Issue 0003, 29th October 2021

Queen Mary
University of London

CCLS
Energy and Climate Change Law Institute Review

https://www.qmul.ac.uk/ccls/research/energy/

Energy Law Institute

Centre for Commercial Law Studies 40 2020

Contents

Foreword.

Lord Carnwath CVO, former Justice of the UK Supreme Court

I am pleased to welcome the publication of this important new work on the very topical subject of energy and climate change.

The Energy and Climate Change Law Institute is a leading postgraduate law school within the Centre for Commercial Law Studies at Queen Mary, University of London. The focus of their research is to provide academically led analysis into both contemporary and anticipated legal issues. The Institute ensures that its research is relevant to the practical world, by working with stakeholders from across the energy sector, and by adopting an interdisciplinary approach. It includes, for example, the role of economics, politics and science in the context of energy and climate change law.

This Law Review is being released to coincide with COP26. It explores some of the legal and technical issues involved in securing effective progress towards net zero in the immediate future. As the articles in the review make clear, significant progress is already being made on climate change regulation, policy and litigation. This Review has the special attraction that it is a work of collaboration between lawyers and scientists, students and law professors, and leading practitioners, policymakers and regulators. A subject as complex and challenging as climate change necessitates collaborative working. Law has a critical role. Science, economics and technical innovation depend on the law "to convert our knowledge of what needs to be done into binding rules that govern human behaviour" (to quote Sultan Azlan Shah, former Chief Justice of Malaysia).

The Review is not only a collaboration across disciplines, but it is also a collaboration across the generations. It includes the voices and perspectives from its award-winning alumni alongside the work of leading experts in the fields of law, science and regulation. It is anchored on four main themes:

1. Youth activism

2. Technological advancement

3. Finance and regulation

4. Governance and ethics

The focus rightly is on what needs to be done now, what can be delivered, what is practical and what is achievable. Whilst climate change action may not appear to be as rapid, consistent or as comprehensive as is needed, real progress is being made and the law is playing a central role in forcing the pace and providing a binding framework for such action. This work will be a valuable reference for all who want to keep up to date with present and future developments in these fields.

Introduction.
Professor Stephen Tromans QC
Guest editor

Professor Stephen Tromans QC

When our Editorial Board met earlier this year to discuss how best to approach a Law Review centred on climate change, our discussion was unsurprisingly wide ranging, which we then distilled into four interrelated themes. Our aim was to pair up for a number of themes a leading lawyer and a technical expert providing the opportunity for authors to co-operate on drafting the articles.

We have chosen to group the articles around the same four themes and as you read through you will recognise consistent threads: the immediate and future impact of climate change: the importance of providing support to developing technologies: and ensuring appropriate financial structures, policy, regulations and governance are in place to manage the risks associated with transition.

Together the articles make a compelling read. Whilst we provided a framework, our authors made it their own, each approaching the subject in a thoughtful, open, analytical way which emphasises the challenge and, importantly, recommending solutions.

Theme 1: Youth activism

Our opening article is a collaboration between the climate change scientist Dr Joeri Rogelj and Marc Willers QC presenting the latest science on climate change and its impact on children and the implications for future generations. The article explains how youth activists, supported by NGOs and using expert scientific evidence, have actively drawn attention to the intergenerational impact of climate change in litigation across the globe and over-reliance of proposed plans on uncertain technological solutions.

Theme 2: Technological advancement

The challenge of bringing new technologies to the market is examined in a joint article by Dr Joe Briscoe and Stuart Bedford. The authors examine two promising technologies at different stages of commercialisation that are expected to make a real contribution to carbon reduction. It goes on to look at the journey of a UK-headquartered company bringing one of these technologies to market, and provides a series of proposals for how we can build on the existing government policies and initiatives to help maintain investment in carbon-reduction technologies beyond COP26

Theme 3: Finance, risk & regulation

Finance, risk and regulation is a substantial topic in its own right and five articles examine the subject from differing perspectives.

As Clare Burgess states in the opening of her article one of the four goals set for COP26 is to 'Mobilise finance', and there are proposals with respect to both public and private finance. Claire Burgess explores in detail three key related areas:

1. The regulatory initiatives
2. The Sustainable Finance Products
3. How can financial institutions help drive climate finance to emerging markets?

The article concludes that the combination of regulatory initiatives and the growth of the sustainable finance market, together with other stakeholder pressures, are already encouraging creditors to divert funds to sustainable investments.

Professor Christina Parajon Skinner - Wharton, University of Pennsylvania, continues the theme of finance by posing the question "How Green can central banking be?"-

The article sets out where the Fed has legal authority to address climate change and the limits of such power and explains some normative considerations associated with the Fed leaning into climate change. Finally, it explains the role of the private sector in mobilising capital toward green projects.

In their article, 'The financial and legal risks of the global transition' Neil Beresford and Nigel Brook explain the threat to the financial system globally that the coincidence of several developments related to the transition, taking place simultaneously, represents. The article highlights the different developments which constitute the principal transition risks and their impact, noting that transition "permeates all areas of socio -economic, political and geopolitical activity. It has direct and indirect financial effects on every conceivable commercial sector".

In 'Regulating for a Green, Fair Future' the authors: Mark Mills, Alexander Aristodemu, Kwame Asamoa-Bonsu- examine transition risk from OFGEM's perspective explaining the existing operational regulatory frameworks before anticipating the future requirements. OFGEM explain the challenges that lie ahead in regulating a rapidly expanding systems environment and delivering value for money and fairness for all consumers.

'An overview of green finance and its actors in the context of COP26'. Giuseppe Candela provides an interesting overview of the main participants involved in climate change finance and the regulations adopted at international level. The analysis focuses on the effectiveness of the regulations adopted by the various policymakers, and also proposes possible alternative scenarios to mitigate the drawbacks detected, including a clear definition of expectations from COP 26.

Theme 4: Governance and ethics

In 'Do Director's duties deliver on climate change?: useful tool or empty framework', Tara Theiss examines the role of directors and considers that integrating climate related risks and opportunities should form part of the board remit.

The article concludes that a combination of an extension to director's duties- including creation of a new director's duty with public enforcement and a reformation of corporate purpose will make the framework a useful tool in combatting climate change.

In their article on 'Climate change and ethics', Professor James Dallas and Tara Theiss explore the role of ethics in the identification and selection of solutions to climate change, including the complexity of the ethical challenges by virtue of the wide range of stakeholder groups.

They suggest that decisions on climate change which ignore the ethical dimension-relying on purely economic or environmental considerations - are flawed and likely to fail. The article also explains the limitations of a reliance on ethics to drive solutions because in some areas what is just, and fair is in the eye of the beholder and over reliance on the capacity of ethics to find solutions could be counter-productive and lead to delay.

Our review concludes with a transcript of the Annual Clifford Chance Lecture given on the 21st October by Emma Howard Boyd CBE, Chair of the Environment Agency on the role of women in managing climate change. The lecture examined the impact on women of climate change and how their voices are diminished. The lecture was introduced by Clare Burgess, Partner at Clifford Chance and was followed by a facilitated discussion by Claire Perry O'Neill, Managing Director for Climate and Energy at the World Business Council for Sustainable Development.

Concluding remarks

It has been exciting seeing the articles come together. Having legal and non-legal specialists working together has worked very well. Our thanks to all our authors for their time sharing their expertise and addressing the challenge of the topic in a way that provokes thought and, we hope encourages action on the urgent timescales required.

Acknowledgements.

We are delighted to publish our third Energy and Climate Change Law Review to coincide with the start of COP 26.

Our thanks to Lord Carnwath for his insightful and encouraging foreword and to Professor Stephen Tromans QC who designed the framework for the review and provided guidance to our authors.

We also much appreciate the help and support of our editorial board who fed us with invaluable and creative ideas. To our authors we owe special thanks for their thoughtful, considered and timely work and co-operation.

We also extend thanks to the editorial team for their sterling work. Ros Cook, our freelance copyeditor, whose expertise in environmental, sustainable, and scientific subject areas were a perfect match for proofreading the review. Our desktop publisher, Tiffy George, has done a superb job in the design and layout of the review. Cecilia Cola Trimarco, one of LLM alumni for reviewing articles and Laurence Leong, from the Queen Mary Marketing and Communications team, who has supported us through the publication.

And to Maria Taylor, our editor, who has guided the review through from the concept stage to the final publication; pulling together the different themes and shaping the review to be both a collaborative and interdisciplinary work. All of this and notwithstanding some material hurdles placed in her way, done to achieve publication on time: it is a real achievement.

Finally, our thanks to the members of the Energy & Climate Change Law Institute for their invaluable and sustained support.

Professor James Dallas
Executive Director, Energy and Climate Change Law Institute

Youth activists are forcing governments to take account of the intergenerational impact of climate change.

Joeri Rogelj and Marc Willers QC[1]

Joeri Rogelj

Marc Willers QC

Introduction

In 2019 the United Nations High Commissioner for Human Rights, Michelle Bachelet, described climate change and its threat to human rights in the following terms:

Climate change is a reality that now affects every region of the world. … The world has never seen a threat to human rights of this scope. (…) The economies of all nations; the institutional, political, social and cultural fabric of every State; and the rights of all your people – and future generations – will be impacted.[2]

The physical reality of climate change is assessed by the Intergovernmental Panel on Climate Change (IPCC), whose consecutive reports over the past three decades have described the nature and causes of the climate change our planet is experiencing with increasing scientific confidence. At the launch of the IPCC's latest assessment in 2021, IPCC Working Group 1 Co-chair, Valérie Masson-Delmotte, stated that: 'It has been clear for decades that the Earth's climate is changing, and the role of human influence on the climate system is undisputed'.[3]

Dangerous climate change will have the greatest effect on our children and future generations and a recent global survey has illustrated the depth of anxiety many young people are feeling about climate change.[4] They have no responsibility for the causes of climate change and yet they will unfairly inherit a legacy they did not choose, both in terms of the climate disruption they will experience and the measures they will be required to take to halt it. It is not surprising therefore that young people have been at the vanguard of climate change protest and litigation in recent years and that in doing so they have raised the profile of the concept of intergenerational equity – that is, the responsibility to ensure that the environment is protected and rendered sustainable in such a way as to avoid the risk that future generations will experience dangerous levels of climate change.

In this paper we begin by identifying the latest science on climate change and its impact on children and implications for future generations. We then review some of the recent youth-led climate litigation that has been based on principles of intergenerational equity before assessing where such litigation might be heading in the future.

Climate change and its impact on youth and future generations

We now live in a world that has been markedly changed as a result of human activities. The 2021 Sixth Assessment Report (AR6) of the IPCC showed that on average the global surface temperature of our planet was about 1.1°C higher in the past decade (2011–2020) than in the second half of the 19th century (1850–1900), which is often taken as a proxy for pre-industrial levels. Each of the last four decades has also been successively warmer than the previous.[5] Climate change in its many incarnations – from global temperature rise and rising sea levels to more intense precipitation, heatwaves, heat extremes and

[1] Joeri Rogelj is Reader in Climate Science & Policy and Director of Research at the Grantham institute for Climate Change and the Environment at Imperial College London. Marc Willers QC is a barrister practising at Garden Court Chambers in London.

[2] 'Global update at the 42nd session of the Human Rights Council: Opening statement by UN High Commissioner for Human Rights Michelle Bachelet' (OHCHR, 2019) <https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=24956&LangID=E>

[3] 'Climate change widespread, rapid, and intensifying – IPCC' (IPCC, 2021) <https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/>

[4] C Hickman and others, 'Young People's Voices on Climate Anxiety, Government Betrayal and Moral Injury: A Global Phenomenon' (SSRN, 2021) <http://dx.doi.org/10.2139/ssrn.3918955>.

[5] IPCC, 'Summary for Policymakers' in Masson-Delmotte and others (eds), Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2021) para A.1.2.

changing tracks of tropical storms – can now be unequivocally attributed to human activities.[6]

Some of the impacts of climate change scale directly with the global warming that is experienced in a given year. Others respond slowly and commit future generations to centuries of change as a result of our past and present actions. Heat extremes, droughts and extreme precipitation are exacerbated with each increment of global warming, but would not worsen much further once global warming is halted. For example, heat extremes that our great-grandparents would experience once in their lifetime during the 1850–1900 period (a one-in-50-year event) are today already happening once every 10 years. Under 1.5°C of warming, these extremes are projected to occur on average once every 6 years, and under 2°C of warming this would become once every 4 years.[7] For other aspects of the climate system, such as ocean warming, melting of mountain or polar glaciers, and sea level rise, our past and present emissions have already committed the planet to centuries of gradual change. For example, sea level will continue to rise over centuries to millennia because of continued ice melt and heat accumulation, even if global warming was halted today.[8]

In addition to our understanding the extent and causes of present and committed future climate change, we also have a robust scientific understanding of what is required to halt further warming. Global warming is near-linearly proportional to the total amount of carbon dioxide (CO2) that is ever added to the atmosphere by human activities.[9] It follows that if global warming is to be prevented from increasing any further then global CO2 emissions must be reduced to net zero levels.[10] The level at which global warming is held depends on the total cumulative anthropogenic (that is, caused by human activities) CO2 emissions that have been emitted before net zero levels are reached – the 'total carbon budget' – as well as how deeply non-CO2 greenhouse gases, such as methane or nitrous oxide, are reduced.[11] Because of a lack of globally significant CO2 emissions reductions to date, the remaining carbon budget for keeping warming well below 2°C and preferably 1.5°C relative to pre-industrial levels, as set out by the Paris Agreement,[12] is very small and already implies deep reductions in the coming decades.[13] For example, staying within a carbon budget consistent with limiting global warming to 1.5°C with at least 50% probability implies reaching global net zero CO2 emissions before 2050.[14]

The notion that there is a finite carbon budget that cannot be exceeded if global warming is to be held below specific levels such as 1.5°C comes with straightforward yet important implications for intergenerational equity.[15] The requirement to reach global net zero CO2 emissions[16] has already been highlighted. Furthermore, emitting more CO2 now or over the next decade means steeper reductions later that will have to be shouldered by future generations. These steeper reductions are technically harder to achieve and also come with higher costs.[17] Failing to stay within the carbon budget for a specific climate limit results in higher warming and consequently more impacts. Global warming could be gradually reversed, but – as indicated above – other changes that are the result of past and present emissions, such as sea level rise, would continue to worsen for centuries.[18]

Trying to gradually reverse global warming also requires global net-negative CO2 emissions, that is, the active removal of CO2 from the atmosphere at a global scale. Imposing the requirement for large-scale CO2 removal[19] (CDR) onto future generations because of a failure to make adequate emissions reductions now raises important intergenerational issues. Not only are CDR measures still projected to be expensive, there are questions about whether CO2 removed through these measures is removed permanently from the atmosphere or could return to the atmosphere at a later point in time. Moreover, the global technical potential for CDR is limited and the large-scale deployment of certain measures can cause important societal and environmental trade-offs, because the land required for these measures can lead to social tensions and compete with

[6] ibid para A.1.3–7.

[7] ibid Fig. SPM.6.

[8] ibid para B.5.1–4.

[9] ibid D.1.1.

[10] ibid

[11] ibid D.1.1–3, Table SPM.2.

[12] Article 2.1.a of the Paris Agreement reads: '(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change' <https://unfccc.int/sites/default/files/english_paris_agreement.pdf>.

[13] IPCC (n 5) D.1.1–3, Table SPM.2. The size of the remaining carbon budget depends on (i) the level of global warming that one intends to avoid (eg, 1.5°C of global warming relative to pre-industrial levels), (ii) the level to which one assumes non-CO2 emissions can be reduced, and (iii) the probability of success that one intends to achieve (eg, a 50% probability, or a 90% probability). The remaining carbon budget for limiting global warming to 1.5°C relative to pre-industrial levels with 50% probability and in the presence of deep reductions of methane and other greenhouse gases is estimated at 500 GtCO2, starting from the beginning of 2020. This is significantly less than the 2390 GtCO2 that have already been emitted by human activities over the period 1850–2019.

[14] Reducing global CO2 emissions from today's levels in a straight line to net zero implies reaching net zero in about 25 years from now. Steeper reductions by 2030 would leave a larger share of the remaining carbon budget for the period thereafter and could delay this date. Insufficient action by 2030 would deplete the remaining carbon budget faster than assumed and advance the net zero date consistent with staying within the remaining carbon budget for limiting global warming to 1.5°C.

[15] R Knutti and J Rogelj, 'The legacy of our CO2 emissions: a clash of scientific facts, politics and ethics' (2015) 133 (3) Climatic Change 361.

[16] Not all net zero emissions targets are equally robust from a scientific perspective. The way in which net-zero emissions targets are defined has important implications for their climate outcome and environmental integrity. See also: J Rogelj and others, 'Three ways to improve net-zero emissions targets' (2021) 591 Nature 365.

[17] L Clarke and others 'Assessing Transformation Pathways' in O Edenhofer and others (eds), Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press 2014) 413–510.

[18] IPCC (n 5) para D.1.6.

[19] Carbon dioxide removal (or CDR) is the intentional removal of CO2 from the atmosphere and storing it durably thereafter. See also: S Fuss and others, 'Negative emissions—Part 2: Costs, potentials and side effects' (2018) 13 Environmental Research Letters 063002.

food security, biodiversity conservation and other sustainable development efforts.[20]

Societal and political choices about whether we will increase or strongly decrease greenhouse gas emissions over the coming decades determine whether global warming will be stabilised and held at around 1.5°C by mid-century or exceed 2°C and continue to increase thereafter.[21] The current policies or promised climate action in the form of country pledges under the United Nations Framework Convention on Climate Change's Paris Agreement[22] remain 'seriously inadequate' to achieve the climate goal of the Paris Agreement and would lead to global warming of about 3°C by the end of the century,[23] while higher levels cannot be excluded given uncertainties in how the climate responds to anthropogenic greenhouse gas emissions. Recently announced net-zero emissions targets could reduce these projections by about half a degree, but at present, pledged short-term emissions reductions for 2030 are in many cases inconsistent with the achievement of the longer-term net zero goals for around mid-century.[24] With climate change progressing, and inadequate climate action being implemented to curb global emissions towards net zero, it is clear that climate change will soon become a defining feature that undermines the health of children born today at every stage of their lives. [25]

Youth-led climate change litigation

As global temperature rises in years to come, dangerous climate change will have the greatest effect on our children and future generations. They have no responsibility for the causes of climate change and yet they will unfairly inherit a legacy they did not choose. The disproportionate impact of climate change on the youth and future generations has been highlighted by campaigns around the world, such as 'Fridays for Future', which grew out of Greta Thunberg's brave step of starting a 'school strike for climate' back in August 2018.

In the courtroom youth activists, supported by environmental NGOs, have also drawn attention to the intergenerational impact of climate change in litigation across the globe and in some cases have forced governments to address the issue with the urgency and determination it requires. We highlight the following successful and pending cases:

Juliana and others v United States[26]

In 2015, 21 youth plaintiffs filed a constitutional climate lawsuit, Juliana v United States, in which they alleged that the US government's actions have caused climate change, violating their constitutional rights to life, liberty and property and breaching the public trust doctrine. The plaintiffs have had to fight tooth and nail to overcome jurisdictional arguments and have had to amend their claim in an attempt to overcome preliminary arguments based upon the separation of powers doctrine. Whether or not their case goes to trial, there is no doubt that the case has raised awareness of the dangers posed by climate change amongst the public and politicians in the US and galvanised youth activists across the world – in no small part due to the inspirational work of their lawyers at the non-profit law firm Our Children's Trust.

Future Generations v Ministry of the Environment and others [27]

In 2018 25 youth plaintiffs achieved a fantastic success when the Columbian Supreme Court held that the deforestation of the Amazon causes serious and imminent damage to all Columbians of both present and future generations and that the principle of intergenerational equity compelled the Columbian government to act without further delay so as not to burden disproportionately young persons and future generations. The court ordered that the government create an 'intergenerational pact for the life of the Columbian Amazon' with public participation in order to reduce deforestation and mitigate greenhouse gas emissions.

