions—or further fragment the international system and incapacitate international cooperation. The diversity in the type of actors raises the likelihood of fragmentation occurring over the next two decades, particularly given the wide array of transnational challenges facing the international community. In


\textsuperscript{16} National Security Council, 2008 (n.14). The IPPC 4AR is somewhat more optimistic about this. See IPCC Synthesis Report (n.7) at p. 68.

\textsuperscript{17} National Security Council 2008 (n.14).
particular, the BRIC countries will have some degree of freedom to follow their own agendas rather than fully adopting Western norms. They are also likely to want to preserve their policy freedom to maneuver, allowing others to carry the primary burden for dealing with such issues as terrorism, climate change, proliferation, and energy security. Existing multilateral institutions—which are large and cumbersome and were designed for a different geopolitical order—will have difficulty adapting quickly to undertake new missions, accommodate changing memberships, and augment their resources.

In relation to the impacts of climate change on global governance, Campbell et al. have developed three scenarios. These scenarios (which are different than the scenarios considered by the IPCC), include different levels of impacts of climate change, from expected to severe to catastrophic. The realization of the first scenario is seen by the authors as unavoidable, and will force the international community to undertake deep changes in governance to deal with the ensuing challenges. This could include, for instance, the establishment of a Climate Change Security Council. Whilst this idea has been advanced by some legal authors, there is no agreement about its feasibility, particularly given the extremely slow progress in reforming permanent membership of the UN Security Council (UNSC) and the suspicions aroused by the UK when it suggested introducing climate change as a security issue in the UNSC agenda. Another issue would be the need to deal with potentially very large flows of climate refugees, which will need to be recognized in some way


under international law. The realization of the latter scenario, to which the authors attach a reasonable likelihood, would mean that humankind enter into an ‘Age of Survival’. States would turn inwards and there would be a massive economic recession, bringing living standards back to those of the early 20th century, systematic state failures, wars, and massive deaths.

The upshot of the foregoing analysis is to show the huge challenges that international climate change law will face in the next years. Not only is climate change starting to generate real impacts upon people and ecosystems, but it needs to be placed on the one hand in the context of other massive and urgent environmental and natural resource related pressures, and on the other hand against the background of a very different world order. How could all these developments impact the development of climate change law? The next sections will lay down the foundations to sketch a preliminary answer to the central question of this paper.

3. Identifying some underlying trends in international (climate) law

Since exploratory scenarios are based on the examination of past trends in order to think about future developments, this section will do precisely that from a legal perspective. It will seek for trends by looking at key literature on international law, literature assessing the climate change regime, literature assessing the international climate change negotiations, and literature exploring new modes of climate change governance. Given the extension of these different literatures, and the goal of this exercise, a cursory analysis based on a selection of sources is unavoidable.


3.1. Underlying trends in the international law literature

There have been efforts to reflect on how international law could and should evolve in the near future. Most of this literature starts by observing that the still dominant Westphalian framework to international law is increasingly unable to describe and explain inter-state relations. A new world order is emerging, which is not yet totally understood. Among the most important changes that sign this transition are the two world wars, the dynamics of decolonization, and the various globalizing tendencies that are increasingly encouraging regional and global institutional arrangements for managing complexity and various forms of fragility, especially environmental and economic. Globalizing trends and their impacts on understandings of international law have received particular attention by international lawyers. Some have reacted by reformulating theories of international law that challenge prevailing realist assumptions. Others have argued that growing networks of international institutions are giving way to a nascent global state. Yet others have focused on particular emerging patterns of global governance that come from western countries, that could be described as global administrative law, and that would focus, from a normative perspective, on principles of administrative law that foster democracy at global level. Last but not least, some focus on the challenges that have to be overcome for international law to make a reality its ideals of world peace and human welfare, at a point in time where this seems to be


more than mere utopia. The latter in particular point out that trends should not be interpreted in a
deterministic fashion, and how international law will evolve in the future depends on (moral and
ethical) choices made now. Indeed, moral and ethical choices made by representatives of states will
also impact the evolution of international climate change law, to which we now turn.

3.1.2. Underlying trends in the legal and economic literature regarding the climate change
regime

The current climate change regime has progressively evolved over the last 20 years, and there is a
large (and largely normative) body of literature trying to assess the current regime and to propose
possible improvements to it. This section will canvass the legal and economic aspects of that
literature.

To start with, there is broad agreement within the economic literature that, since climate change is a
global problem, a global (or at least multilateral) solution is required in order to prevent free riding
and enabling meaningful action. Moreover, given the relatively high costs of substantial mitigation,
economic instruments should form a crucial part of the regulatory landscape. From this starting
point, economists go on to examine the main strengths and weaknesses of the present regime.
Strengths include the reliance on market based instruments for mitigation, the flexibility afforded to
developed country parties to comply with their mitigation targets in any way they want, and the


27 Economic work in climate change is pervasive and has sought from early on to influence the development of the
regime. Moreover, the United Nations Framework Convention on Climate Change and the Kyoto Protocol are heavily
reliant on economic concepts and instruments. Hence international climate change law has a strong economic
component that has to be taken into account here.


29 SM Olmstead, R N Stavins, ‘Three Key Elements of post-2012 international climate change policy architecture’,
appearance of fairness in that the regime imposes mitigation targets only upon the wealthiest
countries and those most responsible for past emissions. Weaknesses identified include the focus of
mitigation targets on a reduced number of countries, absence of targets on some of the world’s
leading emitters (namely China and India), international emissions trading takes place among
governments, which are not cost-minimizing entities, the offsetting nature of the CDM, and the
short-term focus of the Kyoto Protocol—with five years commitment periods—which is not in line
with the long-term nature of climate change. In the light of these findings, many economists have
made suggestions to address all these issues.

There is also a very substantial amount of legal literature that cannot be made full justice within the
confines of this paper. One (large) strand of that literature has focused on the barriers to the
adoption of a comprehensive multilateral agreement on climate change, which from the perspective
of lawyers is often seen as the ideal solution. Among the achievements of the current regime,
Depledge and Yamin identify the generation of momentum, the achievement of reciprocal deals
among states, institutional learning, and the setting up of reporting and review obligations for
developed countries. Among the weaknesses, they point to dysfunctional north-south politics, the
complexity of the regime, unwieldy decision-making processes, and slow learning due to the
absence of an independent technical body that could either respond quickly to requests for analysis
or provide policy advice in a direct fashion. Depledge and Yamin go on to suggest some possible

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30 Ibid.
31 A large amount of literature can be consulted in the website of the Harvard Project on International Climate
Agreements.
http://belfercenter.ksg.harvard.edu/project/56/harvard_project_on_international_climate_agreements.html
32 J Depledge, F Yamin, ‘The Global Climate Change Regime: A Defence’, in D Helm, C Hepburn (eds), The
improvements to the current regime. But it is important to note that these authors consider that a
global regime is not only the sole politically realistic alternative to dealing with the (global) climate
change problem, but moreover that the climate change regime is inexorably headed towards an
expanded, permanent structure, akin to the World Trade Organization.