Sacchi and others v Argentina, Brazil, France, Germany, and Turkey[28]

In 2019, 16 young people from around the world, including Greta Thunberg, submitted a ground-breaking petition to the United Nations Committee on the Rights of the Child in which they asserted that Argentina, Brazil, France, Germany and Turkey have violated their rights protected by the Convention on the Rights of the Child by making insufficient cuts to greenhouse gases and failing to encourage the world's biggest emitters to curb carbon pollution.

The petition asserts that the respondents have four related obligations under the Convention: (i) to prevent foreseeable domestic and extraterritorial human rights violations resulting from climate change; (ii) to cooperate internationally in the face of the global climate emergency; (iii) to apply the precautionary principle to prevent deadly consequences even in the face

[20] H de Coninck and others, 'Strengthening and Implementing the Global Response' in Amjad Abdulla and others (eds), Global Warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (SR1.5) (World Meteorological Organisation 2018) Section 4.3.7; and

J Roy and others, (2018) 'Sustainable Development, Poverty Eradication and Reducing Inequalities' in Svitlana Krakovska, Ramon Pichs Madruga and Roberto Sanchez (eds), Global Warming of 1.5 °C (SR1.5) (World Meteorological Organisation 2018) Section 5.4.

[21] IPCC (n 5) para B.1.2–3, Table SPM.1.

[22] These are known as Nationally Determined Contributions or NDCs. See NDC Registry <https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx>.

[23] UNEP, The Emissions Gap Report 2020 (UNEP 2020) <https://www.unep.org/emissions-gap-report-2020>; and

UNFCCC Secretariat, FCCC/PA/CMA/2021/8: Nationally determined contributions under the Paris Agreement. (UNFCCC 2021) <https://unfccc.int/sites/default/files/resource/cma2021_08_adv_1.pdf>.

[24] Ibid

[25] N Watts and others, 'The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate' (2019) 394 The Lancet 1836.

[26] Case No. 6:15-cv-01517-AA <http://climatecasechart.com/climate-change-litigation/case/juliana-v-united-states/>.

[27] See: https://www.dejusticia.org/en/climate-change-and-future-generations-lawsuit-in-colombia-key-excerpts-from-the-supreme-courts-decision/; http://climatecasechart.com/climate-change-litigation/non-us-case/future-generation-v-ministry-environment-others/; and http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2018/20180405_11001-22-03-000-2018-00319-00_decision-1.pdf for key excerpts from the judgment.

[28] 'Communication to the Committee on the Rights of the Child' (UN 2019) <http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2019/20190923_Not-available_petition-1.pdf>.

of uncertainty; and (iv) to ensure intergenerational justice for children and posterity.

The youth petitioners have asked the committee to declare that the respondent states violated their rights by perpetuating climate change, and to recommend actions that the states should take to address climate change mitigation and adaptation.

Brazil, France and Germany filed objections in which they argued that the petition was inadmissible on three grounds: (1) the committee lacks jurisdiction; (2) the petition is manifestly ill-founded or unsubstantiated; and (3) the youth petitioners have not exhausted their domestic remedies. In response the youth petitioner have argued: (1) that the committee has jurisdiction because they are directly and foreseeably injured by greenhouse gas emissions originating in the respondent states' territories; (2) the claims are manifestly well-founded because the young people are suffering direct and personal harms now and will continue to do so in the foreseeable future; and (3) that pursuing domestic remedies would be futile. The committee's determination of the petition is awaited.

Duarte Agostinho and others v Portugal and 32 other member states

In September 2020, six young people from Portugal filed the first ever climate change case to be brought before the European Court of Human Rights (ECtHR) against 33 member states of the Council of Europe.

The youth applicants complain that the respondent states are in breach of their rights protected by Articles 2, 8 and 14 of the European Convention on Human Rights (the rights to life, to private and family life, and to non-discrimination) for two broad reasons:

- First, because the states are failing to adopt the deep and urgent cuts to their greenhouse gas emissions that the UN has said are necessary to keep global warming to the 1.5°C target set by the Paris Agreement;
- Second, because they are failing to take responsibility for the ways in which they contribute to the release of emissions overseas, such as through the export of fossil fuels.

Significantly, the ECtHR has given the application priority status and communicated the case to the respondent states so that they can address both the issue of admissibility and the merits of the complaint.[29] Interestingly, the court has also asked the respondent states to comment upon whether the youth applicants' complaint engages Article 3 of the Convention (the right not to be subjected to inhumane or degrading treatment), despite it not being raised by the applicants.

If the youth applicants jump through the ECtHR's admissibility hurdles, they will argue that the respondent states share presumptive responsibility for dangerous climate change that, on its current trajectory, far exceeds 1.5°C of global warming and may expose them to the possibility of living to see as much as 4°C of global warming. This argument puts the onus on the respondent states to demonstrate the adequacy of their climate change mitigation efforts.

Neubauer and others v Germany[30]

In February 2020, a group of German young people filed a legal challenge to the Federal Climate Protection Act (KSG) arguing that its target of reducing greenhouse gases by 55% by 2030 from 1990 levels was insufficient and that the KSG therefore violated their human rights protected by Germany's constitution, known as the Basic Law.

On 29 April 2021 the Federal Constitutional Court struck down parts of the KSG as incompatible with fundamental rights for failing to set sufficient provisions for emissions cuts beyond 2030.[31] The court found that Article 20a of the Basic Law, which protects the natural foundations of life in responsibility for future generations, obliges the legislature to protect the climate and to aim towards achieving climate neutrality. Further, the court stated that Article 20a 'is a justiciable legal norm that is intended to bind the political process in favour of ecological concerns, also with a view to the future generations that are particularly affected'. Accepting arguments that the legislature must follow a carbon budget approach to limit warming to well below 2°C and, if possible, to 1.5°C, the court found that the legislature had not proportionally distributed the budget between current and future generations, stating that 'one generation must not be allowed to consume large parts of the CO2 budget under a comparatively mild reduction burden if this would at the same time leave future generations with a radical reduction burden (...) and expose their lives to serious losses of freedom'. The court ordered the legislature to set clear provisions for reduction targets from 2031 onward by the end of 2022 and, significantly, the German government amended the climate protection legislation within months of the court's judgment.

Sharma and others v Minister for the Environment[32]

In Sharma eight children successfully challenged the Australian Environment Minister's decision to approve a new coal project. Bromberg J found that carbon emissions released from mining and burning fossil fuels would contribute to rising global temperatures and exacerbate climate change and that there was a real, significant and foreseeable risk that Australian children would suffer harm as a consequence. He also stated that the climate crisis 'is to fairly be described as the greatest inter-generational injustice ever inflicted by one generation of humans upon the next'. Having done so the judge concluded that the minister had 'a duty to take reasonable care, in the exercise of her powers under s130 and s133 of the Environment Protection and Biodiversity Conservation Act 1999 (…) to avoid causing personal injury or death to persons who were under 18 years of age and ordinarily resident in Australia at the time of

[29] See the English translation of the ECtHR's summary of the case and questions it posed the respondent states at https://youth4climatejustice.org/wp-content/uploads/2021/05/2020.11.20-objet-de-laffaire-professional-translation.pdf.

[30] Complaint Nos: 1 BvR 2656/18; 1 BvR 78/20; 1 BvR 96/20; and 1 BvR 288/20 <http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2020/20200206_11817_complaint.pdf>.

[31] [2021] FCA 560, 8 July 2021 <http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2021/20210429_11817_judgment-1.pdf>.

[32] [2021] FCA 560, 27 May 2021 <http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2021/20210527_12132_judgment.pdf>.

the commencement of this proceeding arising from emissions of carbon dioxide into the Earth's atmosphere' and issued a declaration to that effect before remitting the decision back to the minister for re-determination of the application with that duty in mind.

Conclusion

As these cases illustrate, youth-led climate change litigation, supported by environmental NGOs and expert scientific evidence, is forcing governments to confront the 'elephant in the room' – the devastating and disproportionate impact of climate change on our children and future generations, and the largely insufficient actions by governments to avoid its most harmful impacts.

It is no accident that young people are leading the charge – some are beginning to see the dramatic effects of climate change in their own environments, and they know their future is at stake. Yet they see little being done by their politicians at a national[33] or local level and have no real say in the adoption of legislation or policy.

Environmental NGOs and scientists are providing youth litigants with invaluable advice and support and the ability to have their voices heard. Together they are maximising the chances that climate change litigation will be successful in the courtroom. Perhaps more importantly they are also ensuring that the arguments of youth are being heard in the court of public opinion – providing their fellow citizens with the knowledge to pressure their elected politicians to take the urgent action required to tackle dangerous climate change for the sake of our children and future generations.

It will be fascinating to see the conclusions reached by the United Nations Committee on the Rights of the Child, to follow the progress of the Duarte Agostinho case before the ECtHR in the coming months, and to watch as the concept of intergenerational equity is developed by national and international judges in future youth-led cases that challenge fossil fuel production, infrastructure projects and policy and legislative decisions taken by states.

As we have identified above, an issue that would have a particular bearing on intergenerational equity is the over-reliance of proposed plans on uncertain technological solutions and CDR, while not taking action over the near term that represents a country's 'highest possible ambition'. [34]

In its landmark decision in Urgenda v The Netherlands[35] the Dutch Supreme Court said that reliance on significant carbon sequestration technologies could not be the foundation for government policy without constituting 'irresponsible risks' that 'would run counter to the precautionary principle'. That point was echoed by Professor Robert Watson who said:

Relying on untested carbon dioxide removal mechanisms to achieve the Paris targets when we have the technologies to transition away from fossil fuels today is plain wrong and foolhardy. Why are we willing to gamble the lives and livelihoods of millions of people, the beautiful life around us, and the futures of our children.[36]

Although deploying CDR as a strategy that complements and accelerates deep emissions reductions would not necessarily be contrary to the precautionary principle, reliance upon such untested, high-risk technological solutions at the expense of other available emissions reduction policies in the near term would be reckless. Moreover, inconsiderate deployment of CDR at large scales can result in important societal and ecological side effects that undermine sustainable development.[37] Over-reliance on CDR would thus also, we suggest, place youth and future generations in a position where their lives, homes and family life are at a disproportionate risk when compared to those of older generations and constitute a breach of their human rights.[38]

It is therefore clear that, besides the need for states to take ambitious climate action without delay to keep global warming as low as possible, it is essential that such action steers clear of high-risk strategies and does not undermine the achievement of other sustainable development objectives during the lifetimes of today's youth. Any pathway to net zero that fails adequately to take these aspects into account seems destined to find itself on the wrong end of a youth-led climate case.

[33] By way of example, the UK government has been repeatedly criticised by the Committee on Climate Change for having dragged its feet when it comes to the adoption and implementation of policies to meet its statutory obligations under the Climate Change Act 2008 to reduce greenhouse gas emissions. See the Committee on Climate Change's Progress Reports to Parliament in 2016 and 2021: Meeting Carbon Budgets: 2016 Progress Report to Parliament, 13; and Progress in Reducing Emissions: 2021 Report to Parliament, 16, 100 and 140.

[34] Article 4.3 of the Paris Agreement states that: 'Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.'

[33] Case No. 19/00135, 20 December 2019 <http://climatecasechart.com/climate-change-litigation/wp-content/uploads/sites/16/non-us-case-documents/2020/20200113_2015-HAZA-C0900456689_judgment.pdf at para 7.2.5>.

[36] James Dyke, Robert Watson and Wolfgang Knorr, 'Climate Scientists agree: achieving net zero is a deceiving trap' (Inverse, 23 May 2021) <https://www.inverse.com/science/climate-scientists-say-achieving-net-zero-is-not-nearly-enough>

[37] Roy (n 21); Fuss (n 20).

[38] Which, by way of example, in the case of youth living in Council of Europe states would constitute a breach of their human rights Articles 2 and 8 of the ECHR taken together with Article 14 of the convention.

Biography

Joeri Rogelj is Director of Research and Reader in Climate Science & Policy at the Grantham Institute and the Centre for Environmental Policy at Imperial College London, and a Senior Research Scholar at the International Institute for Applied Systems Analysis. He explores how societies can transform towards more sustainable futures connecting Earth system sciences to the study of societal change and policy.

He has published on the effectiveness of international climate agreements such as the Paris Agreement, carbon budgets, net zero emission targets, 1.5°C emissions pathways, and the interaction between climate and sustainable development.

He also provided scientific evidence in support of the 'Children vs Climate Crisis' petition, in which 16 children from across the world petitioned the United Nations Committee on the Rights of the Child to hold five of the world's leading economic powers accountable for inaction on the climate crisis.

He contributed to several climate change assessments over the past decade. He is a long-serving lead author on the annual Emissions Gap Reports by the United Nations Environment Programme (UNEP). He also contributed to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), served as a Coordinating Lead Author on the IPCC Special Report on 1.5°C of Global Warming and as a Lead Author on the IPCC Sixth Assessment Report. In 2019, he was the youngest member serving on the UN Secretary-General's Climate Science Advisory Group.

Biography

Marc Willers QC is a senior member of Garden Court Chambers in London and specialises in planning and environmental law; public and administrative law; human rights and discrimination law: see his full profile at https://www.gardencourtchambers.co.uk/barristers/marc-willers-qc/sao.

Marc's environmental law practice is extensive and includes casework and advice within the United Kingdom and abroad. He regularly acts for NGOs and campaigners in challenges to legislation and policy, including those relating to fossil fuel production and climate change and he was part of the legal team that filed the groundbreaking Portuguese youth climate case, Duarte Agostinho v Portugal and 32 other states, before the European Court of Human Rights in 2020.

Bringing UK capital and expertise together to make energy transition a reality.

Dr Joe Briscoe and Stuart Bedford

Dr Joe Briscoe

Stuart Bedford

Introduction

Technological innovation is going to be central to reducing the UK's carbon footprint. Advances are needed on many fronts to ensure that, among other things, energy can be produced on a net zero basis and our reliance on fossils fuels to power transport, home heating and industries can be phased out over time.

No single technology will, however, provide the answer to energy transition. We need to progress the development and commercialisation of many different technologies and facilitate their adoption at scale in order to achieve the targets that have been set by the UK government (and other governments around the world) in accordance with the Paris climate agreement.[1]

There will inevitably be a mix of incremental improvements to existing technologies together with some new 'moon shot' technologies that transform how we look at power generation and energy storage and consumption. In the Ten Point Plan for a Green Industrial Revolution,[2] the government identified ten priority areas where it is seeking to promote research and development expenditure in the UK. The investments made under the plan as part of the £1 billion Net Zero Innovation Portfolio[3] will provide real impetus for the commercialisation of technologies in these areas.

However, to continue to meet or beat the UK's carbon budgets under the Climate Change Act,[4] we need to rapidly accelerate the process for bringing through critical carbon-reduction technologies. A 2018 study[5] found that the period from invention to widespread commercial use of a new ground-breaking technology has, since the industrial revolution, been on average between two and four decades. Against the backdrop of the various targets set for the next 30 years, the UK therefore needs to continue to find ways to facilitate the shortening of that development cycle to enable attainment of our stated goals whilst ensuring that finance can be provided to match the development term.

Even with material improvements in the typical commercialisation life cycle, much of the capital currently available in the market will be seeking returns on a shorter-term basis. Matching funding to the returns characteristics is a key challenge in bringing to bear the deep pools of private sector liquidity in the context of long-term technology evolution and development. This need for patient capital for technology investment was highlighted in HM Treasury's Financing Growth in Innovative Companies consultation response[6] and led to, among other things, the establishment of British Patient Capital.[7]

Whilst a significant level of government funding has already been committed, the scale of the transition required means that success will depend on attracting increased amounts of longer-term private sector capital. From individual and angel investors through to the major pension and endowment funds, sustainable investment is at the forefront of investment aims and strategy, and for corporates and asset managers alike the

[1] Paris Agreement (adopted 12 December 2015, entered into force 4 November 2016) <https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en>.

[2] UK Government, 'The Ten Point Plan for a Green Industrial Revolution' (2020) <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution/title>.

[3] UK Government, 'Net Zero Innovation Portfolio' (2021) <https://www.gov.uk/government/collections/net-zero-innovation-portfolio>

[4] Climate Change Act 2008 <https://www.legislation.gov.uk/ukpga/2008/27/contents>.

[5] R Gross and others, 'How long does innovation and commercialisation in the energy sectors take? Historical case studies of the timescale from invention to widespread commercialisation in energy supply and end use technology' (2018) 123 Energy Policy 682.

[6] HM Treasury, 'Financing growth in innovative firms' (2017) <https://www.gov.uk/government/consultations/financing-growth-in-innovative-firms>.

[7] https://www.britishpatientcapital.co.uk/

recently introduced Taskforce for Climate-related Financial Disclosures[8] regime and the publication of the EU Taxonomy[9] will only serve to further promote energy transition-focused investment. The capital pools are there if the right structures and incentives can be developed.

This is not though just a question of assembling equity and debt finance. Taking a technology through to commercialisation and deployment presents a host of other issues: securing talent, accounting and finance, and legal, tax and regulatory compliance to name but a few. In addition, for those businesses looking to manufacture in the UK, real estate and planning requirements have to be negotiated and founders have to navigate through a complex regime of reliefs, incentives and grants.

How then do we ensure the right information, incentives, funding and programmes are in place to bring founders and investors together?

The issue is complex due to the broad range of issues to be resolved, coupled with the need to drive forward complementary technologies simultaneously to yield the true benefits (e.g. the continued expansion of renewable generation needs to be matched by advances in storage technology to address intermittency). There are also both supply-side and demand-side hurdles to be negotiated (i.e. those funding the creation of a carbon-reducing product from an innovative new technology need certainty of demand for that product). Furthermore, different support and incentives are required according to whether the aim is to create an environment that helps ideas becomes viable products or to take those products to widespread commercialisation.

With a systems issue of this scale and complexity and the inevitably extended timetables associated with certain elements of the technology deployment, government policies, initiatives and funding will inevitably play a critical role in helping to channel private sector capital and resources to achieve the common net zero goal and ensuring founders have an environment that encourages them to bring the right technologies to market.

Against this backdrop, this article examines two promising technologies at different stages of commercialisation that are expected to make a real contribution to carbon reduction. It goes on to look at the journey of a UK-headquartered company bringing one of these technologies to market, and provides a series of proposals for how we can build on the existing government policies and initiatives to help maintain investment in carbon-reduction technologies beyond COP26.

Looking to the future

As outlined above, we critically need technology innovations in both power generation and energy storage to accelerate the transition to a net zero economy. Solar photovoltaics (PVs) are seen as a critical component in the renewable electricity generation mix, but cost reductions and efficiency increases are still required to accelerate uptake and increase market share.[10] Of course, as with most renewables, solar is intermittent, and therefore energy storage is also of critical importance. Much research effort is underway to look for alternatives to the incumbent technologies of crystalline silicon for PVs and batteries for energy storage.

A step change in the efficiency of solar power generation

In the PV field, one research-level technology that is on the path to commercialisation is that of 'perovskite' solar cells (PSCs). PSCs use a class of material known as hybrid metal halide perovskites as the 'active' material in the solar cell, which absorbs the light and converts it to electricity – a role performed by crystalline silicon in traditional PVs (which currently hold >90% of the market). One of the key advantages of the perovskite materials over silicon is they absorb light much more efficiently – around 1000 times less material is required to absorb the same amount of light. Furthermore, the perovskite materials can be deposited by a chemical solution, or 'ink', making it much less expensive to produce compared with silicon, which must be melted at high temperature (~1500°C) and cast into a crystalline form. The first research report of these perovskite materials in PVs was in 2009,[11] with improvements in efficiency and stability reported in 2012,[12,13] and the field rapidly picking up in the last decade with thousands of research groups now working on the technology.

Other 'thin film' technologies have already been commercialised, particularly those based on cadmium telluride and copper indium gallium diselenide. Whilst these technologies do not have the advantage of being processable from chemical solutions, historically they had the advantage of lower module production costs than silicon PVs, though with recent rapid drops in silicon PV costs this is no longer the case.[14] Their efficiencies remain ~5% lower than silicon, however, and efficiency is the key metric for a successful PV technology. This is because installation of any solar PV solution, whatever the underlying technology, comes with certain overheads due to the need for additional components such as mountings, electrical connections and inverters – these are known as balance-of-system (BOS) costs. These BOS costs account for around two thirds of total installation costs. Thus, the most effective way to lower cost per watt of the power generated is not to make the PV modules cheaper, but rather to increase their efficiency. This is where PSCs are gaining the edge: their record efficiency (at the research level) is now within ~1% of silicon, thus making them the first technology to be developed that can truly compete, or perhaps even supplement silicon PVs.

[8] Task Force on Climate-related Financial Disclosures, 'Recommendations of the Task Force on Climate-related Financial Disclosures' (2017) <https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf>.

[9] 'EU taxonomy for sustainable activities' (European Commission) <https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en>.

[10] REN21, Renewables 2019 Global Status Report (2019).

[11] A Kojima and others, 'Organometal halide perovskites as visible-light sensitizers for photovoltaic cells' (2009) 131 Journal of the American Chemical Society 6050.

[12] MM Lee and others, 'Efficient hybrid solar cells based on meso-superstructured organometal halide perovskites' (2012) 338 Science 643.

[13] H-S Kim and others, 'Lead Iodide Perovskite Sensitized All-Solid-State Submicron Thin Film Mesoscopic Solar Cell with Efficiency Exceeding 9%' (2012) 2 Scientific Reports 591.

[14] V Benda and L Černá, 'PV cells and modules – State of the art, limits and trends' (2020) 6 Heliyon e05666.

A further advantage of hybrid perovskite materials is that they are highly chemically tunable –the composition can be changed to alter the part of the solar spectrum that they absorb. This has two main advantages:

(i) The composition can be varied to find the optimum for solar power conversion efficiency. Due to the mechanism of solar-to-electric energy conversion in a PV, there is an optimum value of the semiconductor bandgap that leads to the maximum theoretical efficiency (around 34% for a conventional PV design using a single semiconductor junction). Thus the perovskite composition can be varied to make a material with the optimum bandgap.

(ii) Alternatively, the composition can be tuned to be optimum for what's known as a 'tandem' PV. Tandem PVs can exceed the theoretical efficiency limit for a single-junction device by stacking multiple solar cells on top of one another. Each cell absorbs a different portion of the solar spectrum (e.g. blue on top, red underneath), converting it more efficiently than a single cell would, thus raising the overall theoretical power conversion efficiency to 40–45%.

It is the area of tandem PVs that is now receiving increasing commercial interest for PSCs. Any approach that can achieve a step change in efficiency would be potentially disruptive to the market. While silicon PVs have been making incremental efficiency gains of around 0.5% per year over the past decade,[14] implementing tandems could step up efficiencies by 5% in one go. To bring the benefits of this increased efficiency to rapid commercialisation: (i) the use of PSCs in tandems must come at no or little additional cost compared with silicon PVs; (ii) silicon-perovskite tandems must be capable of being implemented as like-for-like upgrades for silicon-only devices, removing the need to establish an entirely new value chain – essentially bringing 'added value' to the already established silicon technology. As a result, a major focus for the development of PSC tandems is to place a perovskite cell on top of a silicon cell to produce a perovskite-silicon tandem (see Figure 1 and case study Oxford PV – making the next generation of solar technology a reality).

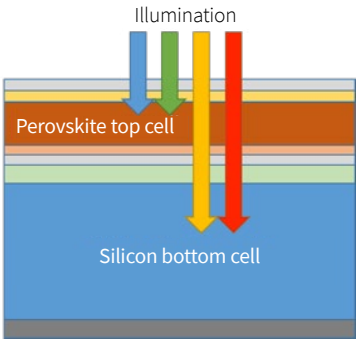


Figure 1:. Perovskite-silicon tandem PV schematic (not to scale). The perovskite solar cell is coated on top of a silicon PV, converting the blue end of the spectrum to electricity more efficiently before the red and infra-red light is passed through to the silicon bottom cell.

Can chemical storage help address the challenge of intermittency?

In the field of energy storage, developments in battery technology – particularly of lithium-ion batteries – have been driven rapidly by the portable device and electric vehicle market. However, grid-scale energy storage has different requirements, and limitations of lithium-ion technologies such as power density (discharge rate), cost and lifetime, as well as the limited supply of lithium,[15] mean that alternative technologies (both alternative battery and non-battery energy storage) must be developed to meet the rapidly growing requirements for grid-scale energy storage.

Many alternatives are available, including well-established techniques such as gravitational storage (e.g. pumped hydro), thermal storage (e.gg within molten salts heated using solar energy), or chemical storage. While gravitational storage is highly efficient, it is limited to only a few suitable geographic locations, and solar-to-thermal storage is most effective in regions with reliable solar resource (i.e. sun-belt regions), with alternatives such as electric-to-thermal being much less efficient. Hence the current focus is on large-scale battery installations for grid-scale storage.

Chemical energy storage uses surplus electricity (or other energy sources) to generate chemical fuels such as hydrogen, methane or ammonia. The use of such 'powerfuels' has numerous advantages:[16]

(i) They can reduce or remove fossil-fuel reliance of sectors previously considered difficult to address, such as shipping, aviation and industry;

(ii) They can substitute numerous chemical feedstocks traditionally derived from fossil fuels;

(iii) They can provide long-term storage for electrical energy to address more major (e.g. seasonal or geographical) fluctuations in renewable energy generation.

However, chemical storage of energy for grid (or other) utilisation is currently very underdeveloped. The most well-established approach is to use water electrolysers to split water into hydrogen and oxygen using surplus electricity from the grid, particularly from wind or solar, producing 'green' hydrogen. This has the advantage that it can use an established technology (electrolysers) that can be connected to the grid and run when there is any electricity surplus. The disadvantage is that electrolysers are relatively expensive, and come with associated efficiency losses, which, coupled to the efficiency losses of the PVs (in the case of solar) lead to overall low efficiency of around 10%[17] and associated high cost of the hydrogen generated. It is for this reason that researchers are developing technologies to essentially skip the intermediate step of electricity generation and directly produce 'solar fuels' from sunlight in a single device in a process known as photocatalysis.

Photocatalysis commonly uses semiconductors, which can absorb light to excite the internal electrons to higher energy

[15] T Faunce and others, 'On-grid batteries for large-scale energy storage: Challenges and opportunities for policy and technology' (2018) 5 MRS Energy & Sustainability E11.

[16] M Ram and others, Powerfuels in a Renewable Energy World - Global volumes, costs, and trading 2030 to 2050 (LUT University and Deutsche Energie-Agentur GmbH (dena) 2020).

[17] A Grimm, WA de Jong and GJ Kramer, 'Renewable hydrogen production: A techno-economic comparison of photoelectrochemical cells and photovoltaic-electrolysis' (2020) 45 International Journal of Hydrogen Energy 22545.

levels. Semiconductors are also used in PVs, where multiple semiconductors are joined together in a 'junction' and connected to a circuit, converting the energy gained by the electrons into current and thereby electrical energy. In contrast, in a photocatalyst the semiconductor is placed in contact with a chemical species (often in solution), and the additional energy gained by the electrons is instead used to initiate or speed up a chemical reaction. In the case of solar fuels, the most common reaction studied is splitting water to produce hydrogen, as outlined above, but the chemical reduction of carbon dioxide to fuels or other chemicals is also gaining increasing attention.

Taking the example of solar water splitting, this process allows a fuel (hydrogen) to be produced using only water, sunlight and a photocatalyst, bypassing the electricity generation step in the case of electrolysers run using renewable electricity. Therefore the theoretical efficiency of this process is around 40%.[18] In reality the problem is clearly much more complex, and the record efficiency for solar-to-hydrogen conversion is ~20%,[19] but this uses highly expensive semiconductors and therefore is too expensive to be commercially viable. A great deal of research is being conducted to develop lower-cost materials, but these have only reached efficiencies of under 10%, which is below that required for economic viability. [20]

Beyond materials challenges, the engineering challenges of conceiving, designing and building effective systems to house these photocatalytic materials, supply the required feedstocks (e.g. water for solar hydrogen production), separate the products, etc. are exceedingly complex. Systems are being considered using powdered photocatalysts in suspension (Figure 2a) and photocatalytic films supported on a substrate, either with all components required to split water (known as an 'artificial leaf', Figure 2b) or electrically connected to another electrode where alternate reactions take place (Figure 2c). In the latter case this can allow the addition of some electrical energy (e.g. from a PV) to increase the efficiency (but at the cost of complexity and cost), in what is known as a photoelectrocatalytic system. Even within a single category, many design options must still be considered such as how to contain the photocatalyst powders, or whether to use flat plates, tubes or other designs for photoelectrode-based systems.

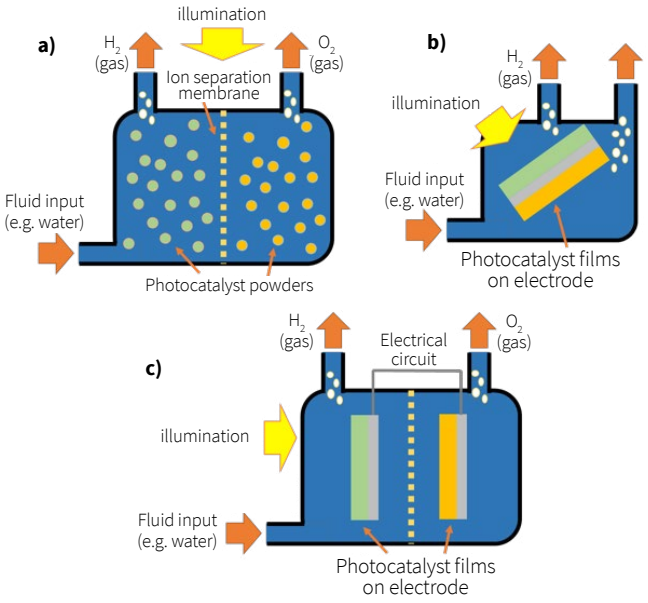


Figure 2. Schematics of solar water splitting using: (a) a powdered photocatalyst; (b) catalysts suspended on a substrate to form a (photo)anode and (photo)cathode on a single conductive substrate ('artificial leaf'); and (c) photoelectrocatalysis, where catalyst films are suspended on two substrates to form a photoanode and photocathode and connected via an external electrical circuit.

Solar fuels, therefore, still have a long path of research and development before they reach full commercial implementation. However, as outlined above, the rapid development of such a potentially disruptive technology is critically important to accelerate the energy transition towards a net zero future. Such technologies cannot afford the decades of development that are normally needed to reach commercial maturity. Any private sector investment would be hugely beneficial to accelerate commercialisation. However, at such an earlier stage there is clearly a large risk for any investors, where no clear technological 'winner' has yet emerged, and long-term investment is needed. Thus, any assistance and guidance for such investment could greatly improve the pathway for such technological innovations to make an impact on our economy and climate.

Smoothing the path to success

We need then to ensure that the above technologies (along with many others) are given the focus and prioritisation and the funding and support to ensure that their development and deployment can be progressed on a timescale that enables the UK to meet its climate goals.

The government has already made huge strides in fostering a better environment for technology investment in the UK and to support the growth of new technology businesses. There are many public (or publicly funded) organisations and schemes that provide support and funding to founders. The research funding and investment provided by the various 'councils' of UK Research and Innovation (UKRI),[21] general coordination provided and skills programmes run by Tech Nation,[22] the funding provided and arranged by the British Business Bank[23] (e.g. through the Future Fund: Breakthrough and British Patient Capital), and the Clean Growth Fund[24] established last year as part of the Department for Business, Energy and Industrial Strategy's Energy Innovation Programme[25] are but a few elements of the network open to founders looking to develop and commercialise their innovation.

[18] KT Fountaine, HJ Lewerenz and HA Atwater, 'Efficiency limits for photoelectrochemical water-splitting' (2016) 7 Nature Communications 13706.

[19] WH Cheng and others, 'Monolithic Photoelectrochemical Device for Direct Water Splitting with 19% Efficiency' (2018) 3 ACS Energy Letters 1795.

[20] BA Pinaud and others, 'Technical and economic feasibility of centralized facilities for solar hydrogen production via photocatalysis and photoelectrochemistry' (2013) 6 Energy & Environmental Science 1983.

[21] https://www.ukri.org/

[22] https://technation.io/

[23] https://www.british-business-bank.co.uk/

[24] https://www.cleangrowthfund.com/

[25] https://www.gov.uk/guidance/energy-innovation

The increasingly positive investment environment is evidenced by the fact that UK venture capital funding hit record levels in 2020 and (whilst from a low base) capital invested in climate tech increased by 21%.[26] However, there remain challenges – the 2020 data[27] also shows that:

(i) Funding remains heavily focused on key consumer-focused industries – fintech (32%), healthcare (19%) and e-commerce (8%) – whereas energy-focused investment accounted for a little over 1% of the venture capital funding in 2020;

(ii) Funding is skewed towards London, which had a share of over 65% in 2020, with Oxford and Cambridge typically ranking as the second and third cities for technology investment;

(iii) Whilst there are now a number of headline large late-stage deals (mostly in fintech), the vast majority of UK funding rounds (particularly where European funds are involved) take place at the Seed and Series A end of the funding spectrum.

Plus, it still remains difficult for founders to find the most efficient way to navigate through the funding and regulatory environment.

What further steps then could the government take to evolve the system to make sure businesses across the UK, operating in the critical area of carbon reduction have access to the right information and the right forms of capital and expertise to fund their businesses throughout the development life cycle so those businesses can reach a scale that they can make a meaningful contribution to the UK's climate targets?

Creating the information marketplace.

Identifying key technology areas through the Ten Point Plan for a Green Industrial Revolution was an important first step. Given the scale and complexity of the solution required, the aim should be to build on these broadly defined areas to create a more informed marketplace for the key carbon-reduction technologies and businesses and explain the role they play within the government's overall strategy and how that can help deliver on the policy goals. Furthermore, through the collation and sharing of data on investments a critical feedback loop can be developed to help monitor progress against targets and promote collaboration between different players in the value chain. Active promotion of legal technology such as CreateiQ[28] in the context of deal documentation could help provide structured data and automate the collation and reporting process.

Providing the roadmap.

Given the number of different players involved in facilitating UK technology investment, it is critical to create an easily navigable roadmap of options that clearly explains the roles played by each of the bodies and organisations and enables founders to more readily tap into the resources available. The newly integrated UK Research and Innovation website[29] will be a helpful step forward but the government can help provide a broader perspective that can draw together information on the main national and regional bodies and initiatives as well as key private sector groups.

Focusing the capital.

Given the breadth of technology-related (and other) opportunities in the market competing for funding, dedicated carbon-reduction funds should be made available to guarantee that investment is made at the earliest opportunity and can have the maximum effect on targets. This could be done by:

- Building on the recommendation of the government's Green Finance Taskforce,[30] working with the private sector to create a series of regional energy transition accelerators to provide financial, commercial and legal support in the very early days of new carbon-reduction businesses. The accelerators can also be used as a hub to draw in individuals beyond the traditional angel community who are looking for ways to get involved but lack the personal network and/or understanding of how they could contribute.

- Establishing further funds targeted on net zero technologies to complement the early-stage-focused Clean Growth Fund to ensure that capital is available throughout the commercialisation lifecycle. The recent launch by Ofgem of the £450 million grid innovation fund[31] is an initiative that needs to be replicated across other parts of the net zero transition.

- Ensuring there is clarity about how these investments are treated in the context of the EU Taxonomy and equivalent regimes so that the investment community can make the necessary capital allocation and corporates can invest in sustainability-focused technologies with confidence.

Making patience a virtue

A number of areas could help attract longer-term funds:

- The recent decision by the pensions regulator to scrap a proposed hard cap on the holding of illiquid assets is a welcome boost. It will be important for the government to work with the pensions industry to create longer-term and evergreen structures that actively encourage pension scheme managers to make funds available to invest in the development and deployment of these technologies.

- Insurers (particularly life insurers) are ideally placed as potential capital providers given their need to invest long-term to meet their long-term liabilities. However, under Solvency II's risk-based-capital model, only assets meeting certain criteria are eligible under the 'matching adjustment' rules for reduced capital requirements. This has resulted in a drive by insurers to identify and/or create such assets and also to lobby for changes to the rules to allow a wider scope of matching adjustment eligible assets. Reduced capital requirements also apply under Solvency II for 'long-term equity' and for

[26] https://technation.io/report2021/#uk-trends – the 21% also includes investment in agriculture companies

[27] Linklaters analysis based on CB Insights data

[28] https://www.createiq.tech/

[29] 'UK Research and Innovation's new website' (UKRI) <https://www.ukri.org/uk-research-and-innovations-new-website-frequently-asked-questions/>.

[30] Green Finance Taskforce, 'Accelerating Green Finance' (2018) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/703816/green-finance-taskforce-accelerating-green-finance-report.pdf>.

qualifying infrastructure investments but each is of relatively limited application. In the UK, the Prudential Regulatory Authority's (PRA) statutory objectives for its regulation of insurers, set out in the Financial Services and Markets Act 2000, are focused on financial stability and an appropriate degree of protection for policyholders. Solvency II is currently being reviewed by HM Treasury (on the principle that Parliament and HM Treasury should be responsible for creating the policy framework in which the regulators operate) with stated objectives that include supporting 'insurance firms to provide long-term capital to underpin growth, including investment in infrastructure, venture capital and growth equity, and other long-term productive assets, as well as investment consistent with the Government's climate change objectives'. Indications from the PRA are that, while it is very conscious of the issues, challenges and risks posed for insurers by climate change, it is unlikely to support the introduction of investment incentives (such as reduced capital requirements for investment in green assets) where they may be at odds with its primary, prudential objectives. That debate, whether in the context of matching adjustment, long-term equity or infrastructure investment, is still to play out. We may see some widening of the characteristics of assets that are eligible for lower capital requirements if this can be accommodated in a way that the PRA feels does not give rise to additional risk. This might include providing for eligibility of investments in funds with diversified portfolios that would be resilient to the riskiness of certain start-ups or scale-ups, or maybe government would need to give some form of support, whether express financial guarantees and/or implicit support through the assurance of stable long-term policies supporting such innovation, thus enabling the PRA to adjust the rules for certain asset classes.

- The FCA consulted on a new type of UK long-term asset fund (LTAF) in May 2021 and is due to publish their response later in the year. It is designed for defined contribution pension schemes in particular to invest in venture capital, infrastructure and other long-term assets, and has high-profile support within government, with Chancellor Rishi Sunak aiming for the first LTAF to be established this year (2021). The jury is out on how successful it will be as there are some headwinds that might make it more challenging, not least the proposal for LTAFs to be open-ended, which doesn't fit easily with the return profile of these types of assets and the limited range of vehicles that can be utilised. It will be extremely important to get the right tax treatment to ensure it is attractive to long-term investors.

From start-up to scale-up

As was highlighted in the Kalifa report in the context of the UK fintech industry,[32] there remains a lack of funding for scale-ups in the UK. The strong tax incentives in place for early-stage investment through the Seed Enterprise Investment Scheme (SEIS) and Enterprise Investment Scheme (EIS) reliefs draw in significant amounts of start-up funding, but many early-stage businesses find life harder in the so-called valley of death as EIS limits are reached. The government should focus then on creation of incentives to help smooth the path from early-stage to scale-up and for those technologies that are critical to the net zero transition. In addition, further incentives should be developed to ensure that the development of carbon-reduction technology in the UK more often leads directly to UK manufacturing jobs (e.g. creating more Enterprise Zones to encourage the development of net zero-focused manufacturing clusters across the UK and ensuring that the annual investment allowance limit for the sector encourages investment in plant and machinery in the medium to long term).[33]

Reducing deal friction:

Driving standardisation.