A closely related approach in the literature has been to assess the regulatory consistence of the
current climate change regime. The starting point is that regulatory schemes may fail even if they
would have political support, because of lack of coherence among its structural, compositional, and
administrative elements. There are of course many levels of legal and regulatory coherence,
including systemic, policy, and instrumental coherence. Feaver and Durrant have assessed the
current climate change regime and conclude with a rather negative judgment on its degree of basic
coherence.33 Systemic coherence is lacking because political negotiations do not reflect yet
scientific findings; policy coherence is lacking because market instruments are designed to protect
economies from the negative impacts of environmental policies rather than to achieve substantial
emission reductions; and instrumental coherence is lacking because the institutional and
administrative structure of the regime is extremely complex and functionally designed to suit
market instrument needs, which themselves are misaligned with the fundamental goal of climate
change law.

Other authors start from a broader viewpoint by claiming that the current international climate
change regime has to be understood and placed in the light of the preexisting, and highly
fragmented, international (environmental) law context, and explores ways to address potential

33 D Feaver, N Durrant, ‘A Regulatory Analysis of International Climate Change Regulation’, (2008) 30 Law and
Policy 394.
interactions among different regimes.\textsuperscript{34} Van Asselt et al. explore the possible legal nature, content and functions of the principle of systemic integration. Whilst this principle would probably have first a political nature—in order to avoid conflictive integration among regimes—it could overtime evolve into a principle of international law.

In this quest for increased integrity and consistency within the international climate change regime and within international law more broadly, some authors have been proposing the creation of an International Environmental Organization (IEO) with comparable breadth and responsibility than the WTO or the International Labour Organization (ILO). An IEO could help mitigation procedural and substantial fragmentation by bringing together different treaties under an umbrella agreement and by creating an overarching institution that can enunciate agreed principles, rule-making procedures, dispute settlement and effective enforcement and compliance procedures.\textsuperscript{35} An IEO would also remedy the inability of current systems of international environmental law to cope with complex global problems such as climate change. However, it must be noted that many commentators are either skeptical that an IEO will ever exist or expressly against it.

Finally, some law and policy scholars have attempted to assess the current climate change regulatory framework from an ethical perspective. In legal and philosophical works, one important starting point is the recognition that many theories of distributive justice exist, diverging on the subjects, the objects and the criteria for the distribution. International relations are often seen from a realist perspective where states are only concerned with present generations of people within their


borders, a view that is challenged by those defending cosmopolitan views of justice. Depending on the view of distributive justice adopted, assessments of the current regime will be very different. Adopting a virtue ethics perspective, the current regime is found wanting in many respects by authors such as Brown. He has analyzed the positions of most countries in the international negotiations at Copenhagen (see below for a closer analysis of those negotiations) and has found that many of them are crudely based on furthering perceived national interests with little or no concern for the needs of other countries (Brown 2010).

After this broad overview of the literature on the international climate change regime, it is fitting to look at the past two years of international climate change negotiations to get a sense of the underlying trends therein, in order to reflect on how might the climate change regime evolve in the next twenty years.

3.1.3. Underlying trends in the recent literature on the international climate change negotiations: from Bali to Cancun and beyond

In 2007, the international community gathered in Bali under the UNFCCC and the Kyoto Protocol in order to kick-start the post-2012 climate change regime. In Bali, the parties crafted two key documents, the Bali Action Plan, crafting the architecture of the future climate change regime, and the Bali Road Map, setting out the work agenda to achieve agreement at COP-15 in Copenhagen. The Bali Action Plan envisaged a global climate change agreement based on a number of key pillars: (i) a shared vision on mitigation; (ii) mitigation commitments from both developed and developing countries; (iii) a clear and stable regulatory framework governing transfers of financial


37 I am extremely grateful for the detailed comments provided by one reviewer on the development of the international climate change negotiations. Any shortcomings and mistakes remain my own.
resources and technology; (iv) strong attention to the adaptation needs of developing countries, and (v) a strong compliance regime at international level.

From the outset, it became clear that different parties had different expectations as to the outcome of the process, and this was reflected throughout the negotiations up to the end of COP-15, held in Copenhagen in 2009, and which produced the so-called Copenhagen Accord. While the EU had been keen all along upon agreeing on a legally binding and comprehensive international regime covering all elements of the Bali Action Plan (mitigation, adaptation, financial and technological transfers), the G-77 was focusing on securing an amendment of the Kyoto Protocol limited to providing for a second commitment period. The G-77 was furthermore split on the question whether the Bali Action Plan should lead to a legally binding outcome, with AOSIS countries in favour by China, India and Brazil opposed to anything other than COP decisions. The USA was at that time ambivalent about the outcome. These divisions, together with concerns about the procedural irregularities in the negotiations within COP-15 meant that states meeting therein merely managed to ‘take note’ of the Copenhagen Accord. This obviously meant that the legal value of that document was lower than that of a COP decision. Nevertheless, the text of the Accord became an annex to COP decision 2/CP.15, which made possible for the Secretariat to administer pledges by signatories to the accord, and for its text to be fed into future negotiation texts.

How has the Copenhagen Accord been judged by commentators? Starting on a positive note, it has been argued that the Accord embraces the fundamental issues that a future international climate change regime needs to tackle: a long-term shared vision on mitigation (with a mention to limiting the global average increase in temperature since the start of the industrial revolution to 2 degrees Celsius and even considering increasing this target to 1.5 degrees), action by developed and

developing countries, transparency in monitoring, reporting and verification (MRV), and scaled up financial transfers from developed to developing countries. All this would represent a substantial improvement vis-à-vis the Kyoto Protocol. Some have gone as far as to consider the Copenhagen Accord the best of all possible outcomes. \(^{39}\) Rajamani has rightly noted that the Accord creates principled expectations of the states that have negotiated it, and has managed to get endorsement by 138 states (Rajamani 2010).

On a more negative note, the Accord was rather vague in relation to all its elements, and moreover it was not clear at the moment of its adoption how it could be linked to the UNFCCC process. It indeed quantifies targets for developed countries in Appendix 1, while actions of developing countries are less precisely laid down. \(^{40}\) However, it does not state how the burden will be shared among countries, does not indicate a benchmark from which the 2 degrees increase is to be measured, fails to prescribe a peaking year or time frame, does not specify the framework regulating North-South transfers of financial resources \(^{41}\) and, although it sows the seeds of a future MRV regime, it does not develop it to any sensible extent. Most problematic is the underlying stance of both developed and developing countries. While the former have made their association with the Copenhagen Accord conditional upon developing countries making ‘comparable’ efforts, developing countries insist upon the voluntary—and based on external support—nature of their actions. As Rajamani notes, these conditions could lead to an unraveling of the finely balanced compromises reached in the Accord leading to the eventual dissolution of the entire regime (Rajamani 2010).


\(^{40}\) UNFCCC/KP/AWG/2010/INF.2.

In sum, the literature studying the outcome of COP-15 has illustrated four specific and deep problems running within the UNFCCC framework:

- The very large number of countries involved
- The widely varying degrees to which these countries contribute to and are affected by the problem to be addressed
- The polarization between economically developed and developing nation
- The rules for the adoption of decisions favor procrastination and lead to paralysis.