As the government commits a greater amount of funding, it should work with investors, law firms, the British Venture Capital Association (BVCA) and relevant legal industry bodies to continue to find ways to reduce friction costs associated with the investment process. Whilst there is already a level of standardisation of documentation, there is more to do and it is critical to increase acceptance of that documentation as the basis for negotiation. The BVCA investment documentation is in the process of being updated and with the rapid expansion of early-stage funding in recent years and the internationalisation of funding sources, templates that are fit for purpose in the global context will provide an important launch point. The standards should also be expanded to include industry-wide templates for convertible loans, agreements for future equity and warrant instruments. Time and expense are wasted generating other documents critical to early-stage businesses including non-disclosure agreements, consultancy agreements and intellectual property assignments. Projects such as OneNDA will hopefully demonstrate the benefits of driving standardisation of contractual arrangements and show how technology can be used to deliver structured data to the counterparties.

Removing complexity.

It would help the cause for standardisation if the EIS 'risk to capital' condition could be met by preference shares in the context of typical early-stage investments. In practice, the market norm is for a preference to be created in all but name through the structuring of the liquidation stack, but this pseudo-preference requires the parties to move away from the BVCA precedents when documenting deals and creates unnecessary complexity for future rounds.

As noted above, the government has implemented and continues to implement a number of excellent initiatives to drive forward the green transition but there is more that can be done and needs to be done to harness the deep pools of

[31] 'New £450m fund to unlock cutting-edge innovation across gas and electricity networks' (Ofgem, 2021) <https://www.ofgem.gov.uk/publications/new-ps450m-fund-unlock-cutting-edge-innovation-across-gas-and-electricity-networks>.

[32] Ron Kalifa, 'The Kalifa Review of UK FinTech' (UK Government, 2021) <https://www.gov.uk/government/publications/the-kalifa-review-of-uk-fintech>.

[33] 'BDO calls for targeted tax incentives to boost UK manufacturing' (BDO, 2021) <https://www.bdo.co.uk/en-gb/news/2021/bdo-calls-for-targeted-tax-incentives-to-boost-uk-manufacturing>.

[34] https://onenda.org/

capital and talent in the UK to help deliver on the UK's climate goals. If we build on the current momentum then hopefully we will see technologies such as perovskite solar cells being deployed widely in the medium-term and a clear and consistent funding path created for the evolution of photoelectrocatalytic water-splitting to take it from the lab into real-world storage applications.

Case study: Oxford PV – making the next generation of solar technology a reality

In the words of Dr Chris Case, Chief Technology Officer at Oxford PV, the company brings 'technology disruption without business disruption'. With tandem PV at its core, Oxford PV is on the cusp of delivering a step change in efficiency of solar PVs, with the added benefit that its next-generation solar cells can readily be integrated into the production of ordinary silicon-only solar modules.

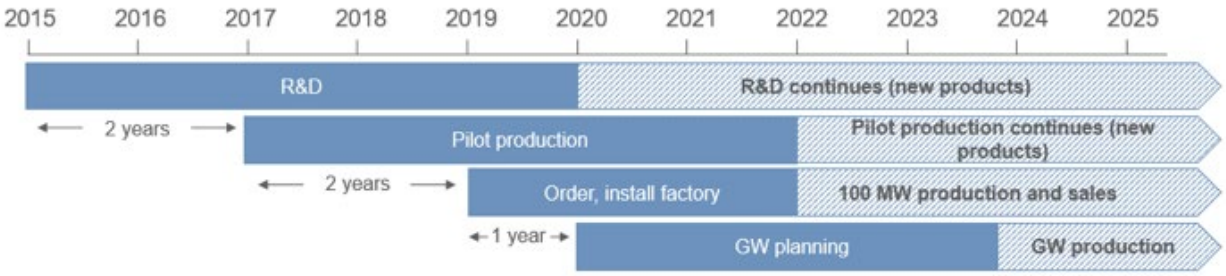
Oxford PV's journey began in 2010 when the relevant technology was spun out of Professor Snaith's lab at the University of Oxford. Since then, supported by a combination of angel, institutional and strategic funding, it has moved from the generation of an idea and establishing proof of concept in the UK, to pilot manufacturing and, in the near future, full manufacturing in Germany.

The company has managed to materially reduce the development life cycle of its tandem PV technology by bringing forward the investment in the key stages of evolution. Whilst this approach brought a level of risk, incentives available in Germany allowed the company to parallel track parts of its product development and manufacturing cycle, which enabled them to remain at the forefront of this technological development.

Despite the impressive rate of development, early investors have had to take a long-term view and the company has benefited from the deep and supportive capital pools in the Oxford area to help anchor its progress.

Oxford PV is now well down the road to successfully commercialising its perovskite-on-silicon tandem solar cell technology, and the advancements it brings should help solar power generation continue to play an important part in the renewable energy solution to the net zero equation.

Accelerating the PV development cycle



OXFORD PV™
The Perovskite Company

Biography

Dr Joe Briscoe completed an MSci at the University of Durham (Grey College) in Natural Sciences, which included researching the doping of ceramic zinc oxide under Dr Andy Brinkmann. Following this he undertook a PhD with Dr Steve Dunn and Prof Rob Dorey at Cranfield University in nanostructured photovoltaic devices with a thesis titled, "Investigation of ZnO nanorod solar cells with layer-by-layer deposited CdTe quantum dot absorbers".

Upon completion of his PhD, Dr Briscoe moved to Queen Mary where he worked on the development of a new type of nanostructured piezoelectric energy harvesting device using ZnO nanorods, and the investigation of ferroelectric materials as novel photocatalysts for the production of fuels (solar fuels / artificial photosynthesis) and the degradation of pollutants. He also worked on a number of projects developing emerging photovoltaic technologies, such as hybrid organic-inorganic lead-halide perovskites, organic photovoltaics (OPVs) and dye-sensitised solar cells (DSSC).

Dr Briscoe is now a Reader in Energy Materials & Devices in the School of Engineering & Materials Science, Queen Mary University of London. His current research is focussed on investigating a range of new materials, structures and material combinations for use in nanostructured, low-cost photovoltaics (PVs), photocatalysis/photoelectrocatalysis (PEC) and piezoelectric energy harvesting, with a particular focus on the use of polar (ferroelectric, piezoelectric) materials within these devices.

Biography

Stuart Bedford is a corporate partner at Linklaters and Global Co-Head of the Linklaters Technology Sector. He recently began a part-time role as the general counsel of Ahren Innovation capital, an early stage investor focused on investing in deep tech and deep science. Within Linklaters he has previously served as both Head of Corporate for Asia and the UK and led the Energy Sector team and, outside of Linklaters, has spent periods working for the impact fund, LeapFrog Investments, and the technology outsourcing consultancy, Grosvenor Consultancy Services.

Stuart has been involved in the technology sector for over 30 years as both a lawyer and a consultant. He has a broad technology-focused practice ranging from advising venture capital, private equity, pension and sovereign wealth funds investing in technology companies as well as advising founders and start-up and scale-up companies as they negotiate their way through the funding and business environment. Stuart also works closely with many corporate clients on technology focused initiatives as they respond to disruption and the rapidly changing regulatory environment for technology businesses.

COP 26 and finance.
Clare Burgess

Clare Burgess

The central role of finance in the fight against climate change is certainly recognised. Indeed, whilst the objective of limiting temperature rises to below 1.5 degrees is perhaps better known, 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development' is one of the three key objectives set out in Article 2 of the Paris Agreement.

One of the four goals set for COP26 is to 'Mobilise finance', and there are proposals with respect to both public and private finance.

In this article we will explore three key related areas:

1. What are the new regulatory initiatives that intend to increase transparency around exposure to climate change, ensure that our financial systems can withstand the impacts of climate change, and increase the flows of finance to climate finance?

2. What are sustainable finance products, and what regulatory initiatives would encourage and improve these?

3. How can financial institutions help drive climate finance to emerging markets?

Regulatory initiatives

As in many areas, Europe has been very active in driving forward new regulatory developments to support sustainability. Much of this regulation has focused on the financial services sector, an already heavily regulated sector of the economy.

The key focus areas for the European legislative agenda have been (1) taxonomy – developing a detailed classification system to define sustainable activities; (2) disclosure – developing a framework for sustainability reporting; and (3) integrating environmental, social and governance (ESG) risks into risk management.

Taxonomy

The EU Taxonomy Regulation[1] establishes criteria for determining whether an economic activity is environmentally sustainable. Note that the criteria is for activities, not companies or other entities. An activity will be deemed environmentally sustainable if it meets the following four criteria:

(1) It makes a 'substantial contribution' (or enables another activity to make a substantial contribution) to one or more of the environmental objectives contained in the Taxonomy Regulation, which fall under six broad categories: (a) climate change mitigation; (b) climate change adaptation; (c) the sustainable use and protection of water and marine resources; (d) the transition to a circular economy; (e) pollution prevention and control; and (f) the protection and restoration of biodiversity and ecosystems.

(2) It does not significantly harm any environmental objectives.

(3) It is carried out in compliance with minimum social and labour safeguards, namely (i) the Organisation for Economic Co-operation and Development's (OECD) Guidelines for Multinational Enterprises; (ii) the United Nation's (UN) Guiding Principles on Business and Human Rights; (iii) the International Labour Organization's Declaration on Fundamental Principles and Rights at Work; and (iv) the International Bill of Human Rights.

(4) It complies with technical screening criteria, which supplement criteria 1 and 2 with detailed standards for different activities. This is somewhat a work in progress, with detailed criteria for climate change mitigation and climate change adaptation front running the other four environmental objectives (which are currently the subject of a draft report and consultation of the Platform on Sustainable Finance (established to advise the European Commission)).

[1] Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088.

The Taxonomy Regulation itself contains certain disclosure requirements, but its primary importance will be as a keystone for many other legislative initiatives that need to have an agreed definition of sustainable activities to hang from, as discussed later in this chapter.

Whilst this project remains a work in progress as noted above, there have already been calls for an expansion of the taxonomy project in several areas.

The Platform on Sustainable Finance is currently consulting on a new 'traffic light' taxonomy system, with three levels being (1) significant contribution; (2) intermediate contribution; and (3) significant harm (the so-called 'brown' taxonomy), together with a complementary neutral category of 'no significant impact', for sectors having minimal positive or negative impacts.

This multi-layered approach to the taxonomy seeks to address the concern that, whilst the Taxonomy Regulation is intended to be the 'gold standard' for sustainability and so requires tough standards to be met, there is a risk that investors will apply a binary test and deem any activities not within the taxonomy as 'unsustainable', and divert funds away from them, even if they may be otherwise positive or neutral from a climate perspective.

The intent with all these taxonomies is that if we have a common language and can agree what is and is not sustainable, and companies are required to report in line with such classifications, it will be clearer to investors and other stakeholders in such companies how aligned they are with such criteria, and it will be far easier to compare the positions of multiple companies.

The Taxonomy Regulation and the related proposed Corporate Sustainability Reporting Directive together require a range of entities to disclose how and to what extent their activities align with environmentally sustainable activities under the Taxonomy Regulation. This includes publication by banks of their green asset ratio – the alignment of their balance sheet exposures with the Taxonomy Regulation.

Although disclosure of taxonomy alignment in itself and alone will not ensure we meet climate objectives, the old adage 'you get what you measure' rings true, and it seems likely that a requirement to disclose alignment with the environmentally sustainability criteria will lead to increased finance being allocated to activities and companies meeting those criteria.

Although this is very much a European project, work is ongoing through global groups such as the Network for Greening the Financial System to consider taxonomies in different regions and seek global alignment as far as possible. Clearly, in a global market, this is key.

Disclosure

Aside from the regulatory requirements coming into effect as mentioned above, there are many existing voluntary standards for disclosures that have been widely adopted by market participants, including the recommendations of the Taskforce for Climate-related Financial Disclosures (TCFD), the Science-Based Targets Initiative, the Carbon Disclosure Project, the Sustainability Accounting Standards Board, the International Financial Reporting Standards' Sustainability Standards Board and others.

Although voluntary adoption can be seen as positive, issues have persisted, in particular in relation to comparability and usability of reporting. There are multiple standards and metrics, and multiple ways of presenting the same information. This is an area where the benefit of common standards imposed by regulation seems most apparent. Properly designed, such common standards would benefit both the users and producers of the data.

In the context of COP26, the TCFD recommendations may cement their place as the frontrunner of disclosure standards. The UK government has announced its intention to make reporting in line with TCFD recommendations mandatory by 2025, with standards applying earlier to listed companies and asset managers. On or around COP26, other countries are being encouraged to announce plans to make TCFD reporting mandatory.

It may be that certain elements of the reporting recommendations are enshrined in law, as there is a push from some corners to mandate the publication of the most decision-useful data as soon as possible, rather than delay such publication in order to obtain a more comprehensive regime. The most recent TCFD status report identified, through user surveys, the most useful disclosure elements from the TCFD recommendations. These included information on how climate-related issues have affected a company's business and strategy, key metrics on climate-related issues, and emissions data.

Mandating such disclosure as a legal requirement would have multiple benefits to directing finance flows to sustainable activities. As mentioned, it improves comparability of companies, which would enable investors to direct their capital to those entities that are best managing their sustainability risks and limiting their impact. It also provides a useful tool to promote investments in emerging markets, which could be more easily compared with developed market equivalents on these indicators.

Risk management and integration of ESG risks

ESG-aligned risk management in the financial sector is being sought through several different mechanisms.

First, further disclosure requirements are being included in legislation such as the Sustainable Finance Disclosure Regulation, which requires certain entities (notably investment/fund managers) to disclose how they integrate sustainability risks within their investment management activities and their remuneration policies. They are also required to disclose how they assess the principal adverse sustainability impacts of their activities. This latter disclosure is mandatory for larger firms but is required on a 'comply or explain' basis for others. One might expect this will encourage firms who do not already have clear policies in these areas to develop them.

Second, there are numerous draft delegated acts across existing fund management, insurance and other investment management regulatory frameworks, which seek to clarify and require the consideration of sustainability risks, preferences, impacts and objectives in the relevant entity's governance frameworks and advisory activities. There are also plans to consider specifically introducing a clear fiduciary duty on pension schemes to consider sustainability impacts. This would support the work of the UN Environment Programme

(and others), which sought to establish that a fiduciary duty to consider sustainability already exists (contrary to some suggestions that fiduciary duties require managers to maximise returns regardless of sustainability implications).

Third, regulators including the European Banking Authority and the Bank of England have been considering further supervisory measures (such as additional reporting templates for quantitative disclosures on physical and transition risks) and climate risk stress tests.

At or around COP26 we may expect further central bank or supervisory announcements around measures, including stress tests and risk management requirements. Whilst it is clear that such requirements require a great deal of work by both the regulators and their supervised entities, such processes can clearly expose areas of risk within financial institutions, which one can expect will lead to further change and emphasis on improving the overall alignment of activities and balance sheets with sustainable activities and investments.

Sustainable finance products

When it comes to financial institutions seeking sustainable investments, for more than a decade the sustainable finance market has been developing and growing, and there are now a range of sustainable finance products on offer.

The two main products are 'use-of-proceeds' bonds and loans (also known as green bonds or green loans), and sustainability-linked bonds and loans.

The key feature of use-of-proceeds debt, as the name suggests, is that the proceeds are used to fund green, social or sustainable 'eligible projects'. Interestingly, in the bond market use-of-proceeds bonds tend to be drafted on an 'intention-only' basis, so that if the funds are not used for the specified eligible projects this will not be an event of default under the terms and conditions of the bond. The eligible proceeds are selected in line with broad, market-led principles, although the vast majority of transactions in the public markets are accompanied by an external review from a sustainability consultant, who opines on the selection criteria for the proposed eligible projects.

Notwithstanding this, greenwashing concerns have been raised around the robustness of the standards applied in the market-led principles. To counter this, the EU has recently (July 2021) proposed a new regulation for an EU Green Bond Standard (EU GBS). This is proposed as a voluntary standard, operating similarly to the market-led principles, with key differences being that the 'eligible projects' must be aligned with the EU Taxonomy Regulation, and that the external review must be conducted by an entity accredited by the European Securities and Markets Authority (through a scheme yet to be established).

Here we return to a familiar debate as to whether market-led approaches or regulatory requirements are preferable. Whilst regulated standards provide detail and aid with benchmarking, there are two main concerns with the EU GBS.

First, the EU Taxonomy Regulation is described as the 'gold standard' for sustainability, and therefore there is some concern that raising the bar on green bonds in this way will limit their growth. It is thought that even if it is voluntary, a European green bond standard will discourage European issuers from issuing a green bond that does not meet the standard. It is vital that the sustainable finance agenda engages with all companies, including those who have further to travel in their transition.

Second, investor expectations on sustainability standards are changing rapidly. Whilst the Taxonomy Regulation is intended to be flexible and will be reviewed and updated, it may fall behind investor requirements, and therefore a market-led approach that responds to such requirements immediately could be considered preferable.

It does appear highly likely that the EU GBS regulation will be adopted, and indeed the European Commission now has its sights on developing a standard for sustainability-linked debt.

Sustainability-linked debt differs from use-of-proceeds debt as the funds can be used for any purpose. Instead, the borrower commits to improving specified sustainability objectives or targets, based on measurable performance indicators over a set timeframe. If it is successful, there will be a resulting change in the bond's characteristics; often a step-up in interest rate is avoided by hitting the targets. This product is proving very popular; perhaps because it provides a way for borrowers to demonstrate their alignment with their overall sustainability strategy, without having to find pools of investments to back use-of-proceeds debt. This clearly encourages compliance with the agreed metrics, and thus a general transition by the borrower, although it does not specifically direct funds to invest in such transition.

Whilst many wish to see the market share of sustainable finance products increase from its position at around 5% of overall finance, such an increase is clearly not the only goal of the sustainable finance agenda; rather the goal must be to drive the real-world investments needed to meet the Paris Agreement objectives. However, if we agree that sustainable finance products are a useful tool to reach this goal, how do we encourage an increase in volume?

One obvious route would be to ensure that sustainable finance products have pricing advantages for borrowers over 'non-sustainable' equivalent products. This could be done by tax benefits, incentive schemes, or, as currently being explored by the EU, adjustments to bank regulatory frameworks by a 'green supporting factor' or a 'brown penalising factor'. Each of these would change the capital requirements relating to certain finance depending on its environmental credentials. This would be a departure from the usual risk-based prudential regulation that currently applies, and therefore has been criticised. Clearly the resilience of our financial system should not be sacrificed. However, there are other areas in prudential regulation where policy approaches sit across the usual risk-based framework (including lending to EU member states) and so this approach would not be a lone outlier, and could be a game changer.

Climate finance in emerging markets

Even where the overall levels of sustainable finance increase, diverting finance flows to developing countries is a key challenge. Developed countries have committed to raise at least US$100 billion every year in climate finance to support developing countries. We are a way off this target – the OECD estimates that US$78.9 billion of climate finance was mobilised in 2018. Development finance institutions in particular are coming under pressure to do more here.

New structures and innovative approaches will be required to ensure sufficient capital is diverted to climate finance in developing countries.

First, there is a need to ensure that there are investable projects ready to proceed. Supporting countries that are looking to develop a pipeline of sustainable investments is vital. We have seen development and commercial banks engaged here, notable examples being the World Bank's Scaling Solar programme and the UK's Climate Finance Accelerator. Both seek to use the experiences of the financial sector to assist with preparing projects for market on an accelerated timeframe, and then bring in external funding to support public finance.

Aside from gathering political will to bring projects forward, and drafting contractual frameworks that provide for an acceptable allocation of risk for all parties, there is of course the key question of funding (as opposed to finance) – who will pay for the investments? There are limited options here – taxpayers in general, users or other beneficiaries of the relevant infrastructure, or another group (eg electricity bill payers). This question of who pays is perhaps more easily answered where there is an obvious revenue stream from the relevant project – such as clean power generation. It becomes more difficult for other measures, including adaptation measures such as flood defences, which may certainly avoid future economic loss but there is perhaps no existing payment stream to be diverted to pay for the investment. Innovative thinking will be required, as we must develop pipelines of energy, transport, building and infrastructure projects, capable of providing investable opportunities for the private sector.