After COP-15, there was a period of reflection before preparations for COP-16 in Cancun were initiated. Much was at stake, particularly the credibility of the UNFCCC as the main forum for climate change negotiations. Against the background of the process and outcome of Copenhagen, salvaging the UNFCCC regime was the central concern of the Mexican delegation and indeed of all other delegations. From this perspective, Cancun has been considered a qualified success, since it fleshed out to some extent the framework laid down by the Copenhagen Accord—while remaining rather vague, brought its content formally into the formal negotiations, and paved the way for further progress by bringing renewed confidence on the possibility of reaching an agreement in the future\textsuperscript{42}. At the same time, Cancun has arguably increased the level of uncertainty about the future shape—and effectiveness—of the international climate change regime. To start with, the Cancun Agreements are still rather vague on many crucial points, including on targets, financial mechanisms, sectoral mechanisms, and the precise functioning of REDD+; moreover, there is no

\textsuperscript{42} The Cancun agreements are laid in two decisions: Decision 1/CP.16 FCCC/CP/2010/7/Add.1, and Decision 1/CMP.6 FCCC/KP/CMP/2010/12/Add.1. For an in depth analysis of the Cancun Agreements, with an assessment of what they might mean for the future of the international climate change regime, see L Rajamani ‘The Cancun Climate Agreements: Reading the Text, Subtext and the Tea Leaves’, (2011) 60 International and Comparative Law Quarterly 499.
agreement yet on the legal nature of the post-2012 regime, and a number of very different alternatives remain possible (including a top-down approach following the model of the Kyoto Protocol and a bottom-up approach as introduced at Copenhagen)\(^{43}\); in addition, the UNFCCC is no longer seen as the ‘only game in town’ to hold climate change negotiations, given, the appearance of many other forum such as the Major Economics Forum and the G-20 (see below), and the engagement of many actors at international, regional, national, sub-national and local level in what has come to be known as multi-level climate change governance; last but not least, the great divide between developed and developing countries on how to share the burden of mitigation and adaptation continues to cast a long shade over the international negotiations. The next section briefly canvasses some salient issues of these developments in order to throw some light on the evolution of the climate change regime.

### 3.1.4. Emerging models of climate change governance

Much effort has been made to understand the current and future evolution of global climate change governance. The starting point is to note that the international climate change regime is moving away from a top-down, target and timetables approach, towards a more complex architecture that combines long-term global targets with bottom-up proposals for action developed by states together with estimations of financial and technical needs to implement them, and all this embedded within a multi-level governance framework in which actors engage in new and dynamic forms of collaboration among themselves and with non-state actors in accordance with their own perceived interests and needs. Whilst this complexity is not a direct consequence of COP-15, it was accelerated by it. For instance, after Copenhagen, countries such as the UK started to move their attention towards alternative negotiation forums, such as the Major Economies Forum and the G-20.

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\(^{43}\) Although authors such as Rajamani consider that the Kyoto Protocol is essentially doomed, and only few of its essential elements will be incorporated into the future regime. Ibid. See also on this issue D Bodansky, ‘A Tale of Two Architectures: The Once and Future U.N. Climate Change Regime’ (2011), SSRN.
Whilst the EU remains committed to the UNFCCC\textsuperscript{44}, it has at the same time suggested that the UNFCCC might not be the adequate place to generate agreement about the development of a global carbon market, and that alternative fora should be explored.\textsuperscript{45}

Scholars have taken these developments reflect on potential consequences for the future of the international climate change regime. Some have explored other venues that could work as either alternatives or complements to the UNFCCC and which would rely to some extent on international law.\textsuperscript{46} Prime examples are multilateral groups such as the G8+5 and the G20, the Major Economies Forum on Energy and Climate\textsuperscript{47} as well as action-oriented partnerships such as the Asia-Pacific Partnership on Clean Development and Climate, the Renewable Energy and Energy, the Methane to Markets Partnership, the International Partnership for a Hydrogen Economy, the Carbon Sequestration Leadership Forum, the Global Nuclear Energy Partnership and the International Thermonuclear Experimental Reactor (ITER). Also, there are examples of bilateral partnerships that seek to advance specific projects that leverage common areas of interest. These would include the America’s Strategic and Economic Dialogue with China, the U.S.-India Global Issues Forum, and several partnerships between the EU and developing countries, for instance to promote carbon capture and storage in China. Last but not least, development banks and NGOs are taking concrete examples to promote the transition towards a low-carbon economy, for instance through specific Funds that work as public private partnerships and through voluntary carbon trading schemes.

\textsuperscript{44} European Commission, Communication on ‘International climate policy post-Copenhagen: Acting now to reinvigorate global action on climate change’, COM2010)86 Final, 4.

\textsuperscript{45} Ibid, 12.

\textsuperscript{46} PJ Dobrianski, V C Turekian, ‘Climate Change Policies: Many Paths Forward’, (Harvard Project on International Climate Agreements, 2010).

\textsuperscript{47} Created by the US and bringing together Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, South Africa, the United Kingdom, and the US.
Stavins has suggested focusing on alternative approaches such as the MEF. An advantage is that these countries and regions account for some 90 per cent of global emissions. Among the disadvantages one can count the risk that the move may create concern among other (excluded) countries, may not solve totally leakage, and that the MEF is currently not recognized by its own participants as a forum for negotiating legally binding agreements. Another option would seem to be the G-20 ‘the group of twenty finance ministers and central bank governors’ established in 1999 to bring together the leading industrialized and developing countries to discuss key issues. It brings together all the nations included in the MEF plus Argentina, Saudi Arabia and Turkey. Since the G-20 is a venue to discuss economic and finance policies, it might bridge one of the divides in the climate regime and contribute to further progress. Yet another option would be to focus on developing bilateral and multilateral approaches on specific issues, such as on technology cooperation (including issues such as carbon capture and storage (CCS). This approach can however generate perverse incentives on developing countries, and might larger transaction costs than multilateral treaties.

For all these reasons, the literature seems to agree on the unlikelihood that any of these venues will fully supplant the UNFCCC, which moreover enjoys wide support and international legitimacy, which are key requirements for the implementation of treaties. Nevertheless, given its current problems, one possible development is towards a set of overlapping regimes or ‘customized multilateralism’ that would address those problems. Some authors have seen in recent developments a progression towards a multi-track framework in which different countries or groups of countries assume different types of commitments or actions along different tracks.  

What role would the UNFCCC have in this new landscape? Authors differ on their responses, and there seems to be

much uncertainty about it. Some consider that the UNFCCC will keep a central role. For instance, Yamin and Depledge consider that the UNFCCC regime can be amended to address most of its current shortcomings, except perhaps for changes to the voting procedure and the introduction of further differentiation among developing countries, and therefore would retain a central role. Bodansky has suggested that a bottom-up approach whereby states put forward pledges within the UNFCCC process while keeping maximum flexibility to decide upon domestic policies might be a sound way to progress that eventually could lead to a more developed and stable international regime.\textsuperscript{49} This view would focus on the complementarities among all levels of governance, with the UNFCCC serving as a forum for exchange and learning among states yet open to non-state actors.\textsuperscript{50} This however suggests that the centrality of the UNFCCC in the evolution of the regime, while likely, is no longer guaranteed.