Once we have identified a pipeline of projects in a country or region, private finance needs to be attracted to fund those projects. There are clear routes to bring finance to emerging market projects through development banks and export credit agency guaranteed debt. However, with increased investment requirements, the balance sheets of development finance institutions need to be utilised carefully and have a high leverage effect.

For certain projects, it may be that a full guarantee from a development bank is not required, but some targeted credit support is required to mitigate certain risks that commercial lenders struggle to accept (or for which they would charge a high margin, affecting the affordability of the overall project). These may include:

(1) Technology risk, particularly for newer technologies that are not tested at commercial scale

(2) Ramp-up risk, for investments in new areas intended to be funded by the public, but where demand for the relevant products is not known

(3) Sovereign risk, where funding of infrastructure relies on contracts with the sovereign or sub-sovereign entities, but the wider universe of creditors is not yet fully comfortable with the performance risk of those entities

(4) Currency risk, particularly where long-term currency swaps are not available in the market.

There are numerous examples of mitigation measures being put in place by development banks specifically to target just such risks.

For example, sovereign risk was mitigated effectively on the financing of the Elazig hospital in Turkey, where an innovative combination of a strong government contract, a political risk insurance policy from the Multilateral Investment Guarantee Agency, and a liquidity facility from the European Bank for Reconstruction and Development all supported a project bond issuance with a rating of Baa2 from Moody's, two notches above the rating at such time of the sovereign, which enabled a wider group of investors to participate in the transaction and improved pricing.

Another example is the targeted credit enhancement by the European Investment Bank under its Project Bond Credit Enhancement (PBCE) scheme. Following the Global Financial Crisis, the capital markets as a source of funding for infrastructure and energy projects in Europe appeared closed. Many projects had historically been funded by issuance of project bonds guaranteed or 'wrapped' by monoline insurers, which took both the credit risk of the projects and provided credit management over the life of the financing. At that point, many of the monolines were facing financial difficulty.

The European Investment Bank, in conjunction with the European Commission, determined that it would actively encourage the reopening of these bond markets as an alternative source of finance for projects. They launched the PBCE product, which provided a line of credit, up to 15% of the overall debt, which could be drawn to meet shortfalls during construction (in the case of cost overruns), debt service shortfalls, 'rebalancing' financial covenants, and a first loss tranche in the event of enforcement, thus de-risking the project for the other creditors. Whilst this support covered a wider range of risks, it was targeted at 15% sizing only, which corresponded with data showing average recoveries of 85% on defaulting projects, and thus this targeted measure could use less of the European Investment Bank's balance sheet but provided strong credit enhancement.

Where development banks provide support to projects, the very fact that a well-respected development bank has performed due diligence on the project and agreed to provide credit support can provide soft comfort to other incoming creditors on a range of issues. In addition, applying a familiar credit support structure to a range of different transactions in different jurisdictions can help create familiarity for creditors when venturing into new areas.

The combination of regulatory initiatives and the growth of the sustainable finance market, together with other stakeholder pressures, are already encouraging creditors to divert funds to sustainable investments. Pipeline development and targeted support from the development finance institutions will be key to crowd-in funding to new technologies and geographies, to help meet the huge investment challenge, and opportunity, that climate finance presents.

Biography

Clare Burgess is a partner at international law firm Clifford Chance. Clare specialises in financings for infrastructure and energy transition assets through project bonds, multi-source financings (including whole business securitisations), private placements, senior and mezzanine debt, and restructurings. Clare has a particular focus on Sustainable Finance and related regulatory and market initiatives, is a member of the ESG Board at Clifford Chance and leads the firm's global initiative on Sustainable Finance. She is also a board member of IPFA (International Project Finance Association)'s UK branch, a member of the Whitehall and Industry Group Infrastructure Advisory Council, a member of the Advisory Council of the Green Bond Principles and Social Bond Principles Executive Committee (ICMA secretariat), a member of the AFME Sustainable Finance Steering Committee, a member of TheCityUK Green and Sustainable Finance Group and board member and chair of the Strategy and Innovation Committee at HILS, a social business.

How green can central banking really be?

Professor Christina Parajon Skinner

Christina Parajon Skinner

Introduction

The issue of climate change increasingly intersects with central banking. Climate change stands to have economic ramifications.[1] The physical risks associated with climate change – severe weather events or gradual sea level rises – could affect labour forces' productivity and mobility.[2] Transition risk, meanwhile, could pose challenges for businesses that must comply with new regulatory requirements.[3]

In view of these possibilities, central banks around the world have committed to addressing climate change. The European Central Bank (ECB) will now 'tak[e] the impact of climate change into consideration in [its] monetary policy framework.'[4] Similarly, the Bank of England (BOE) is also exploring how climate change impacts its 'central mission', that is, the bank's mandates for monetary and financial stability.[5] Many other leading central banks share the desire to tackle climate change. Indeed, the eponymous Network for Greening the Financial System (NGFS), now with 95 members, is a newly formed consortium of likeminded central banks.[6]

The stated goals of the NGFS are threefold: (1) to 'help strengthen the global response required to meet the goals of the Paris agreement,' presumably through central banking action; (2) 'to enhance the role of the financial system to manage risks and to mobilize capital for green and low-carbon investments'; and (3) to 'define and promote best practices' within central banks and, relatedly, 'conduct or commission analytical work on green finance'.[7] The expression of these goals – though lofty – glosses over the practicality that each of the NGFS' member central banks is subject to a particular legal framework that will either enable the institution to deploy its policy tools toward one or more of these objectives, or constrain it from doing so. In the same vein, each member central bank will invariably operate in a highly specific financial marketplace and will thus need to operationalise any green policy initiatives in differing economic contexts.

This essay considers the NGFS's various goals against the legal framework specific to the US central bank – the Federal Reserve (the Fed). The Fed is a member of the NGFS, and is presently exploring whether climate change enters its policy arena; but to what extent can it retrofit its existing policy tools to pursue the NGFS objectives? The Fed's position with respect to climate change can be understood from two different perspectives. In the first instance, the Fed (perhaps like some other central banks) lacks clear legal authority to use its policy tools offensively to mitigate climate change. The Fed does, of course, have tremendous intellectual horsepower to engage in climate research and analysis, but the depth of its activity in that regard

[1] See NGFS, 'A Call for Action: Climate Change as a Source of Financial Risk' (2019) 13–17 <https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf>; Emanuele Campiglio and others, 'Climate Change Challenges for Central Banks and Financial Regulators' (2018) 8 Nature Climate Change 462, 462.

[2] Lael Brainard, Member, Board of Governors of the Federal Reserve System, 'Remarks at the Economics of Climate Change Conference: Why Climate Change Matters for Monetary Policy and Financial Stability' (8 November 2019) <https://www.federalreserve.gov/newsevents/speech/files/brainard20191108a.pdf>; Sophie Quinton, 'As Wildfire Risk Increases, Home Insurance Is Harder to Find' (Pew, 3 January 2019) <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2019/01/03/as-wildfire-risk-increases-home-insurance-is-harder-to-find>.

[3] Brainard (n 2); Intergovernmental Panel on Climate Change, Special Report: Global Warming of 1.5°C (2018) 323 <https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf> (noting that disruptive innovation can lead to assets, such as fossil fuels, being 'stranded' and 'unburnable'); NGFS (n 1) 15; Campiglio (n 1) at 462.

[4] European Central Bank, 'Climate Change and the ECB' <https://www.ecb.europa.eu/ecb/climate/html/index.en.html> accessed 22 September 2021.

[5] Bank of England, 'Climate Change' <https://www.bankofengland.co.uk/climate-change> accessed 22 September 2021.

[6] NGFS <https://www.ngfs.net/en> accessed 22 September 2021.

[7] NGFS, 'Origin and Purpose' <https://www.ngfs.net/en/about-us/governance/origin-and-purpose> accessed 22 September 2021.

may be circumscribed by the structure of the Federal Reserve System itself. And notably, while the NGFS urges central banks to push the financial system toward better risk management and capital allocation, the US banking sector has already taken significant strides in this direction voluntarily, without Fed intervention.

To flesh this discussion out, this essay largely draws upon – and synthesises – various other pieces of my work discussing the Federal Reserve's mandates, independence and legitimacy to give a 'bird's eye view' on the Fed and climate change.[8]

The essay first sets out in broad strokes the areas where the Fed has legal authority to address climate change and the limits of such power. Second, the essay explains some normative considerations associated with the Fed leaning into climate change (and summarises some relevant empirical research, highly specific to the US landscape). Finally, it explains the role of the private sector in mobilising capital toward green projects.

1. Responding to climate change: the Fed's mandates

While some central bankers and public observers consider it axiomatic that central banks should tackle climate change, in actuality only a few central banks have an explicit legal basis for proactively pursuing green objectives. As one recent piece of empirical research has pointed out, after a comprehensive analysis of the mandates and objective of 135 central banks 'only 12% have explicit sustainability mandates'. [9]

The Fed, like the majority of central banks worldwide, lacks an express mandate to pursue sustainability or other green goals. In terms of monetary policy, section 2A of the Federal Reserve Act establishes the Fed's objectives as 'promot[ing] effectively the goals of maximum employment, stable prices, and moderate long-term interest rates'.[10] Conventionally, this provision is known as the Fed's dual mandate, and it legally restricts the Fed's use of its various monetary policy tools to pursuing price stability and maximum employment.[11]

In pursuit of these objectives, the Fed's decisions about the target federal funds rate (which is how it seeks to influence market rates in ordinary times) is data-driven [12] Importantly, as I have elsewhere argued, it 'responds to real, observed changes in the economy and to shocks – generally, it does not move to anticipate these things ahead of their fruition'. [13] Given the continued uncertainty about the macroeconomic effects of climate change, the Fed does not have a solid legal basis to set monetary policy – via interest rate policy – on the basis of anticipated impacts from climate change.

Other aspects of the Federal Reserve Act similarly constrain the Fed's use of monetary policy tools to proactively green the economy. Section 14 of the Federal Reserve Act, which supplies the authority to purchase assets in the open market seems to preclude the purchase of private sector bonds – green, brown or otherwise.[14] That provision provides a list of the debt securities that the Fed 'shall have power' to buy, which does not include private sector bonds.[15] Taken together, the limited language in sections 2A and 14 of the Federal Reserve Act seem to preclude the Fed from using its balance sheet (or otherwise tinkering with interest rate targets) as a means of proactively mitigating climate change. To be clear, the Fed always has its standard (and now, unconventional) panoply of crisis-fighting measures available to combat an economic shock – including one that might be induced by a climate event. These powers, in section 10B, 13(3) and 14 of the Federal Reserve Act are agnostic as to the trigger of an economic panic or shock – but to respond to a climate shock is a different matter altogether than offensively seeking to make the financial system greener.

The Fed likewise has constraints – some legal, some policy-based – on its ability to deter banks from lending to brown companies. Consider risk-based capital requirements as an example. In theory, the Fed could use its rule-making authority to increase capital requirements regarding certain brown asset classes that could, pursuant to rule changes, be deemed to carry a higher risk and therefore 'weight'. But such a policy manoeuvre would likely meet with turbulence in the US Administrative Procedure Act, which precludes administrative agencies (including the Fed) from making rules that are 'arbitrary' and 'capricious'.[16] To satisfy this standard of reasonableness, concrete evidence would be required by the Fed that certain assets currently pose greater risk than others to a financial institution's balance sheet.

Supervisory actions designed to deter banks from lending to brown business may also be met with legal scrutiny. While

[8] Christina Parajon Skinner, 'Central Bank Activism' (2021) 71 Duke LJ (forthcoming); Christina Parajon Skinner, 'Central Banks and Climate Change' (2021) 75 Vand L Rev (forthcoming); Sarah E Light and Christina Parajon Skinner, 'Banks and Climate Governance' (2021) 122 Colum L Rev (forthcoming); Carola C Binder and Christina Parajon Skinner, 'Laboratories of Central Banking' (2021) (unpublished manuscript).

[9] Simon Dikau and Ulrich Volz, 'Central Bank Mandates, Sustainability Objectives and the Promotion of Green Finance' (2021) 184 Ecological Econ 1.

[10] Federal Reserve Act § 2A, 12 USC § 225a.

[11] Board of Governors of the Federal Reserve System, 'Statement on Longer-Run Goals and Monetary Policy Strategy', (26 January 2021) 1 <https://www.federalreserve.gov/monetarypolicy/files/FOMC_LongerRunGoals.pdf>.

[12] To gain some insight into the Federal Open Market Committee (FOMC) and monetary policy decisions, the Fed does publish the economic forecasts of each member of the FOMC and the presidents of the 12 regional Reserve Banks. Formally, this is the Summary of Economic Projections (SEP); colloquially, this is known as the 'dot-plot'. For the most recent SEP, see Federal Reserve, 'Summary of Economic Projections' (2021) <https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20210616.pdf>. These projections pertain to key economic indicators (ie, real output, growth, unemployment, overall inflation, core inflation) for several horizons in the future. See Ben S Bernanke, 'Federal Reserve Economic Projections: What are they Good For?' (Brookings, 28 November 2016) <https://www.brookings.edu/blog/ben-bernanke/2016/11/28/federal-reserve-economic-projections/>.

[13] Skinner, 'Central Banks and Climate Change' (n 8) 124; see Christopher J Waller, Governor, Board of Governors of the Federal Reserve System, 'Speech at the Peterson Institute for International Economics: Treasury–Federal Reserve Cooperation and the Importance of Central Bank Independence'.

[14] Federal Reserve Act § 14, 12 USC § 355.

[15] 12 USC § 355; Glenn D Rudebusch, 'Climate Change and the Federal Reserve' (FRBSF Economic Letter, 25 March 2019) <https://www.frbsf.org/economic-research/publications/economic-letter/2019/march/climate-change-and-federal-reserve/> (discussing the impacts that climate change will have on the Fed's duty to provide macroeconomic and financial stability).

[16] 5 USC § 706(2)(A).

the Fed no doubt has the discretion to make a wide range of supervisory determinations about banks' lending practices and underwriting decisions, insofar as formal or informal enforcement actions go, the Fed's latitude is much more limited to matters that pose 'significant risks to the safety and soundness of the banking organization' or practices that violate the law.[17] A charge that banks' climate exposures pose risks of safety and soundness presently seems unsupported. As indicated by my study of the balance sheets of the largest, systemically important financial institutions, these banks' climate-related exposures are a small proportion of the balance sheet (in all cases under approximately 7% of total wholesale loan exposures, often lower), while the banks' equity capital that stands ready to absorb loan losses is three or four times in absolute amounts.[18]

In theory, the Reserve Banks have more legal leeway than the Federal Reserve Board to, for example, condition access to the discount window on certain kinds of green collateral. In practice, however, such policy may be undesirable as it is inconsistent with prevailing norms against central bank involvement in credit allocation. Similar experiments were tried historically, most notably in the 1920s, pursuant to a policy of so-called 'direct action'.

This history is instructive. As stock speculation mounted in the mid-to-late 1920s, the Federal Reserve Board grappled with what to do in regard to the growing volume of bank loans being used by borrowers to finance stock market speculation.[19] The Board wanted the Reserve Banks to restrict access to the discount window as a means of deterring member banks from extending credit for speculation.[20] A Federal Reserve Board letter of February 2, 1929 set out that policy:

The Federal Reserve Act does not (...) contemplate the use of the resources of the Federal Reserve banks for the creation or extension of speculative credit. A member bank is not within its reasonable claims for rediscount facilities at its Federal reserve bank when it borrows either for the purpose of making speculative loans or for the purpose of maintaining speculative loans.[21]

There were political problems with this policy. The direct action edicts from the Board opened the door to selective use of the discount window at various Reserve Banks that nettled Congress and could have put the central bank's reputation at risk.[22] A 1929 Wall Street Journal article reported on a speech given by Louis T McFadden, then chairman of the House Committee of Banking and Currency, regarding the 'excessive use of authority' at the Federal Reserve banks.[23] This provoked the congressman's ire, warning that 'the Federal Reserve System [should] be on its guard against overstepping the bounds of authority vested in it (...) Beyond the Federal Reserve policy of credit, all questions of general banking policy have been reserved by Congress.'[24]

Of course, not every central bank shares the same law and history as the Fed. One may wonder how other central banks justify their monetary or supervisory interventions into climate change. The Bank of England, for example, has taken steps toward climate change mitigation by instituting a new exploratory stress test.[25] It has also begun to consider 'how to "green" the Corporate Bond Purchase Scheme (CBPS), using our balance sheet to incentivise bond issuers to support transition, and encourage other investors to do likewise'.[26] The ECB, meanwhile announced in January 2021 that it would use its own funds portfolio to invest in a new green bond fund created by the Bank for International Settlements – and well before that, it had been buying green bonds as part of its asset purchase programme.[27]

The so-called secondary mandates of these central banks supply the appropriate legal hook. As Dikau and Volz point out, 40% of the 135 central banks they studied 'are mandated to support the government's policy priorities, which mostly include sustainability goals'.[28] Both the Treaty on the Functioning of the European Union and the Bank of England Act instruct the ECB and BOE respectively to have regard to the economic objectives of the government.[29] In the case of the ECB, Article 11 of that Treaty expressly references sustainability and environmental protection requirements. In the Bank of England's case, the HM Treasury is empowered to specify the

[17] Thomas Eisenbach and others, 'Supervising Large, Complex Financial Institutions: What Do Supervisors Do?' (Federal Reserve Bank of New York, 2015) 4 <https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr729.pdf>.

[18] Skinner, 'Central Banks and Climate Change' (n 8), 117-18, 124. I fully acknowledge, however, that with greater attention to climate data analysis, these assessments of the balance sheet could one day change.

[19] David C Wheelock, 'Conducting Monetary Policy Without Government Debt: The Fed's Early Years' (Federal Reserve Bank of St Louis, May/June 2002) 7.

[20] ibid.

[21] The authority for the present-day discount window, section 10B, would not be added until 1932.

[22] For example, 'The Governor of one of the Reserve Banks stated that borrowing to buy automobiles was one of the most extravagant things they had to cope with and that people were buying cars who could not afford them. One Reserve Bank refused to discount paper arising from the sale of pleasure automobiles, on the basis that the industry was over-extended.' Clay J Anderson, 'Evolution of the Role and Functioning of the Discount Mechanism', Federal Reserve Bank of Philadelphia, Prepared for the Steering Committee for the Fundamental Reappraisal of the Discount Mechanism Appointed by the Board of Governors of the Federal Reserve System (November 1966) 26 <https://fraser.stlouisfed.org/files/docs/historical/federal%20reserve%20history/discountmech/evolrole_ander.pdf>.

[23] 'McFadden Raps Federal Reserve: Sees Danger in Bureaucratic Tendency to Overstep Authority—Question of Trust Power Revocation' (17 January 1929).

[24] ibid.

[25] Bank of England, 'The 2021 Biennial Exploratory Scenario on the Financial Risks from Climate Change' (2019) 1 <https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf>.

[26] Bank of England, 'Options for Greening the Bank of England's Corporate Bond Purchase Scheme' (2021) <https://www.bankofengland.co.uk/paper/2021/options-for-greening-the-bank-of-englands-corporate-bond-purchase-scheme>.

[27] ECB, 'ECB to Invest in Bank for International Settlement's Green Bond Fund' (25 January 2021) <https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210125~715adb4e2b.en.html>; Roberto A De Santis, Katja Hettler, Madelaine Roos and Fabio Tamburrini, 'Purchases of Green Bonds Under the Eurosystem's Asset Purchase Programme' (2018) 7 Eur Cent Bank: Econ Bull <https://www.ecb.europa.eu/pub/economic-bulletin/focus/2018/html/ecb.ebbox201807_01.en.html>.

[28] Dikau and Volz (n 9).

[29] Consolidated Version of the Treaty on the Functioning of the European Union [2012] OJ C 326, art 127; The Bank of England Act, for example, mandates the Financial Policy Committee: Bank of England Act 1998, c 11, pt 1A, s 9C (UK). Its monetary policy objectives are similarly worded: Bank of England Act 1998, c 11, pt 1A, s 11 (UK).

government's objectives on a yearly basis; accordingly, when the Treasury's 2021 'remit' letter to the Bank instructed it to take sustainability considerations in view when fashioning monetary policy, such direction was perfectly compatible with the prevailing legal arrangement between the government and the central bank.[30] In contrast, in the US legal framework, neither the Treasury Secretary nor the President have the authority to instruct the Fed on additional goals to bear in mind when orchestrating monetary policy.

In summary, in regard to the NGFS's first two goals – to contribute to a global response to climate change and incentivise the private sector to do the same – the Fed's ability to participate is legally constrained. This is not to say that the Fed has no power at all to address climate change. As noted, it has authority to defend the economy against climate-related macroeconomic shocks. It also has ample authority in the Bank Holding Company Act to dialogue with the institutions that it supervises regarding their nascent and developing approaches to factoring climate change into credit risk (as well as regarding the operational risks that climate change could pose).[31] The next section turns to the NGFS' third goal of developing analysis and best practices, particularly in relation to the regional Reserve Banks' pursuit of those objectives.

2. Developing analysis and best practices

The US Federal Reserve System is unique among the world's central banks for its distinctive federalist structure. That is, the system is comprised of the Federal Reserve Board that sits in Washington as well as twelve regional Reserve Banks distributed throughout the country. Indeed, while the Fed's monetary, supervisory and regulatory powers are perhaps most often debated in the public sphere, the 'research function is one of the longest-standing roles of the Federal Reserve'.[32]

The original Federal Reserve Act vaguely contemplated research at the central bank. For the Board, section 11(l) would provide rather open-ended authority: 'To employ such attorneys, experts, assistants, clerks, or other employees as may be deemed necessary to conduct the business of the board.'[33] The Board is presently engaged in climate-related research in Washington and at the international level through the Financial Stability Board.[34]

In regard to the regional Reserve Banks, section 4(7) would allow the Reserve Banks '[t]o exercise by its board of directors, or duly authorized officers or agents, all powers specifically granted by the provisions of this Act and such incidental powers as shall be necessary to carry on the business of banking within the limitations prescribed by this Act'.[35] These 'incidental powers' likely provide the authority for the Reserve Banks' research functions (at the Fed's founding and today).

Over the years, the Board gave the Reserve Banks increasing autonomy to develop their research functions; and, more recently, the Reserve Banks augmented their community development roles to expand their research into areas adjacent to the Fed's core mandates of price stability, maximum employment, bank safety and soundness, and (implicitly) financial stability.[36] These new areas included, as just one example, questions around climate change. In separate work, Professor Carola Binder and I set out the history of the Reserve Banks' research function and then empirically document a trend of increasing research efforts – at some Reserve Banks – into areas outside the Fed's core mandates.[37]

While the legal framework does not preclude the Fed Board or the Reserve Banks from undertaking climate-related research, our normative conclusions here are mixed. On the one hand, a vibrant intellectual community across the Reserve System is desirable; so, too, is a vigilant, adaptive central bank that has the analytical resources to anticipate how uncertainty might impact the Fed's mandates (even if they are not so impacted today).

On the other hand, we note the risk of politicisation and polarisation associated with a Federal Reserve System that appears to cherry-pick social or economic issues in seeming response to popular or presidential pressure. One might wonder, why not research and investigate other important economic issues – like trade, immigration, economic relations with China, or tech disruption? In a world of finite resources, it seems necessary to draw lines somewhere. There is also the need to communicate clearly to the public the line between undertaking research for the legitimate purpose of exploring the impact of uncertainty on a central bank's mandate (and general public education) and sending signals to markets or regulated firms that the Fed would prefer them to lend or allocate credit to some sectors of the economy and not others. Moral suasion or backdoor regulation is inconsistent with a rule-of-law perspective.

On the whole, however, the legal authority to engage in climate research certainly exists and these normative concerns can be modulated with proper mechanisms of accountability and oversight from Congress and the Board. On balance, it seems a legitimate step for the Fed to take – and is consistent with the NGFS goal of commissioning analysis and working toward an understanding of best practices. This is especially so insofar as the Reserve Banks' (or Board's) research focuses on best

[30] 'Letter from Rishi Sunak to Andrew Bailey, Governor' (Bank of England, 3 March 2021).

[31] Bank Holding Company Act of 1956, Pub L No 84–511, 70 Stat 133.

[32] See Skinner and Binder (n 8) manuscript at 3. The original Federal Reserve Act (Federal Reserve Act (Original)) can be found as Public Law No 43 of the 63d Congress, HR 7837 <https://fraser.stlouisfed.org/files/docs/historical/fr_act/nara-dc_rg011_e005b_pl63-43.pdf>. .

[33] Federal Reserve Act, § 11(l).

[34] Speech, Randal K Quarles, 'Disclosures and Data: Building Strong Foundations for Addressing Climate-Related Financial Risks' Speech at the Venice International Conference on Climate Change, Venice, Italy (11 July 2021) <https://www.federalreserve.gov/newsevents/speech/quarles20210711a.htm> (emphasising the FSB's work on disclosure, and in particular the importance of establishing 'a globally consistent baseline standard for climate-related disclosures. Globally consistent and comparable entity-level disclosures by non-financial companies, banks, insurers, and asset managers are increasingly important to market participants and financial authorities as a means of providing information needed to assess and manage risks').

[35] Federal Reserve Act (Original), § 4(6).

[36] Skinner and Binder (n 8) (documenting the history of the research function).

[37] Our dataset includes information about all 4,715 working papers published by the 12 regional Federal Reserve Banks from January 2006 to June 2021.

practices limited to those areas where the Fed does have jurisdiction, such as microprudential supervision.

3. Markets and the private sector

Finally, it bears emphasising the tremendous effort being undertaken by US banks to address climate risk as a balance-sheet risk. As Professor Sarah Light and I detail in separate work, all of the US's systemically important banks – those financial holding companies that the Fed oversees – are actively working toward what we call 'private climate governance'.[38] These various initiatives include commitments to reduce the firms' own carbon footprints; review existing loan portfolios to re-assess the composite climate impact of their borrowers; positively finance clean technology and provide equity and advisory services for the same; and develop industry standards and best practices through private industry associations including new voluntary or market mechanisms – such as disclosure standards and carbon pricing.[39]

Certainly, these initiatives and modified underwriting practices designed to address climate risk are in their early days. It remains to be seen how these practices cash out in terms of carbon reductions. Still, the shift in banks' commitments to addressing climate change is significant, suggesting concerted movement to reduce the negative externalities and market misallocations that flow from emissions and greenhouse gas-producing borrowers.

That the banking sector would be motivated to facilitate a transition to a low-carbon economy is not all that surprising. As we argued in that work, not only do they have the economic incentives to facilitate profitable technology that will supply the infrastructure of future life, but they also have the inherent motivation to retain the public's trust and their accompanying social license. In my own assessment, these substantial efforts by the banking sector – coupled with the movement of equity into sustainable funds – suggests that ongoing concern about central bank efforts to redirect dollars in the economy (toward green and away from brown) may be superseded by private sector initiatives and innovations.

Conclusion

In the US, the Federal Reserve has relatively limited legal authority to proactively mitigate climate change. Its lacks monetary policy authority to offensively green, and its regulatory and supervisory authority is highly circumscribed (aside from firm-level supervision). Research is possible and certainly desirable, provided there is clear communication about the lack of policymaking power from the Reserve Banks and that research will not necessarily transform the Fed's mandate without congressional instruction. Ultimately, one would be remiss to focus on what the central bank is not doing – or cannot do – without considering the financial markets context. Where private sector solutions are offered to address market failures, one must carefully discern where gaps remain to ensure that central bank action (or other regulation) is proportionately designed.

Biography

Christina Parajon Skinner is an expert on financial regulation. Her research focuses on central banking, the debt markets, separation of powers, corporate governance, and law and macroeconomics. Professor Skinner's work is international and comparative in scope, drawing on her experience as an academic and central bank lawyer in the United Kingdom. Her research has been published or is forthcoming in the Columbia Law Review, the Duke Law Journal, the Vanderbilt Law Review, and the Georgetown Law Journal, among other leading academic journals. Professor Skinner has also contributed to financial regulatory policy working groups, including those convened by the Federal Reserve Bank of New York, the Financial Stability Board, and the U.K. Banking Standards Board. From 2021-2022, she will be working on secondment to the Legal Directorate of the Bank of England, providing advice on a range of issues at the intersection of central banking law and policy.

Prior to joining the faculty at Wharton, Professor Skinner served as legal counsel at the Bank of England, in the Financial Stability Division of the Bank's Legal Directorate. Her work there focused principally on matters of bank resolution, financial market infrastructure, and macroprudential policy. Previously, Professor Skinner was an Academic Visitor at the University of Oxford, Faculty of Law and a Visiting Fellow at the London School of Economics, Law Department. From 2014-2016, she was a post-doctoral fellow and lecturer in Law at Columbia Law School.

Professor Skinner received her J.D. from Yale Law School, and an A.B. from the School of Public and International Affairs at Princeton University, with a concentration in international economics. She received certificates of proficiency in European Politics and Society, and Spanish Language and Culture

[38] Light and Skinner (n 8).

[39] ibid (offering an in-depth explanation of these practices as well as the history of banks' facilitating industrial transformation in US and Europe).

The financial and legal risks of the global transition.

Neil Beresford and Nigel Brook

Neil Beresford

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Introduction

Transition risk is one of the three principal categories of climate-related risk. It is a consequence of the extensive changes taking place during the global transition to a lower-carbon economy, and may arise from:

- Climate-related developments in policy and regulation
- The emergence of disruptive technology or business models
- Shifting sentiment and societal preferences
- Evolving evidence, frameworks and legal interpretations, and
- Movements in financial markets.[1]

Transition risk is inversely correlated with physical risk. The more rapid (or disorderly) our efforts to avert the worst impacts of climate change, the more serious transition risk becomes.

Transition risk is also a source of liability risk. A poorly managed transition will cause extensive losses, and transition risk is now a widely acknowledged threat to the stability of the financial system.[2] There is a particular risk that assets may become stranded, meaning that they no longer earn an economic return.[3] A failure to manage transition risk effectively creates a risk not only of liability, but also of serious reputational harm.

In this paper we explore the nature and characteristics of transition risk.

Following the recommendations of the IPCC,[4] we adopt a strictly negative risk definition and focus only on the adverse consequences of the transition. The very significant opportunities arising from the transition are amply considered elsewhere.

Sources of transition risk

Transition risk is a product of several developments taking place simultaneously. In this section we consider those developments and their role as sources of transition risk.

Government policy and regulation

The Paris Agreement requires governments to take decisive action to achieve their pledge to limit global warming from pre-industrial levels to well below 2 degrees Celsius by 2100. Article 4 of the Agreement contains the widely discussed ratchet mechanism requiring members to revise and strengthen their emissions targets every five years.

In recent years, various national courts have supported the implementation of the Agreement and cemented its status by imposing enforceable duties under domestic law.

In Urgenda v Netherlands, the Supreme Court of the Netherlands concluded that, by failing to take adequate, measurable steps to reduce emissions by at least 25% by the end of 2020, the Dutch government would breach its positive obligations under Articles 2 (right to life) and 8 (right to privacy and integrity of the family home) of the European Convention on Human Rights. The Court took the highly unusual step of requiring the national government to honour its international agreement by creating effective domestic legislation.

In March 2021, the German Federal Constitutional Court issued

[1] Prudential Regulation Authority, 'Enhancing banks' and insurers' approaches to managing the financial risks from climate change' (2019).

[2] Bank of England, 'Climate change: what are the risks to financial stability?' <https://www.bankofengland.co.uk/knowledgebank/climate-change-what-are-the-risks-to-financial-stability>.

[3] Carbon Tracker, 'Stranded Assets' <https://carbontracker.org/terms/stranded-assets/>.

[4] IPCC, 'The concept of risk in the IPCC Sixth Assessment Report: a summary of cross working group discussions' (September 2020, updated 15 February 2021) 5.

a similar judgment, declaring parts of the German Climate Protection Act of 2019 to be unconstitutional. The court focused on the provisions of the Act that set out annual emissions targets for particular sectors in order to reduce overall emissions by 55% of 1990 levels by 2030. It held that those measures were inadequate as they failed to legislate for the period beyond 2030 and imposed an unacceptable burden on future generations.

In Agostinho v Portugal, the European Court of Human Rights will soon adjudicate on the question of whether climate change amounts to a breach of the European Convention on Human Rights. The rights under consideration are the right to life (article 2), the right not to be subjected to inhuman or degrading treatment (article 3), the right to privacy and integrity of the family home (article 8) and the right of non-discrimination (article 14). The EU Commissioner for Human Rights has published written observations in which the importance of the right to a remedy is emphasised.[5] The observations conclude:

The increasing number of climate change-related applications provide the Court with a unique opportunity to continue to forge the legal path towards a more complete implementation of the Convention and to offer real-life protection to individuals affected by environmental degradation and climate change.[6]

The involvement of international and domestic courts will help to ensure that the Paris commitments are met. Their decisions are likely to accelerate the transition quite significantly.

In response to the Urgenda litigation, the Dutch government announced a bold new set of policies designed to reduce annual carbon emissions by almost 10 megatons per year. Several new coal power plants were either closed or subjected to capacity reductions, a €3 billion spending package was announced to subsidise renewable energy projects, and reductions were made to livestock numbers and the national motorway speed limit.

Within two months of the decision of the German Constitutional Court, the German government had revised the Climate Protection Act to strengthen the emissions reduction targets up to 2030. A new legal commitment has been made to reduce greenhouse gas emissions by 88% compared to 1990 levels by 2040.[7]

The question now is not whether governments will act, but when and how they will act, and which sectors will feel the impact most keenly.

The UN-supported investor network Principles for Responsible Investment (PRI) has undertaken extensive research into policy-led transition risk. As part of its Inevitable Policy Response project, the PRI has formulated a Forecast Policy Scenario to highlight the difference in expectations between the widespread perception of gradual, coordinated action and the reality of a policy-led transition, which will be 'delayed, abrupt and disruptive'.[8]

The predicted policy responses include bans on coal and internal combustion engines, an increase in nuclear capacity and bioenergy crops, greater effort on energy efficiency and reforestation, wider use of carbon pricing, and an increase in the supply of low-cost capital to green economy projects.

Developments in technology

Rapid technological developments are another important component of transition risk. This is exemplified by the (continuing) plunge in the costs of new solar and wind power and of batteries, well ahead of even the most optimistic forecasts a few years ago. Incumbents in various sectors can find their business models being undermined, or they can be pressured into the premature adoption of unproven technologies.

A salutary example is the US$10 billion acquisition by General Electric (GE) of Alstom's gas power generation division in 2015. The purchase was based upon the false assumption that demand for natural gas and coal would continue to track global economic growth. Three years after the acquisition, GE wrote off US$23 billion from the value of its power division, most of this relating to the acquisition, and announced the departure of its chief executive officer (CEO).[9] In the meantime, GE's share price had declined by US$193 billion, some 74% of its market capitalisation. The collapsing share price caused a US$16 billion loss to Blackrock investors and led to the replacement of two successive CEOs before GE was removed from the Dow Jones in 2018.[10]

The energy and power sectors are most obviously exposed to technology-led risk. Energy is so deeply embedded in the global economy, however, that almost every sector will become exposed. In its recent report 'Net Zero by 2050: a Roadmap for the Global Energy Sector', the International Energy Agency has set out the most likely transition pathway affecting buildings, transportation, industry and the generation of electricity and heat. The pathway calls for a 4% global rate of energy efficiency improvements, and a fourfold increase in the annual additions of renewable energy (solar and wind) by 2030. Many of the technologies that will be required to achieve the necessary reductions through to 2050 are still at the demonstration or prototype phase.

As the technological transition increases in scale and ambition, automotive, aviation, shipping and construction companies may all struggle to keep pace.

Market movements

Investor behaviour

Investor behaviour is changing rapidly and will continue to do so. According to analysis by Goldman Sachs, the total issuance

[5] Council of Europe, 'Third party intervention by the Council of Europe Commissioner for Human Rights' (2021) <https://rm.coe.int/third-party-intervention-by-the-council-of-europe-commissioner-for-hum/1680a26105>.

[6] ibid.

[7] Bundesregierung, 'Intergenerational contract for the climate' <https://www.bundesregierung.de/breg-de/themen/klimaschutz/climate-change-act-2021-1913970>.

[8] 'Inevitable Policy Response 2021, Policy Forecast' (2021) <https://www.unpri.org/download?ac=12950>.

[9] 'GE's $23bn writedown is a case of goodwill gone bad' Financial Times (2018) <https://www.ft.com/content/9beb58f4-c756-11e8-ba8f-ee390057b8c9>.

[10] Tim Buckley, Kathy Hipple and Tom Sanzillo, 'General Electric Misread the Energy Transition: A Cautionary Tale' (IEEFA, 2019) <https://ieefa.org/wp-content/uploads/2019/06/General-Electric-Misread-the-Energy-Transition_June-2019.pdf>.

of sustainable debt including green, social and sustainability bonds has now surpassed US$1 trillion.[11]

At the same time, investors in traditional companies are using their financial influence to press for strong governance frameworks, reductions in carbon emissions across the value chain and enhanced corporate disclosure. The effort is being spearheaded by Climate Action 100+, an investor-led initiative comprising 615 investment managers with a combined US$55 trillion in assets under management. The companies in which they invest account for 80% of current global industrial emissions.[12]

Raw material fluctuation

The transition is also likely to bring about extreme fluctuation in the cost of raw materials. The publication of the IPCC's Sixth Assessment Report in August 2021 caused the price of US crude oil to drop by 4.33% in the first morning of trading.[13]

The energy transition will trigger a massive increase in demand for critical minerals such as copper, lithium, nickel, cobalt and rare earth elements. Electric vehicles will be a particular driver of consumption. By 2040, the International Energy Agency (IEA) forecasts that demand for lithium will have increased 42 times relative to current levels.[14]

Although there is not thought to be a particular shortage of minerals, the IEA warns that:

the data shows a looming mismatch between the world's strengthened climate ambitions and the availability of critical minerals that are essential to realising those ambitions.

Consumer behaviour

Changing consumer behaviour will also induce a market-led transition.

According to a major survey undertaken in late 2019, around 69% of global consumers have already changed their patterns of consumption owing to concern about climate change.[15] The trend is significantly stronger in developing economies, with 85% of respondents in Peru and 83% in Colombia confirming that they understood the action needed on their part to tackle climate change. The three most prevalent changes of consumer behaviour identified in the survey were making greater use of recycling, buying renewable energy, and purchasing electric vehicles.

The survey also highlighted the scale of the necessary changes in consumer attitudes. The three most effective measures to reduce personal climate change impact (having one fewer child, not having a car at all and avoiding long distance flights) were relatively low down the list of current consumer priorities.

Many commentators are pointing to a generational change in attitude, Goldman Sachs making the salient point that: 'Millennials will inherit more than USD50 trillion in the coming decades.' [16]

Reputational challenges

Direct reputational challenge

Changes in societal values and consumer preference will drive reputational risk, affecting not only those businesses whose activities directly lead to carbon emissions, but also the financial, investment and advisory entities that support them.

The Unfriend Coal campaign is a useful case study of the power of reputational risk. Unfriend Coal was established in 2017 as a global coalition of NGOs and organisations with the stated ambition to pressure insurance companies to move away from coal and support the transition to clean energy. The campaign had a dramatic effect, with three insurers adopting coal exit policies in 2017, four following in 2018 and ten more in 2019. By 2019, 35 global insurers had adopted a coal divestment policy, and the campaign issued a scorecard recording that 'ending insurance for new coal has become the international benchmark'.[17]

By 2020, at least 65 insurers, estimated to comprise around 40% of the industry's total assets, had either adopted a divestment policy or committed to making no new coal investments.[18]

Unfriend Coal has now rebranded as Insure Our Future and widened its scope to oil and gas. The coalition will focus on insurers' involvement in any further fossil fuel projects.