### 3.1.5. Interim observations

From the foregoing, we can conclude that there is a substantial degree of uncertainty in the literature as to how the international climate change regime might evolve in the next 20 or 30 years. A trend towards multilevel governance has been identified above, but questions remain about the architecture of the regime and about its effectiveness in mitigating climate change and adapting to its impacts. This is part of the reason why it seems valuable to think in the future of the regime through scenarios. This is what the next sections will seek to do in a tentative and preliminary fashion by putting forward a number of scenarios.

\textsuperscript{49} Ibid, 17-18.

4. Pulling the threads together: developing future scenarios to think about the evolution of international climate change law

The insights gathered so far should serve as a background to sketch different scenarios representing alternative pathways for international climate change law in the next 20 years or so. In that way, it should be possible to imagine the main impacts that such legislation could generate upon key areas of concern. The five scenarios contemplated in this paper are inspired in the four scenarios developed by Berkhout et al in the context of EU climate change policy. They elaborate four possible scenarios in which international governance could evolve: (1) coordinated mitigation; (2) autonomous mitigation; (3) coordinated adaptation; (4) autonomous adaptation. A fifth scenario is added here to give more emphasis to the possibility of coordinated mitigation outside the UN.

4.1. Coordinated mitigation: an international climate change organization under the UNFCCC

This first scenario assumes in essence that the world is able to cooperate meaningfully in order to mitigate climate change to such an extent that the need for adaptation is not too large and in any case manageable. The main legal elements of this scenario would be as follows:

-One or a few, legally binding, international climate change treaties, covering the key elements of the Copenhagen Accord (a long-term vision, mitigation, adaptation, financing and technology transfer, and MRV provisions).

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52 In the literature it is sometimes suggested to treat chlorofluorocarbons under a different regime (akin to the Montreal Protocol on the Ozone layer) than the rest of greenhouse gases, in order to increase efficiency. See S Barret, ‘Rethinking Global Climate Governance’, (2009) 3 Economics 1.
A global or close to global and comprehensive (in terms of sectors and gases) carbon market.

Broad agreement on burden sharing, whereas in a bottom-up or in a top-down fashion. The specifics of burden sharing would be sorted out probably in a way that favors the BASIC countries and the US. The EU would participate with very stringent emission reduction commitments and large transfers of financial resources and of technology toward developing countries. This could be done to a large extent through a global carbon market, which would progressively develop covering new countries and sectors (shipping, aviation), although a formal legal framework to deal with financial obligations would be in place.\(^5^3\)

A strong and credible compliance regime, covering all the aspects of the Copenhagen Accord.

From an institutional and architectural perspective, this scenario assumes that the principle of systemic integration permeates international environmental law, and that an IEO has either been achieved or is much closer to being realized than it is the case today.

As a result of the progressive implementation of the regime, climate change is substantially mitigated, minimizing the need for adaptation policies. In sum, the occurrence of this scenario would mean that the current strategy of the EU has been largely successful.

### 4.2. Coordinated mitigation outside the UN

The second scenario suggests a world where the largest polluters are able to come together and devise common approaches to mitigation, yet largely outside the auspices of the UN. This reflects the shift in global power and trade mentioned in 2.2.2, where China and India among others have to

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\(^5^3\) The current situation of financial support is fragmented, complex and utterly insufficient to enable the transition to a low carbon economy. See for instance R Stewart et al., (eds), *Climate Finance: Regulatory and Funding Strategies for Climate Change and Global Development* (New York University Press, New York, 2009).
a substantial extent succeeded in having their interests largely shaping the international climate change negotiations.

The main legal elements of this scenario would be as follows:

- There is agreement among participating countries on burden sharing in mitigation, which tends to follow current Chinese and Indian views on per capita consumption as the main criterion for allocation. This criterion could effectively focus on country emissions on the basis of consumption, and not production as currently envisaged by the Kyoto Protocol.

- A global carbon market is in place, covering the largest emitters on a sectoral basis, with substantial ‘hot air’ allocated to large developing countries. This removes to an extent concerns about impacts on competitiveness within developed countries. Least developed countries’ participation in the carbon market is marginal.

- Adaptation is central to the regime, but since it takes place outside the UN, the needs of least developed countries are not recognized.

- There is no legally binding compliance regime in place, although a system to compare emission targets and a mechanism for the MRV of policies and measures has been agreed upon.

From an institutional and architectural perspective, this scenario is rather different than the previous one, because agreement would be achieved outside the UN (it could be achieved within the G-20 instead). Whether this outcome would marginalize the UN is difficult to predict, but the risk is that, if the agreement is not robust, i.e., because it fails to take into account the interests and needs of the most vulnerable countries, the latter may feel marginalized, something which could destabilize global governance. Democratic accountability and inclusion of all voices could therefore be undermined under this scenario.
From an environmental perspective, this regime achieves substantial mitigation, but might fail to give adequate attention to the interests and needs of the poorest states.

4.3. Autonomous mitigation

The period leading to the Copenhagen Accord as described in section 3 suggested that it is not clear that the path leading to a post-2012 agreement will be similar to the one that led to the adoption of the Kyoto Protocol. Under this scenario, some developed countries have rejected the ‘top-down’ approach followed by the latter. Other countries that supported strong rules and institutions during the Kyoto negotiations, have been disappointed by the performance of the Parties and the institutions they created under the Kyoto Protocol. Moreover, efforts by developed countries to include more specific commitments by developing countries have dampened the enthusiasm of the latter for a legally binding regime with a strong compliance mechanism. As a result, confidence in UN led processes has largely disappeared, and has not been replaced by alternative approach to global climate governance. As suggested by progress in the MEF, the emphasis in this scenario lays more on the legal character of domestic rules and the capacity of national institutions as the main engines of implementing and enforcing climate change policy. The US has a major influence in this move away from internationalism, but also China and India may rely on sovereign related concerns to promote domestic policies and domestic review of those policies, rather than accepting an international climate regime. This bottom-up approach would include the following legal instruments:

-A high level of reliance on domestic climate change policies, which would be partially agreed upon at international multilateral forums, and perhaps linked to each other to some extent

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afterwards. This scenario could progressively lead to the adoption of an international climate change regime, thanks to the push of non-state actors, particularly in the US.

-A key legal issue here is the ‘comparability’ of efforts among developed and major developing countries, which generates strong concerns about ‘leakage’ and might lead to frequent tensions in the ambit of international trade.

-The absence of an international compliance mechanism. Compliance with domestic targets would be determined according to domestic procedures. In the absence of an international compliance system, countries could resort to trade related measures to punish those countries that are perceived to be doing less than enough. This approach to compliance increases the risk of conflicts between the climate regime and the WTO, since the Dispute Settlement Body could eventually be required to rule on the legality of a climate related trade measure. Such a bottom up approach could also lead to, i.e., performance-based financial mechanisms and carbon markets that would reward countries on the basis of unilateral assessments of country commitments and compliance. Potential consequences could be, unless states make strong efforts of coordination, the loss of trust among states and a race towards a trade war that would reduce global trade and therefore economic growth.

-Limited attention by developed countries to the needs of least developed countries. Indeed, in the absence of a comprehensive agreement, developed countries will tend to focus on achieving stable agreements with major developing countries, and will tend to discount those states whose emissions are insignificant in absolute terms.

From an institutional and architectural perspective, this scenario assumes that international environmental law has become even more fragmented than it presently is, with the result that clashes between different regimes are constant and there are no effective mechanisms in place to address them. The idea of an IEO is very far from becoming a reality.
From an environmental effectiveness viewpoint, this scenario might generate sufficient mitigation to avoid the worst impacts, as long as states implement stringent and effective mitigation policies. But the extent to which this can happen is unclear, given the degree of fragmentation and ensuing tensions. Two issues that are particularly relevant from a legal perspective may become prominent in this scenario (although they will likely exist in any scenario): the use of litigation as a policy tool, and the possible resort by the international community (or some of its members) to geoengineering. The potential role of each is briefly assessed here.

**Climate change liability**

A failure by (some) developed countries to engage into substantial mitigation efforts may lead to numerous legal challenges before international and domestic courts against them and against large companies, initiated by other states, NGOs, or citizens.

Climate change litigation is already burgeoning at different levels. Ghaleigh has identified four categories of climate related litigation: (1) defensive; (2) promotive; (3) boundary-testing, and; (4) perfecting.\(^{55}\) Defensive litigation takes place in jurisdictions that do not currently have a climate change regulatory framework in order to make sure that the status quo prevails. Promotive litigation would take place in the same jurisdictions but with the opposite goal in mind. Boundary-testing litigation takes place in jurisdictions with a climate change legal framework in place, in order to set more clearly the limits of the regulatory framework (i.e litigation taking place in the context of the EU ETS). Finally, perfecting litigation has as its main goal to raise even higher the environmental performance of an existing climate change regulatory framework. Ghaleigh suggests that a trend can be discerned in that the focus of climate related litigation appears to be progressing move from (1) to (4). Whilst such trend might suggest that states are progressively adopting and implementing

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\(^{55}\) NS Ghaleigh, *“Six Honest Serving Men”: Climate change litigation as legal mobilization and the utility of typologies*, (2010) 1 Climate Law 31.
climate change mitigation policies, it cannot be concluded from it that the reason they are doing so is the threat of being sued in courts of law. In any case, it is clear that climate change litigation per se is no alternative to climate change policies, and can at best play a complementary role, which should however not be totally discarded.²⁶

**Geoengineering**

Geoengineering methods can be usefully divided into two basic categories: carbon dioxide removal (CDR) techniques and solar radiation management techniques. CDR techniques address the root cause of climate change by removing greenhouse gases from the atmosphere. Solar radiation management techniques attempt to offset effects of increased greenhouse gas concentrations by causing the Earth to absorb less solar radiation.²⁷ The particular characteristics of some geoengineering techniques make them a potentially very attractive alternative (or complement) to more conventional mitigation options, particularly in a context of lack of cooperation among states at international level. In particular, under certain configurations geoengineering can be undertaken as a single project, which might be relatively inexpensive while having a near-immediate effect on climate. All this means that some large countries that are likely to suffer serious impacts from climate change may consider putting forward unilateral geoengineering strategies to mitigate impacts. This is why it is examined under this scenario, although it could be present under any of the scenarios contemplated in this paper.

In general, the deployment of geoengineering solutions present a large number of challenges, including scientific, ethical, economic, environmental and legal ones, which could be exacerbated

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within this scenario, because states could engage in it in order to compensate for the failure of the international community to mitigate climate change emissions. It would moreover be considered by some states under conditions of international frustration and mistrust. Although the goal of deploying it would be to mitigate the impacts of climate change, there is no guarantee that it would be done in such a way that potentially negative impacts upon other states would be prevented or minimized. The way in which international law evolves in the next twenty years regarding the governance of geoengineering will determine which impacts can be expected in the future. At present, international law affords a large degree of freedom to states to initiate geoengineering activities, so long as the effects are contained within that state’s territory (which could be the case with some CDR techniques). But even then, certain provisions of international environmental law can be applicable, particularly those dealing with the protection of natural heritage. Of course, in the presence of transboundary impacts, further obligations under international law would certainly apply. If in the next years an international regulatory framework is put in place that succeeds in properly regulating research and potential deployment, thereby minimizing potential risks and ensuring compensation for potential losses, then geoengineering might become a success story, i.e., by buying time to deploy other mitigation technologies. Otherwise, geoengineering may impact the world in ways that cannot be presently imagined. The literature has made some progress in identifying the key policy questions surrounding geoengineering that the international community needs to confront, and has outlined some of the initial steps that could be taken. Clearly,

58 Ibid, 40.
60 The Royal Society, ‘Geoengineering the Climate’, (n 53).
multidisciplinary research (including law) will be essential to get more precise knowledge about the potential risks and benefits of geoengineering.

4.4. Coordinated adaptation

This scenario, which in principle might look like a rather bizarre and unlikely outcome, could nevertheless arise if new advances in climate science and climate economics show that expected impacts of climate change will be lower than expected, while mitigation policies will be more costly than expected. Under that scenario, the rational behavior may well be to consider adaptation largely as a substitute for mitigation. In that case, an international agreement would focus on adaptation, with mitigation playing a secondary role. The agreement’s core elements would turn around the identification of local impacts, burden sharing of adaptation costs, and the establishment of mechanisms to govern the transfer of financial and technological resources. Moreover, the attention would be placed mainly on the needs of the worst affected countries, in order to ensure that their inhabitants have their human rights protected. From a legal perspective, integration of climate change impacts into all areas of policy most vulnerable to climate change, including in areas such as infrastructure, agriculture, tourism, development aid, and the environment, are paramount. In particular, international law has developed to facilitate the migration of peoples and species from endangered areas and countries into other areas and countries. Although under this scenario one assumption is that climate change science has shown that climate related impacts are less serious than expected, nevertheless strong attention goes to identify ‘tipping points’ that could be caused by the higher global average temperature reached. In particular, the risk of abrupt climate change and associated damages receives sustained attention under international and particularly domestic law.

4.5. Autonomous adaptation

This scenario is based on a highly fragmented and uncooperative world that has largely failed to reduce greenhouse gas emissions. The sense of frustration and mistrust between developed and developing countries is so marked that agreement on a coordinated and comprehensive approach to adapt to climate change is impossible. Since the impacts of climate change are already extremely severe and threaten to become catastrophic (see section 3 commenting on the possibility of the world entering an ‘age or survival’), the focus of states is on setting up largely unilateral measures to protect themselves against enormous and increasing climate change related damages. From a legal perspective, this includes ensuring sufficient access to natural resources (energy, water, food), in an increasingly unstable world. Military alliances are shaped to achieve these goals in a climate of growing instability and uncertainty.

From an institutional and architectural perspective, this scenario reflects a total failure of international law to grapple with climate change, and a predominance of realist approaches to international relations.

Table 4: matrix of scenarios, degrees of coordination and degrees of effectiveness.