As a direct result of such campaigns, fossil fuel projects have become tricky financial propositions. The Carmichael coal mine in central Queensland attracted such a degree of public opprobrium that most major international banks publicly ruled out the prospect of providing direct finance to the project.

Greenwashing

The reputational challenges of the transition will encourage companies to overstate their green credentials. This creates its own systemic risk and is of genuine concern to financial regulators.

Strong and effective disclosure obligations are being devised to minimise the risk of greenwashing. At the G7 summit in June 2021, agreement was secured to mandate climate disclosures across member economies by 2025, in line with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD).

[11] Goldman Sachs, 'Sustainable Finance' <https://www.goldmansachs.com/our-commitments/sustainability/sustainable-finance/index.html?mkwid=sUqBTApT3_dc_pcrid_532392507342_pkw_climate%20transition_pmt_p_pdv_c_slid__pgrid_123462990176_ptaid_kwd-880771273564_&gclid=Cj0KCQjwv5uKBhD6ARIsAGv9a-xgQQpfxJsn-h7UXZeier1wZg7gEoay7RX-hj2pfQdzyz_tTS_Zml0aAqCPEALw_wcB>.

[12] Climate Action 100+ <https://www.climateaction100.org/>.

[13] David Vetter, 'Oil Prices Drop As Climate Experts Stress Human Causes Of Global Temperature Rise' (Forbes, 9 August 2021) <https://www.forbes.com/sites/davidrvetter/2021/08/09/oil-prices-drop-as-climate-experts-stress-human-causes-of-global-temperatures-rise/?sh=3470520f3045>.

[14] International Energy Agency, 'The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions' (2021) <https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf>.

[15] Ipsos, 'Ipsos Perils of Perception: climate change' (2021) <https://www.ipsos.com/sites/default/files/ct/news/documents/2021-04/Press%20Release.pdf>.

[16] Goldman Sachs (n 11).

[17] Unfriend Coal, 'Insuring Coal No More: The 2019 Scorecard on Insurance, Coal and Climate Change' (2019) <https://unfriendcoal.com/wp-content/uploads/2019/12/2019-Coal-Insurance-Scorecard-soft-version-2.pdf>.

[18] Insure Our Future '2020 Scorecard on Insurance, Fossil Fuels and Climate Change' (2020) <https://insureourfuture.co/2020scorecard/>.

The TCFD was established by the Financial Stability Board to develop recommendations for more-effective climate-related disclosures that could promote more-informed investment, credit and insurance underwriting decisions. In 2017, it released a framework for climate-related financial disclosure structured around four thematic areas: governance, strategy, risk management, and metrics and targets. This framework has become established as the international standard for climate-related disclosures and now has more than 2,300 supporters in 88 countries.[19]

The UK Financial Conduct Authority is working to implement standardised TCFD-derived disclosure rules, which will apply to asset managers, life insurers and FCA-regulated pension schemes from 1 January 2022.[20]

Losses arising from transition risk

It is already apparent that transition risk will cause real-world consequences to every commercial sector: from primary extraction to energy, manufacturing, transportation, professional advice, finance and investment. We now turn to evaluate those losses in greater detail.

Stranded assets

The term 'stranded asset' was first introduced by Carbon Tracker to promote discussion of the economic implications of the energy transition. Their latest definition is as follows:

Stranded assets are now generally accepted to be those assets that at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return (i.e. meet the company's internal rate of return), as a result of changes associated with the transition to a low-carbon economy (lower than anticipated demand / prices). Or, in simple terms, assets that turn out to be worth less than expected as a result of changes associated with the energy transition.[21]

Each of the sources of transition risk identified above is in principle capable of giving rise to stranded assets.

New policy initiatives, implemented to fulfil commitments under the Paris Agreement, human rights doctrines or domestic court decisions, may create a so-called 'regulatory stranding' of assets. Fossil fuel reserves, energy plants and internal combustion engines are the most obvious casualties of regulatory stranding, but the risk also extends to other sectors such as agriculture and property ownership, where more rigorous standards may result in the obsolescence of assets and infrastructure.

Technological change is particularly closely associated with so-called 'economic stranding'. As technological challengers begin to undermine the demand for established products, the value of the industries providing them may fall very quickly below the level of incumbent expectations. A good example is the rapidly falling price of renewable energy, which has made coal plants financially unviable and hastened their demise.

US data collated by the Institute for Energy Economics and Financial Analysis (IEEFA) indicates that between March and July 2021 the generating capacity of coal plants slated to retire or convert to gas before 2030 has risen by 116% against the previous year.[22]

It is also suggested that the writing down of coal assets in the Netherlands owes more to market forces than to regulatory change. According to IEEFA analysis, of the €3 billion investment lost in the Eemshaven power plant in the north of the Netherlands, less than €700 million can be directly attributed to the compulsory closure of the plant by 2030. The remainder is thought to result from the rapid decline of market conditions and changing economics.[23]

Economic stranding may also result from market movements, as the unavailability of raw materials makes it impossible to continue with existing technologies.

Undermining established business models

The effect of the transition on long-established business models is clear to see. The recent case of Milieudefensie v Shell provides a powerful illustration of how this might happen. Following essentially the same reasoning as the Urgenda case, the Hague District Court issued a similar judgment against Royal Dutch Shell, in which it ordered Shell to reduce its carbon emissions by 45% by 2030. The judgement applies not only to Shell's own Scope 1 emissions, but also to the Scope 2 emissions of its suppliers and to the Scope 3 emissions of its customers.

In reaching its decision, the court referred to various reports and brochures identifying that 'Shell companies expect to reduce emissions of greenhouse gases in their own operations as well as helping their customers to do the same'. The court compared those positive statements of intent with Shell's Energy Transformation Report from 2018, which recorded:

we expect to make continued investments in finding and producing oil and gas. We estimate that around 80% of our current proved oil and gas reserves, will be produced by 2030 and only around 20% after that time. Production that is already on stream will continue as long as we cover our marginal costs.

The court then undertook a forensic analysis of Shell's business model. It identified that executive remuneration continued to depend on short-term financial targets, with less than 10% of the weighting being attached to the energy transition. The court pointed to Shell's investment in Canadian tar sands from 2006, its investment in shale gas from 2017 and an apparent lack of ambition in its scenario models, which assumed that fossil fuels would continue to contribute 22% of global energy needs even by the time society reached net zero in 2070.

In future years it is inevitable that corporate business models will come under enhanced scrutiny from regulatory change, investor pressure and (dare we say it) litigation.

[19] TCFD, 'About' <https://www.fsb-tcfd.org/about/>.

[20] FCA, 'Business Plan 2021/22' (2021) <https://www.fca.org.uk/publication/business-plans/business-plan-2021-22.pdf>.

[21] Carbon Tracker (n 3).

[22] IEEFA, 'IEEFA U.S.: Surge of coal-fired generation retirements looking like a reverse S-curve' (2021) <https://ieefa.org/ieefa-u-s-surge-of-coal-fired-generation-retirements-looking-like-a-reverse-s-curve/>.

[23] SOMO, 'Compensation for Stranded Assets' (2021) <https://www.somo.nl/compensation-for-stranded-assets/>.

Unproven and controversial technologies

Unproven technologies have a troublesome tendency to cause investor losses during any period of industrial advance. The energy transition is no exception. In fact, it is moving at such a speed that technologies will fall in and out of favour extremely quickly.

A good example of technological ebb-and-flow comes from the controversy surrounding Bioenergy with Carbon Capture and Storage (BECCS). BECCS involves growing plants, which remove carbon dioxide as they grow, and are then burned in power stations to produce electricity. The carbon dioxide resulting from this combustion is captured and stored underground. The result is net carbon dioxide removal from the atmosphere.[24]

The idea was introduced as early as 2001, when an academic proposal was made for the Swedish paper industry to capture its carbon emissions and participate in the Kyoto carbon emissions trading system.[25]

Despite at that stage being an unproven academic proposal, BECCS was swiftly adopted by climate modellers as an important negative emissions technology. Some models suggested an exponential growth in BECCS power plants, to 700 in 2030 and 16,000 in 2060. The technology remains controversial, however, and the use of BECCS technology in climate models has been criticised for 'a lack of transparency and ethical discussion'.[26] Its future as a mass technology is uncertain, leaving investors with very significant opportunities, which are also attached to very significant risks.

Fluctuations in share price

Looking beyond individual companies to the wider marketplace, it is still very much an open question whether global investors have adequately integrated climate risk into their pricing considerations.

Published research into European equity markets suggests, somewhat tentatively, that price fluctuations might imply a correlation between climate risk exposure and share performance.[27] On the other hand, a recent study into the US market has shown that exposure arising from international summits, natural disasters and global warming has little measurable effect on share price. While there is some evidence of price movement around US climate policy, the research suggests that investors are most often choosing to hedge their investments against climate risk rather than to abandon traditional industries entirely.[28]

If climate exposure does eventually result in major share price fluctuations, it is likely to result in claims being made against directors for breach of duty.

Other policy-related risks

Although this paper focuses upon immediate financial risks, it is also relevant to consider the economic effects of the widespread political and societal changes to which the transition will give rise.

In 2020 the International Risk Governance Council (IRGC) of the World Economic Forum issued a policy brief encouraging governments to embrace the policy-related challenges to which the transition will give rise.[29] In addition to the direct financial risks, which have already been set out above, the policy brief draws attention to the following socio-economic and political risks:

- The potential of the transition to create winners and losers, with the potential for social and political disruption if careful attention is not paid to issues such as inequality and social justice. Examples of this risk have already begun to crystallise. The unrest in France caused by the gilets jaunes movement was widely publicised. Also in Ecuador, public protests following the withdrawal of fuel subsidies led to the imposition of a state of emergency in 2019.[30]

- The likely reconfiguration of the international system that will result from the impacts of the transition. China is currently by far the world's largest carbon emitter, contributing 27% of global emissions and eclipsing the emissions of all developed countries combined.[31] In 2020, China's coal-fired power-generating capacity grew by a net 29.8 gigawatts, while in the rest of the world net capacity decreased by 17.2 gigawatts.[32] Nonetheless, China is keen to assume international leadership, having declared in September 2020 its ambition to achieve an emissions peak by 2030 and carbon neutrality by 2060.[33] China has very recently pledged not to finance new coal plants abroad.

- The uncertain effect of the transition on gross domestic product, combined with sectoral and geographical concentrations of unemployment.

- Environmental damage, for example through land-use changes and the extraction and disposal of new critical materials.

[24] Paul Behrens, 'Bioenergy carbon capture: Climate snake oil or 1.5C panacea?' (Energy Post, 30 October 2018) <https://energypost.eu/bioenergy-carbon-capture-sequestration-beccs-snake-oil-or-panacea/>.

[25] Leo Hickman, 'The History of BECCS' (Carbon Brief, 13 April 2016) <https://www.carbonbrief.org/beccs-the-story-of-climate-changes-saviour-technology>.

[26] Dominic Lenzi and others, 'Don't deploy negative emissions technologies without ethical analysis' (Nature, 19 September 2018) <https://www.nature.com/articles/d41586-018-06695-5>.

[27] Danni Tu, 'Do the stock markets price climate change risks?' (HEC Paris) <https://www.vernimmen.net/ftp/DoStockMktsPriceClimateChangeRisks_Danni_TU.pdf>.

[28] Renato Faccini, Rastin Matin and George Skiadopoulos, 'Dissecting Climate Risks: Are they Reflected in Stock Prices?' (2021) <https://www.qmul.ac.uk/sef/media/econ/events/FMS_17_June2021_Dissecting-Climate-Risks.pdf>.

[29] A Collins, MV Florin and R Sachs, 'Risk governance and the low-carbon transition' (EPFL International Risk Governance Center, 2021).

[30] 'Ecuador protests: State of emergency declared as fuel subsidies end' (BBC News, 4 October 2019) <https://www.bbc.co.uk/news/world-latin-america-49929272>.

[31] Kate Larsen, Hannah Pitt, Mikhail Grant and Trevor Houser, 'China's Greenhouse Gas Emissions Exceeded the Developed World for the First Time in 2019' (Rhodium Group, 2021) <https://rhg.com/research/chinas-emissions-surpass-developed-countries/>.

[32] Global Energy Monitor, 'China Dominates 2020 Coal Plant Development' (2021) <https://globalenergymonitor.org/wp-content/uploads/2021/02/China-Dominates-2020-Coal-Development.pdf>.

[33] Ministry of Foreign Affairs of the People's Republic of China, 'Statement by H.E. Xi Jinping President of the People's Republic of China At the General Debate of the 75th Session of The United Nations General Assembly' (2020) <https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1817098.shtml>.

- Challenges to the flexibility and resilience of the global energy supply.
- The dangers of over-reliance on imperfect transition-risk models.

Liability risk

We have already referred to the prominent role of the courts in accelerating and policing the transition.

As the transition accelerates and (as appears likely) becomes increasingly disorderly, financially interested parties will seek to allocate their losses resulting from the manifestations of transition risk. A tsunami of litigation is almost certain to result. Potential targets include directors and officers, asset managers and professional advisers who misread the transition, and governments who are alleged to have interfered with vested rights through their transition measures.

Current duties of care, applied to the rapidly evolving state of what is or should reasonably be known, are enough to provide viable causes of action in many cases. Transition risk will act as a multiplier of those duties, with the bright light of corporate disclosure illuminating boardroom decisions and making them susceptible to challenge.

New duties will also emerge, such as the emerging human rights doctrines in European courts and evolving directors' duties of care. Although the analysis of those duties is sadly beyond the remit of this paper, the Commonwealth Climate and Law Initiative has compiled an excellent resource on this important topic.[34]

Conclusion

Transition risk is in many ways the most problematic branch of climate risk. It permeates all areas of socio-economic, political and geopolitical activity. It has direct and indirect financial effects on every conceivable commercial sector. Most problematically, transition risk derives from a pervasive level of uncertainty that makes it impossible to model with any degree of confidence.

In view of that background, our advice to businesses in all sectors is to keep the transition firmly in mind, and to conduct regular scenario-based risk analysis. The best prepared businesses will undoubtedly emerge stronger from the storm.

Biography

Neil Beresford is a partner at Clyde & Co, an international law firm. He has a particular interest in product liability and environmental claims, and the considerable overlap which now exists between both disciplines. He provides claims and consultancy advice to financial institutions in connection with climate transition and liability risk.

Biography

Nigel Brook is a partner at Clyde & Co, an international law firm, where he specialises in insurance and reinsurance coverage. He leads the firm's Resilience and Climate Risk offering, which spans the firm's main practice areas, and frequently writes and speaks on climate-related risk, litigation and regulation.

[34] Commonwealth Climate and Law Initiative, 'Directors' Liability and Climate Risk: Comparative Paper – Australia, Canada, South Africa, and the United Kingdom' (2019) <https://ccli.ouce.ox.ac.uk/wp-content/uploads/2019/10/CCLI-Directors%E2%80%99-Liability-and-Climate-Risk-Comparative-Paper-October-2019-vFINAL.pdf>.

Regulating for a green, fair future - Ofgem's perspective[1].

Mark Mills[2], Kwame Asamoa-Bonsu[3] and Alexander Aristodemou[4]

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Introduction

A major global transition is underway due to economics, as renewable technologies mature increasing their competitiveness, and as a growing number of governments commit to net zero carbon strategies. Energy regulators have already been at the heart of delivering change and will continue to shape energy markets in accordance with government policies. In Great Britain, Ofgem, guided by Parliament, is tasked with this role. While Ofgem is proud of what it has already achieved, we acknowledge that there is more work to be done: Ofgem will need to go further and faster if the most damaging effects of climate change are to be avoided. Although there are very different energy systems across the world, this is a global problem and most of the challenges faced as regulators are the same. We need to work together to find the best answers, sharing and learning from each other's best practice – and each other's mistakes. In this article, we therefore explore the overall framework and operation of the regulations in which we operate.

Below, we outline how the existing framework in which Ofgem carries out its regulatory duties has evolved and summarise discussions around its potential further development. Of course, the things that Ofgem has always cared about as a regulator loom even larger in the transition to net zero. Ofgem is conscious of the cost burden falling on those least able to pay. We know there are significant distributional issues to worry about if the energy transition is to be just and equitable. With such a long-term project there are also questions about intergenerational fairness. This generation must avoid putting financial costs on our children and our grandchildren, not only through climate change itself but also through the costs of investment in the new energy system that we need.

An effective regulatory regime is one that can and does evolve over time; the job of an effective regulator within that regime is to adapt to successfully meet the challenges of the time. To make sure we can protect our customers' interests and drive that transition to net zero we must be fast, responsive and reactive. The need to build collaborative relationships with the industries, energy companies and wider sectors that we work with has never been stronger.

Regulatory structure

The Gas and Electricity Markets Authority (GEMA) was established[5] to regulate the electricity and downstream gas markets in Great Britain. Ofgem is the body of civil servants who exercise those powers on a daily basis. The UK government makes policy decisions around decarbonisation, including schemes to support non-fossil fuel sources of generation, which are often administered by Ofgem.

Although Ofgem operates independently, it cannot make changes to overarching policy in the sector itself, as reflected in the regulatory framework set out in Acts of Parliament. However, what it can do is determine how best to carry out its duties through the decisions it makes, including in the context of delivering a net zero energy system for a net zero economy. Understood in this way, the boundaries of Ofgem's remit are set by what is in the statute book and in the parliamentary timetable. This contributes to transparency and stability in the investment decisions of energy market participants. While Ofgem places considerable importance on its independence, it recognises the need to establish and maintain effective working relationships with other governmental departments and regulators. Obligations to report annually on its activities to the Secretary of State for the Department for Business, Energy

[1] This article is inspired by an event of the same name organised by Ofgem in mid-2021 – please see Regulating for a green, fair future event – 24 May 2021 <https://www.ofgem.gov.uk/publications/regulating-green-fair-future-event-24-may-2021>.

[2] Deputy Legal Director, Ofgem

[3] Legal Adviser, Ofgem

[4] Legal Adviser, Ofgem

[5] Utilities Act 2000, s 1(1).

and Industrial Strategy (BEIS) who in turn lays the report before Parliament act to keep it accountable to the consumers it serves.

Crucially, Ofgem is responsible for the day-to-day administration of the licence regime including licensing of energy suppliers and enforcement activities. Ofgem is also responsible for conducting reviews and approving modifications to the industry codes that govern market participation in the electricity and gas sectors.

Another of Ofgem's key roles is to set price controls for certain activities in the gas and electricity sectors. The rationale for this role has developed from the need to constrain the potential negative impacts of monopolies on effective competition in other parts of the sector and protecting domestic consumers from market information asymmetries, inefficiencies and poor service provision. Historically, price controls were designed with a focus on achieving efficiencies and cost savings in licensees' operations. This approach did not necessarily facilitate longer-term achievement of consumer benefits through innovation, which is key to addressing the issues of decarbonisation, energy security and affordability. It also arguably contributed to under-investment in assets and lack of attention to positive consumer outcomes. This resulted in 2010 in the establishment of a new price control model, known as RIIO (Revenue = Incentives + Innovation + Outputs), for electricity and gas transmission and distribution network companies. RIIO was designed to incentivise practices that lead to improved outputs in areas covering safety, reliability, environmental impact, customer service, connections service and social considerations, with the possibility to revise these. It also awarded funding specifically for innovation.

The principal objective

The structure of the modern energy market in Great Britain can be traced back to the gradual separation of activities in the gas and electricity markets in the 1980s and 1990s. The two sectors are largely governed by the Gas Act 1986 (GA86) and Electricity Act 1989 (EA89) (together, the Acts), respectively. The Acts have been amended at the instigation of different governments over the years to reflect the desire to focus on achieving different policy objectives.