<table>
<thead>
<tr>
<th>Extent of mitigation achieved</th>
<th>+</th>
<th>++</th>
<th>+++</th>
<th>++++</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AA</td>
<td>CA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>++</td>
<td>AM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+++</td>
<td>CM1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>++++</td>
<td></td>
<td></td>
<td>CM2</td>
<td></td>
</tr>
</tbody>
</table>
AA: autonomous adaptation; CA: coordinated adaptation; AM: autonomous mitigation; CM1: coordinated mitigation; CM: coordinated mitigation; CM2: coordinated mitigation outside the UN

Table 4 classifies the four scenarios developed according to two variables: the degree of coordination of states at international level that they entail, and the degree of environmental effectiveness (meaning mitigation) that they achieve. These variables are linked, since, as we noted in section 2.2.1 above, global environmental assessments conclude that a higher degree of cooperation among states will yield better environmental outcomes.

5. Impacts in key areas of legal developments within each of the scenarios

This section links the scenarios developed in section 4 with the key areas of interest identified in section 1 in order to discuss potential impacts that international law as developed under each of the scenarios could have upon key areas.

Table 5: scenarios, legal developments and impacts on key areas

<table>
<thead>
<tr>
<th>Intensiveness of impact of future int'l climate change legislation in key areas</th>
<th>AM</th>
<th>H</th>
<th>H</th>
<th>M</th>
<th>H</th>
<th>M</th>
<th>M</th>
<th>H</th>
<th>M</th>
<th>M</th>
<th>M</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>AA</td>
<td>P</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>C</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Degrees of coordination</td>
<td>CM1</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
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<tr>
<td>CM2</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
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</table>
P: people; H: health; R C: physical resources and commodities; GG: global governance; OI:
overseas infrastructure; NS: national security; CI: global positioning and competitive advantage of
firms; KN: knowledge; TS: technology and skills; FSI: financial services and insurance; Eth:
social/ethics.

Table 5 links the five scenarios developed above (and the legal instruments adopted therein) with
key areas in order to enable an assessment of the impact of international climate law on those areas.
Impacts are classified in a quantitative manner (high, medium and low) on the basis of the degree of
deviation from the status quo which they give rise to. No attempt is made to make value judgments
as to the desirability of those changes. In addition, this classification does not say anything about
the nature and distribution of impacts; rather, it highlights those areas where we feel that impacts
can be particularly acute—or have not received adequate attention—and therefore deserve closer
scrutiny. Where an impact is described as high, a more detailed justification follows in the analysis
carried out below.

5.1. Impacts related to the coordinated mitigation scenario

Under a scenario of coordinated mitigation, the impacts of international climate law on overseas
infrastructure, knowledge, technology and skills, financial services and insurance, and ethics are
considered to be high, for the following reasons:

Achieving stabilization of GHG concentration levels at around or below 400 ppmv requires a deep
transformation in global energy systems, that will need a broad deployment of technologies such as
carbon capture and storage (CCS), nuclear energy—which might accentuate concerns about waste
storage and about proliferation\textsuperscript{62}, renewable energy, and energy demand reduction technologies. Inserting all these developments will require undertaking massive changes to current energy infrastructures worldwide. For instance, the EU will need under this scenario to develop a truly integrated EU-wide smart electricity and gas grids.\textsuperscript{63} At the same time, security of supply considerations will require developing new interconnections with foreign energy systems. The UK energy grid will have been seamlessly integrated with an EU-wide grid. Implementing all this changes will require a huge leap in the level of knowledge about and implementation of new low-carbon technologies, alongside their massive transfer to developing countries. This will generate large amounts of new technological skills, which will also need to be transferred to developing countries. In so doing, the role of the financial services industry will be key in generating the necessary resources.\textsuperscript{64} It is envisioned that a substantial part of these transfers will take place in the context of a global carbon market. Governing such a carbon market will be a great challenge, particularly taking into account that it will need to embrace a large number of states worldwide which are at very different stages of development, as well as a large number of gases and sectors, including aviation and shipping, which are not currently included in the Kyoto Protocol and therefore in international emissions trading. The literature has only started to consider these challenges\textsuperscript{65} making links with attempts to introduce regulation dealing with financial institutions at


\textsuperscript{64} At this point there is skepticism in the literature about the ability of the financial markets to promote environmental protection. See for instance C Arup, ‘The Global Financial Crisis: Learning from Regulatory and Governance Studies’, (2010) 32 Law and Policy 363.

global level. From an ethical perspective, global participation in an international climate change regime requires widespread agreement on burden sharing principles, the overall architecture as well as on details of the functioning of the carbon market. Achieving such an agreement will require a large measure of sacrifice among presently developed countries, since they might have to reduce their emissions to negative levels and moreover transfer large amounts of resources to developing countries. Moreover, adaptation will receive under this scenario as much attention as mitigation, although the needs for adaptation will not be too large. Therefore, this option scores very high in terms of concern about peoples in other countries and about future generations, suggesting a move towards a common acceptance of the concept of cosmopolitan justice.\(^{66}\) Linking this discussion with the observations made above about current trends in international law, this would represent a clear move away from a Westphalian understanding of the world towards a more cosmopolitan one.\(^{67}\)

### 5.2. Impacts related to the coordinated mitigation outside the UN scenario

This scenario introduces deep changes to current global governance mechanisms, which might become less stable, at least for some time. There is an important role for a global carbon market that covers the largest emitters on a sectoral basis, with substantial ‘hot air’ allocated to large developing countries. This removes to an extent concerns about impacts on competitiveness within developed countries. Since this scenario also achieves large emission reduction levels, it requires profound changes in the global energy system, akin to those foreseen in the first scenario. Therefore, impacts on overseas infrastructure will be high. Knowledge levels and technological skills will likewise be increased substantially, but in this case transfers may only or mostly take place among developed countries and major developing countries (the BASIC), while least

\(^{66}\) S Caney, ‘Cosmopolitan Justice’ (n 37).

\(^{67}\) P G Harris, ‘Climate Change and Global Citizenship’, (2008) 30 Law and Policy 481.
developing countries may be left aside, reflecting their lower contribution to global emissions and their limited power. The financial sector will thrive under this scenario thanks to the development of a global carbon market, which might develop in a bottom up fashion, through linking of domestic schemes. The impacts of international law on ethics will be more ambiguous than in the first scenario: on the one hand the substantial levels of mitigation achieved will limit the need for adaptation policies; on the other hand, the carbon market may or may not benefit directly least developing countries, although this will depend, i.e, on the evolution of the CDM. If mechanisms like REDD (reduced emissions from deforestation and forest degradation) thrive and remain linked to the global carbon market, then benefits might accrue for developing countries.

5.3. Impacts related to the autonomous mitigation scenario

Under the third scenario, countries fail to arrive to an agreement on burden sharing in mitigation, which leads to the loss of relevance of the current UN climate change regime and also prevents substantial agreement in alternative forums. However, climate change remains a concern, particularly for the worst affected states. Nevertheless, global emissions keep rising, although at a lower level than in the scenarios focused only or mainly on adaptation. For this reason impacts on people and health are higher than in the previous scenarios.

Concerns about energy security of supply and the desire to prevent further destabilization in global governance lead many countries to put in place policies that achieve mitigation, which are however largely disconnected from each other. While some cooperation will still take place, it will occur mostly through multilateral and bilateral agreements. A patchy and very fragmented framework is in place. Current shifts in global governance mean that BASIC countries are able to increasingly impose their conditions in those agreements, which hence tend to reflect their priorities and interests. If those conditions are not acceptable for developed countries, then the potential for agreements will be reduced. As a result, concerns about potential impacts of legislation upon the global positioning and competitive advantage of firms rank high, and it is possible that countries
seriously engaged in mitigation decide to couple their domestic polices with trade related measures such as border tax adjustments. This might lead to an increased role for the WTO Dispute Settlement Body in determining the legality of climate change policies. This mere possibility may act as a sufficient deterrent for countries considering adopting stringent mitigation policies, and therefore lead to a reduction in the environmental effectiveness of those policies. But another possible development could be the increasing judicialization of climate change policy, with legal challenges more frequently brought against states and large private polluters. Current literature tends to see the role of litigation as a valuable complement of other law and policy efforts because it fosters needed interaction across levels of government and different time periods. However, in the absence of comprehensive and consistent approaches to mitigation, the contribution of litigation is limited.

Transfer of technology in the ambit of CCS and nuclear energy plays a key role in this scenario, the latter leading to increased concerns about global insecurity. Global governance might struggle to guarantee global security, and countries may resort to develop stronger military powers or to search for new alliances. In addition, some countries that consider themselves particularly vulnerable to the impacts of climate change might consider putting in place geoengineering solutions. Depending on the technologies adopted, geoengineering might have negative global consequences. However, in 2010 there is no comprehensive approach to geoengineering. Therefore under this scenario there might be strong efforts at international level to put in place an international treaty regulating the who’s, the what’s and the how’s of geoengineering. Due to the possibility that this option might materialize, impacts upon peoples and health might be high.

5.4. Impacts related to the coordinated adaptation scenario

Under this scenario, a comprehensive international law regime on adaptation to climate change is in place. Agreement has been achieved on burden sharing between developed and developing countries (and between most and least vulnerable countries to climate change). Although a carbon market might still exist, it will not mobilize as much resources under the scenarios of cooperative mitigation, therefore there is a larger role for transfer of public funds.

Another issue that generates impacts on the financial services and insurance sector is the need to set up mechanisms for compensating victims of climate change. Even if science finds that damages are lower than originally thought, impacts can still be considerable and require large amounts of compensation. This raises questions about the capacity of insurance markets to deal with the payments, and states may have to come to their rescue by entering the picture as co-insurers or reinsurers of last resort. Victims of climate change will also conform the core of multilateral negotiations on (climate related) migration. While some states might be the natural destinations of peoples escaping from increasingly uninhabitable countries (particularly low-lying states), there will be a need to regulate that migration and to compensate states absorbing most of it. This might be done under the banner of burden sharing mentioned in the previous paragraph.

A third focus of domestic and international law will be to ensure the continued availability of natural resources such as energy, water and food as well as of the resilience of the infrastructures needed to deliver them. Given the high degree of international coordination under this scenario, the negotiation and adoption of international treaties dealing with those resources are likely to have been concluded. Those treaties will focus on issues on securing the availability of, regulating access to, and sharing of, those resources. While water would likely be subjected to regional treaties

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69 In contrast with the naturally vague and occasionally contradictory global declarations and principles, the local and regional institutions developed by riparian nations have focused on specific, basin-level conditions and concerns. The
energy and food may be the object of global treaties, building to some extent on initiatives existing today, given the universal public good elements of both resources. A particular focus of attention will be the continued resilience of infrastructures in the face of more acute (but not catastrophic) impacts. Impacts such as raising sea levels, more intense and more frequent storms, and droughts, will impose increasing stresses upon existing infrastructure, which will require both domestic and international action, given the transboundary nature of large portions of energy and transport infrastructure.\footnote{70}

5.5. Impacts related to the autonomous adaptation scenario

This scenario depicts an increasingly unstable, unpredictable and anarchical world that is brutally changed by climate change. Because global governance is in total disarray, the degree of cooperation, and thus mitigation, is very low, and no global strategies are put in place to increase resilience in the face of potentially catastrophic impacts. In this world, the loss lies where it falls. Impacts on people and health are the highest, overseas infrastructure suffers to the point that some countries and regions become isolated and unproductive, and concerns about national security in the face of massive migratory movements and disputes about resources take centre stage. The UN fails to channel tensions and confrontations are likely to arise. This is also a world where the most powerful imposes its ethics upon the rest. Given that the most powerful may well turn out to be

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\footnote{70}{The importance attached to this issue can be seen for instance in the fact that UK EPSRC has currently an open call in the area of adaptation of energy infrastructure to climate change impacts, namely the Energy Networks Grand Challenges call for proposals.}

Food and Agriculture Organization of the United Nations has identified more than 3,600 treaties relating to international water resources dating from 805 to 1984, the majority of which relate to some aspect of navigation. Since the 1950s, more than two hundred agreements have been developed that address nonnavigational issues of water management, including flood control, hydropower projects, or allocations for consumptive or nonconsumptive uses in international basins.
China and India, this might be an extremely different world than the one we now know. Also countries that stand to gain from an increase in global average temperature (such as Russia) might increase their might. International law will look very fragmented under this scenario, increasingly described by ‘fortress’ countries and regions holding relations based on power, not on diplomacy and the rule of law.

6. Ruminations on the building blocks of a domestic response to the evolution of the international climate change regime

This paper has suggested that there remains much uncertainty about the future evolution of international climate change law, and that the use of scenarios can assist in thinking about the possible impacts of international climate change law that might require a domestic legal response. This section constitutes a preliminary assessment to characterize the main elements of such responses. As a starting point, it is possible to make a few general remarks that apply to all scenarios. Then, some comments will be made regarding areas to which the UK could need to place more attention, i.e. by devoting resources to further research.

First, most international climate change law will impact the domestic law of member states of the European Union through EU law, which will be increasingly relevant under most scenarios (except in the autonomous adaptation scenario and perhaps in the autonomous mitigation scenario).

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71 For more in detail analysis on the impact of climate change on international security, see D Depledge, ‘The Impact of Climate Change on Security: is the UK in Need of a Nationwide Review’, (Royal United Services Institute, London, 2010).

72 Of course, EU law enjoys supremacy over UK law. Under EU law, when the EU concludes an international environmental agreement, it normally does so together with its member states, in what are known as mixed agreements. Although the precise distribution of competences between the EU and the states in relation to mixed agreements is not always an obvious and/or uncontroversial issue, both the EC institutions and the member states must do their utmost to
Second, it is important to stress that states have a role to play in the evolution of the climate change regime. The future depends on choices made today, including moral and ethical choices. Hence, the ethical stance adopted so far states in the international climate change negotiations and its impact on the evolution of international (climate) law deserves further exploration.

Third, assuming that all scenarios have some chance of representing future developments, countries should focus on developing strategies that remain robust under as many scenarios as possible. Some elements of this strategy for the UK will be considered below.

Fourth, some of the possible developments within international law mentioned in this paper are consistent with all or most scenarios, such as the (fuller) development of a global carbon market and the possible recourse to (some) geoengineering techniques, and therefore deserve particular attention. Geoengineering might raise some unique challenges to international law, i.e., to the law of the sea, space law, and state responsibility and liability for transboundary harms that need to be explored in more detail.\(^{73}\)

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\(^{72}\) See Hauptzollamt Mainz v. C.A. Kupferberg & Cie KG a.A., Case 104/81, [1982] ECR 3641, para.11. Moreover, the impact of EU law upon international and domestic law is constantly growing, particularly in the area of climate change in what is known as the ‘Europeanization’ of international law. See J Wouters et al, (eds.), *The Europeanisation of International Law* (TMC Asser Press, The Hague, 2008). This means, i.e., that EU law largely determines how international (climate change) law is to be applied in the EU member states, See R Wahl, ‘Europeanisation Beyond Supremacy’, in J Wouters et al. (eds), *The Europeanisation of International Law* (TMC Asser Press, The Hague, 2008). Since the bulk of EU environmental law is adopted through qualified majority voting in the Council (though with some important exceptions in the area of energy policy, taxation and land planning, which however look increasingly weak in the context of climate change policy with its horizontal nature), it can become binding upon the UK regardless of its position in the Council. Given the horizontal nature of climate change policy, even areas for which unanimity is required in the Council are not ‘safe’ from impacts of EU law.

So how could a country like the UK go about framing a response to possible developments in international climate change law?

- In the coordinated mitigation scenario, impacts of law on the key issues considered in this paper are high. To help achieve this world, the UK will likely have had to accept playing a leadership role in many of these areas, since it has comparative advantage in some of them (e.g., financial services and insurance, technology), and in others its choices can exert influence at global level (ethics). Particularly in the latter context a lot of effort will have been made in understanding the basic postulates of developing countries in relation to issues such as burden sharing and adaptation needs. The UK will also need to cooperate very closely with the EU when developing legislation, and EU law will likely have important consequences for its financial and energy sectors.

- Under the coordinated mitigation scenario outside the UN, impacts are high on the same areas than in the previous scenario, although for different reasons in the area of global governance. While carbon markets are at the core of this world, which can benefit the financial and insurance industries, (unilateral) ethical choices regarding the design of domestic schemes might be more relevant than in the previous scenario, given the absence of a global regulatory framework. Given the likely continuation of the EU ETS, choices on how to link it with other domestic markets will need to be made at that level and those choices will determine to an extent the behavior of UK firms.

- Under the autonomous mitigation scenario, the range of impacts differs substantially from the previous scenarios. Here, people and health are much more affected (in part due to climate change and in part due to recourse to solutions such as geoengineering), and the UK will need to consider strategies to deal with them. Also affected will be the global positioning and competitive advantage of UK firms, particularly if the UK continues to pursue a stringent mitigation target. The lack of a coordinated and systematic global
approach might mean that many states might decide to couple climate change policies with trade measures, which will likely reduce global trade thus impacting negatively upon the UK economy. Also the relation with countries such as China, India and other developing countries will be key, in particular to adopt bilateral and multilateral agreements that promote mutual interests in relation to mitigation and adaptation.

- The coordinated adaptation scenario is very different to the previous ones. Here, the highest impacts will fall upon physical resources and commodities, overseas infrastructure (in order to adapt it to climate change impacts), knowledge, technology and skills, and financial services and insurance (to finance adaptation measures domestically and abroad). The UK will need to consider carefully its involvement in developing sound knowledge of climate change impacts domestically and abroad, in deciding its position on burden sharing, in making sure that it develops the necessary expertise to adapt infrastructure (including energy infrastructure) to climate change, and in deciding how to managing issues such as migration and biodiversity under international, EU and domestic law.

- The last scenario is certainly grim but considered realistic in the literature. If by the late 2020’s mitigation is not progressing fast enough, the UK might need to attach close consideration to (perhaps militar) alliances and strategies that will ensure its continued survival in the face of likely catastrophic impacts.

In sum, a robust response to the main impacts arising from the scenarios considered in this paper would seem to feature the following basic elements: increasing the role of renewable sources of energy in the energy mix, integrating the UK energy electricity and gas frameworks more seamlessly into the EU system, promoting intensively energy efficiency, CCS, and nuclear energy at domestic and international levels, building a leading position in a future global carbon market while attending to the concerns of developing countries, putting more effort in understanding the positions of developing countries in international negotiations with the aim of building bridges
between (presently) very disparate positions, increasing and strengthening trade and political relations with China, India and other emerging powers, adapting infrastructure to climate change impacts, and, last but not least, treating climate change as a security issue and considering military related implications should worst possible scenarios materialize. Of course, further research is required to determine whether and to what extent these issues can be combined within a single strategy, how to justify it, and which trade-offs to make should it be necessary.

7. Concluding remarks
The future development of international climate change law is very uncertain, and depends of many scientific, technical and normative developments that are either not known at present or can be influenced by choices made by the relevant actors. This paper has explored the potential of scenarios to aid legal thinking about the development of international climate law over the next few years. While scenarios cannot deal with the essential details of any regulatory framework, it is suggested that they can aid thinking in the face of pervasive uncertainties, for instance with a view to develop domestic responses to those developments. This paper has sought to do so, in order to suggest a few recommendations that states could consider adopting. The core recommendation arising from scenario thinking is that countries should develop a robust (legal and political) strategy that can allow itself to adapt to as many scenarios as possible. In that regard, particular attention should be given to understanding more in depth the needs and interests of developing countries in the context of climate change, particularly but not exclusively the most developed ones, to the role of ethics in its approach to burden sharing, to the progressive development of a global carbon market and the position of its industry therein, to geoengineering, and to further improve knowledge on the regional and sectoral distribution of climate impacts under different scenarios in order to start considering possible legal responses to them.

Table 6 linking scenarios, global implications, and implications for the UK
<table>
<thead>
<tr>
<th>Risk/Scenario</th>
<th>Global/Regional Implications</th>
<th>Implications for UK (opportunities as well as threats)</th>
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</thead>
<tbody>
<tr>
<td>Coordinated mitigation in UN</td>
<td>Global carbon market, substantial mitigation, possible use of some geoengineering techniques</td>
<td>Loss of competitiveness if UK does not take a leading role for itself in global carbon market</td>
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<tr>
<td>Coordinated mitigation outside UN</td>
<td>Global carbon market, substantial mitigation, shift of power towards China and India, geoengineering</td>
<td>Fragmentation of international governance, unilateral geoengineering is possible,</td>
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<tr>
<td>Autonomous mitigation</td>
<td>Domestic climate policies lead to trade tensions, less cooperation on mitigation and adaptation, poorer</td>
<td>Global governance more fragmented and unstable, trade conflicts, threats to competitiveness if</td>
</tr>
<tr>
<td>Coordinated adaptation</td>
<td>International agreement on adaptation, attention to needs of vulnerable countries, geoengineering</td>
<td>Damages from climate substantial, insurance markets may not be able to cope, climate related migration might be substantial</td>
</tr>
<tr>
<td>Autonomous adaptation</td>
<td>International system fragments, massive climate impacts, security concerns, mass migrations, risk that geogineering techniques are implemented unilaterally</td>
<td>Need to frame climate change as national security issue to deal with growing instability, break down of many global markets, and political insecurity</td>
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