The clearest illustration of this is the evolution of Ofgem's principal objective (PO) and general duties, which act as guiding principles in determining what Ofgem should seek to achieve and how to do so. We will explore below how this has developed over time, but suffice to say that in exercising its decision-making powers Ofgem is required to consider many factors, which are not necessarily aligned.

Within this framework, one crucial question is how to accommodate net zero within Ofgem's decision-making framework, as well as its relative status compared to other important factors. Informing this understanding is an acknowledgement that we are in the midst of an energy transformation, within a decentralised, flexible energy system that relies not only on physical but increasingly also on digital assets, with enhanced consumer participation, which plays a progressively greater role in both demand and generation. Ofgem's Impact Assessment Guidance was updated in May 2020 to reflect the approach Ofgem will adopt when assessing how decisions impact on sustainability, in particular the achievement of decarbonisation.[6]

Historical context

The early years

In their initial expressions from the mid to late 1980s and long before the creation of Ofgem, section 1 of the respective Acts created the roles of Director General of Gas Supply and the Director General of Electricity Supply (the Directors). These arose from the privatisation of previously nationalised gas and electricity companies. The Acts empowered the Directors to exercise their functions in a way that ensured that supply of electricity and gas met demand whilst also ensuring that the companies undertaking licensed activities remained able to invest in those functions in competitive markets.

Consumer protection

The Utilities Act 2000 (UA2000) abolished the Directors' offices, transferring their functions to GEMA, giving new functions to that body and making substantive amendments to the PO and guiding principles.[7] UA2000 sets out the PO by way of additions to the Acts. The PO shapes Ofgem's policies, effectively putting consumer interests at its core.

The initial functions of the Directors still have a place in the Acts, however these have been effectively reframed to support revisions to the PO. This reframing means that effective competition is promoted 'wherever appropriate'.[8] The Explanatory Notes to the Electricity Act 2010 (EA2010) note the changes made to section 3A of EA89, clarifying that Ofgem should consider alternative solutions to address consumers' interests instead of, or alongside, measures to promote competition, which may take time to deliver and create unintended market barriers for consumer participation.[9] Furthermore, the PO must be furthered by having regard to meeting reasonable demands for electricity and gas while ensuring that licence holders continue to be able to finance their activities.

Set out in sections 3A EA89 and 4AA GA89, the PO has developed through subsequent legislation, while words inserted by the Energy Act 2008 to both Acts clarify that existing and future consumers are included. Despite the differences arising from the specifics of each fuel, the Acts mirror each other in almost every other material aspect. A cross-sectoral reference can be found in each Act, providing that in carrying out its functions, Ofgem may have regard to the interests of consumers in relation to the other sector.[10]

[6] Ofgem, 'Impact Assessment Guidance' (2020) <https://www.ofgem.gov.uk/publications/impact-assessment-guidance>: Ofgem has said 'we will ensure that our approach remains consistent with Government policy, for example taking account of the Committee on Climate Change's (CCC) 6th Carbon Budget in September 2020, or any revised guidance and policies on how the Net Zero target will be met.'

[7] GEMA delegates many of its functions to Ofgem by virtue of the Rules of Procedure: <https://www.ofgem.gov.uk/publications/rules-procedure-gas-and-electricity-markets-authority>.

[8] EA89 s 3A(1B); GA86 s 4AA(1B).

[9] EA2010 Explanatory Notes <https://www.legislation.gov.uk/ukpga/2010/27/notes/division/7/1/1>.

[10] EA89 s 3A(4); GA86 s 4AA(4).

The path to net zero

The requirement to have regard to the environment[11] was first expressed in the first version of the PO created by the amendments to the UA2000. It has been an enduring feature of regulatory decision-making over the years. Remaining largely unchanged in the current version of the Acts, it allows Ofgem to balance and have consideration for the various policy objectives at play when making decisions.

Following on from international efforts and commitments made to cut emissions under the Kyoto Protocol, the government's Energy White Paper of February 2003[12] committed to a target of obtaining 20% of electricity from renewable sources by 2020. The White Paper acknowledged that this required raising the profile of environmental considerations in Ofgem's regulatory decision-making as a crucial step to minimising inconsistencies between policy objectives and the regulatory regime for the gas and electricity markets. Continuing therefore the evolution of Ofgem's regulatory oversight, the EA2004 included, for the first-time, reference to sustainable development in the Acts.

The current version of the PO in the Acts clarifies that the interests of existing and future consumers are their interests taken as a whole, including in the reduction of electricity and gas-supply emissions of targeted greenhouse gases. The addition of these considerations to the PO was by virtue of the Energy Act 2010, which incorporates definitions of 'emissions' and 'targeted greenhouse gases' from the Climate Change Act 2008 within the regulatory framework. In this way, we see a clear interaction between the Acts and net zero. As readers will be aware, the Climate Change Act 2008 was amended in 2019, which revised from 80% to 100%, the required reduction of targeted greenhouse gases by 2050, compared with 1990 levels.

The UK–EU Trade and Cooperation Agreement seeks to ensure that the existing commitments made by the signatories in relation to greenhouse gases and ozone depleting substances are maintained. There is also a commitment to effectively implement the United Nations Framework Convention on Climate Change and the Paris Agreement goals. In Ofgem's decarbonisation action plan of 2020,[13] trade-offs identified in the transformation of the energy system include short-term costs, which could be offset by potential medium- and longer-term savings. Therefore, the benefits of greenhouse gas reductions to future consumers need to be balanced with potential costs to current consumers, and careful planning is necessary to ensure that the most vulnerable consumers are protected. Ofgem has previously identified that all consumers have different and evolving needs, and they are not necessarily equally capable of playing a greater role in the transition to net zero. The challenge is therefore to decarbonise our economy while ensuring that consumers do not get left behind.

A potentially important addition that is likely to inform Ofgem's decision-making on net zero and energy policy in the future is the issuing of a Strategy and Policy Statement by the Secretary of State, provided for under the Energy Act 2013. In its 2020 Energy White Paper the government indicated that a consultation in 2021 will take place with a view to putting in place a Strategy and Policy Statement (SPS) for Ofgem. The White Paper indicates that, subject to consultation, the SPS will require 'the Secretary of State and Ofgem to carry out their regulatory functions in a manner which is consistent with securing the government's policy outcomes, including delivering a net zero energy system while ensuring secure supplies at lowest cost for consumers.'[14]

Net zero through RIIO-2

To the extent possible for an independent regulator, Ofgem's evolving priorities need to deliver its PO while aligning its actions, wherever possible, with government policy.[15] An example of this is RIIO-2, which is the second set of price controls implemented under Ofgem's RIIO model. Although the price controls cover different time periods and relate to different parts of the gas and electricity networks, there is an understanding that flexibility and coordination are crucial to achieve net zero. The RIIO model includes mechanisms for licensees to apply for adjustments to revenues during the price control period, considering factors such as additional required investment in achieving net zero. This type of re-opener tied to implementation of net zero policies can therefore be understood as a type of uncertainty mechanism. It allows Ofgem to adjust a licensee's allowances either up or down, and allows for the creation of additional outputs or price control deliverables in response to changing circumstances during the price control period, including the need for additional strategic investment to help meet net zero. The ability to enable the price control to flex in this way when investment needs become clearer ensures that funds are allocated in the right place at the right time.

Meeting the net zero challenge

The newly appointed House of Lords Industry and Regulators Committee has followed up on some of these themes in its examination of Ofgem's role in net zero. In its Call for Evidence,[16] the Committee notes Ofgem's increasingly multifaceted role. Evidence submitted to the Committee, has reflected that some of the challenges that Ofgem faces in the transition to net zero may include:

- Effectively regulating entities that are increasingly expected to perform functions that differ from the scope of functions envisaged by the current regulatory framework. For example, the transition of distribution network operators to performing decentralised system operation functions.

[11] EA89 s 3A(5)(c) provides that 'Secretary of State and the Authority shall carry out their respective functions under (…) in the manner which he or it considers is best calculated (…) to secure a diverse and viable long-term energy supply, and shall, in carrying out those functions, have regard to the effect on the environment of activities connected with the generation' [emphasis added].

[12] Environmental Audit Committee, Energy White Paper – Empowering Change (2003) <https://publications.parliament.uk/pa/cm200203/cmselect/cmenvaud/618/618.pdf>.

[13] Ofgem, 'Ofgem's Decarbonisation Action Plan' (2020) <https://www.ofgem.gov.uk/publications/ofgems-decarbonisation-action-plan>.

[14] Secretary of State for Business, Energy and Industrial Strategy, Powering our Net Zero Future (White Paper, CP 337, 2020) 86 <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf>.

[15] For more information, see for example: Ofgem, 'Re-opener Guidance and Application Requirements document' (2021) <https://www.ofgem.gov.uk/publications/re-opener-guidance-and-application-requirements-document-0>.

[16] UK Parliament, 'New Lords committee launches Call for Evidence on Ofgem and net zero' (23 June 2021) <https://www.parliament.uk/business/lords/media-centre/house-of-lords-media-notices/2021/june-2021/new-lords-committee-launches-call-for-evidence-on-ofgem-and-net-zero/>.

- Addressing the changing role and behaviours of demand-side market participants in a way that maximises the opportunities arising from network flexibility.
- Designing price controls and charging arrangements that drive investment towards the achievement of net zero, whilst having the ability to manage complex trade-offs.
- Increasingly incentivising innovation through enhanced use of regulatory sandboxes.

Looking to the future

Looking back

The last decade has seen major reductions in the carbon footprint of electricity generation with carbon emissions falling by over half during that period. Ofgem considers that this may continue as prices of low-carbon-generation alternatives fall and the system adapts to make the most efficient use of the electricity they generate through flexible solutions, such as storage and adaptation of consumer demand to minimise overall costs.

Considering the legislative framework governing Ofgem's functions outlined briefly above, we see that there has been significant continuity but also evolution of the framework and its application as priorities have changed.

Ofgem's statutory functions have developed since the time of privatisation in the energy sector into a complex framework reflecting a variety of social and environmental goals. While we are confident that the current framework gives sufficient scope to deal with many of the challenges to date and those to come, we also recognise that Parliament may consider legislative revision as desirable to ensure that Ofgem can continue to be able to deliver for consumers in the manner it intends as we move into a new future.

The new future

That future will likely be more complex. It will require Ofgem to be more agile, so it can respond rapidly to change and facilitate the transition to a low-carbon and more cost-effective energy system that delivers good outcomes for all consumers.

It is likely that a future energy system that works well for consumers will be more interactive between its different constituent parts, with a blurring of the boundaries between producers and consumers, as well as between wholesale markets, systems and retail markets. New technologies, such as electricity storage and smarter and more flexible demand side response, will provide viable alternatives to building ever more network and generating capacity to manage peak demand. Markets will find new and cost-effective ways of matching supply and demand to manage the system. This will mean different prices at different times of the day across different locations. Ofgem expects that:[17]

- There will be more diversity in the types of companies operating in the sector, who will offer consumers a broader range of products and bundled energy services across heat, power and transport and other utilities.
- Innovation will reduce costs to businesses and consumers and help make better use of networks and other existing energy assets, saving money for everyone and improving service standards.
- There will be greater digitalisation, with open access to data and intelligent IT platforms automating markets and consumer participation to manage the increased complexity that will be a feature of the future.

This future may create challenges

Ofgem's 2019–2023 strategic narrative recognises the challenges that may be created by this future and explains how Ofgem expects to tackle them within the current framework. The strategic narrative sets out three key objectives in helping Ofgem further the interests of consumers in line with its principal objective:

- Enable competition and innovation that drives down prices and results in new products and services.
- Protect consumers, especially the vulnerable, stamping out sharp practice and ensuring fair treatment.
- Decarbonise to deliver a net zero economy at the lowest cost to consumers.

These changes will impact on wider sectors in the economy, necessitating a coordinated approach between regulatory initiatives. In this respect, developments such as operation of UK Freeports[18] and the tax savings achieved by businesses operating in these locations could promote delivery of cheaper renewable energy projects. For example, as the take-up of electric vehicles increases, transport emissions will be reduced and flexible charging will allow consumers to benefit from lower overall costs. Increased electrification of heating and industrial energy use could further build on this trend. The use of district heating or the conversion to low-carbon gas – through biogas and/or hydrogen – would substantially reduce carbon emissions from heating. With the government accepting the Committee on Climate Change's recommendation for a net zero carbon dioxide emissions target by 2050, there is an increasing focus on decarbonisation, particularly in the transport and heat sectors, including in relation to proposals being consulted on at the time of writing around the design and delivery of a future system operator.[19]

The shift to an increasingly decentralised network where variable generation is the norm demands fit for purpose market and regulatory arrangements. This includes adapting to the changing design of the energy system, such as encouraging positive flexible demand-side response behaviour to match supply in a way that is compatible with the net zero goal while keeping consumer costs affordable.

For example, the costs for consumers to charge electric vehicles can be kept low if we are able to charge them at the right times.

[17] Ofgem, 'Ofgem strategic narrative: 2019-23' (2019) <https://www.ofgem.gov.uk/publications/ofgem-strategic-narrative-2019-23>.

[18] For more information, please see: D Webb and I Jozepa, 'UK Government policy on freeports' (UK Parliament, 2020) <https://commonslibrary.parliament.uk/research-briefings/cbp-8823/>.

[19] BEIS and Ofgem, 'Energy future system operator consultation' (2021) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004044/energy-future-system-operator-condoc.pdf>.

However, if Ofgem delays taking action to design the market to do that, those costs will be significantly higher and as a result Ofgem will struggle to maintain public confidence in the transition.

As governments around the world now look to spend their way to economic recovery, many consider that such spending should be directed to give the world a chance to build a fairer and greener economy, and one that is more resilient to systemic threats such as pandemics and climate change. As such, many recovery packages propose measures aimed at decarbonising energy systems. For example, the UK government has pledged £160 million to increase the country's offshore wind capacity to 40GW by 2030, the German government is providing €50 billion in support for future-proof green technologies[20] and in Colombia, renewable energy will form one of the country's 'three pillars' of economic recovery.[21] Looking ahead, we expect renewable energy deployment to play a vital role in rebuilding economies around the world and mitigating climate change risk.[22]

With increasing focus on climate change and energy security, and the need to accelerate the UK's move to a low-carbon economy becoming crucially important, the Sustainable Development Commission has suggested that Ofgem's remit may need to be refined.[23] One such issue is in the scope of activities subject to some form of regulation or the nature of the regulation to which those activities are subject. While the scope of activities subject to regulatory oversight through licence (in the electricity sector, transmission, distribution, interconnection, generation and supply) continues to cover much of the sector, the nature of some of those roles needs to change to be fit for purpose. However, other parties' developing roles may also need to be reflected in greater regulatory oversight than it is to date. In this respect, it may be necessary for government to revise the breadth of the regulatory framework, for example by creating new categories of licensable activities or amending the existing ones, to capture emerging activities in the changing energy market that have the capacity to impact on consumer outcomes. Examples in this area include the enhanced roles that distribution network operators are expected to play in system operation as part of a decentralised energy system and of a 'whole systems' (taking into account impacts on gas and electricity) approach between market participants. While, as we have discussed above, there is sufficient in-built flexibility in the regulatory regime, acting on these issues is unlikely to be solely within the scope of Ofgem's powers alone.

Conclusion

We are at a critical stage in successfully transitioning to a low-carbon energy system. A decentralised and flexible system, driven by data, offers ample opportunity to put the UK on track to net zero by 2050. The accelerating pace of change within the energy sector, not least due to setting of increasingly ambitious targets, is welcomed. A whole systems approach across our economy led by robust governance frameworks will allow for further progress.

In some instances, Ofgem has been able to adapt its regulatory functions without new regulations, significant changes in the scope of its powers or reprioritisation of its duties. For example, during Covid-19, Ofgem prioritised work in areas directly relevant to consumers such as retail energy markets workstreams. At the same time, it considered reducing the regulatory burden on industry from price controls wherever sensible so that it could remain committed in its focus to continue to provide essential services to customers. By comparison, other regulators without this flexibility have had to use emergency regulation to make similar changes.[24] Covid-19 therefore illustrated the capacity of Ofgem to take agile and innovative action, and the need for a flexible framework.

With the net zero target clearly outlined and expected to be achieved by 2050, the challenge ahead for Ofgem is different. It will require significantly expanding and repurposing new and existing systems to decarbonise effectively and on time, while delivering value for money and fairness for all consumers.

Over the next decade, the energy system will undergo a fundamental transformation as the processes of decarbonisation, digitalisation and decentralisation progressively manifest themselves across the system. We note that we do not know exactly how the future will evolve, nor is it Ofgem's role to determine it. But it can be sure that the pace of change – driven by new technologies – will increase and we stand ready to make the best use of our toolkit to tackle the challenges.

Postscript

Since this article was written we have seen high global gas prices having a wide-ranging impact across the energy sector, the broader economy in Great Britain and the world.[25] This may (naturally) lead some people to question the observations made earlier in this article about the role of net zero within the scope of Ofgem's regulatory functions. It is still too early to assess the impact of higher global gas prices on economic growth, however the case for greater diversification in our energy supply has never been more apparent. We are therefore committed to ensuring that the transition to a decarbonised energy system continues at pace, and at lowest cost to consumers, as we continue to protect consumers during what can feel like an unsettling time.

[20] https://www.bundesfinanzministerium.de/Content/EN/Standardartikel/Topics/Public-Finances/Articles/2020-06-04-fiscal-package.html

[21] https://www.ft.com/content/6ff1545a-d9aa-4bde-af1e-65ba2107e5c4

[22] CMS, 'CMS Expert Guide to renewable energy law and regulation' <https://cms.law/en/int/expert-guides/cms-expert-guide-to-renewable-energy>.

[23] Sustainable development Commission, 'Lost in Transmission: The role of Ofgem in a changing climate' (2007) <http://www.sd-commission.org.uk/data/files/publications/SDC_ofgem_report%20(2).pdf>.

[24] OECD, 'When the going gets tough, the tough get going: how economic regulators bolster the resilience of network industries in response to the COVID-19 crisis' (2020) 33 <https://read.oecd-ilibrary.org/view/?ref=135_135364-qc5jpyar8f&title=When-the-going-gets-tough-the-tough-get-going-how-economic-regulators-bolster-the-resilience-of-network-industries-in-response-to-the-COVID-19-crisis&_ga=2.226149786.12878906.1632144021-1108283478.1632144020>.

[25] Reuters, 'Power price surge threatens Spanish recovery' <https://www.reuters.com/world/europe/power-price-surge-threatens-spanish-recovery-2021-09-23/>

Biography

Mark Mills is Deputy Legal Director (Acting) with Ofgem, the regulator for the gas and electricity markets in Great Britain where he has worked for over 10 years. He has a diverse practice and advises across a broad range of Ofgem's work. This includes competition law, in relation to which he was seconded to the Competition and Markets Authority, and other enforcement matters, as well as general public law and commercial judicial review. Mark is and has been responsible for supporting a number of projects which are crucial to net zero including Ofgem's input into the implementation of the Clean Energy Package and into the proposals for to create a future system operator.

Mark trained at a major city law firm, spending time in London and Brussels, and since qualifying has also worked at the Competition and Markets Authority and the law firm Kingsley Napley. Mark is a graduate of the University of Essex (LL.B Law) and Cambridge University (LL.M Commercial Law). Mark has contributed to publications including the GCR publication, The Guide to Energy Market Manipulation, as the author of the chapter on enforcement activities in the EU.

Biography

Alexander Aristodemou is a Legal Adviser at Ofgem, working on a broad range of matters within the electricity and gas sectors. He holds an LLM in Banking and Finance Law from CCLS, Queen Mary, having completed his dissertation on sovereign debt restructuring and conditionality. He has academic and professional experience in transactional and contentious matters in the energy sector, including advising states in the context of Energy Charter Treaty disputes. Recently, he has been supporting the development of cross-border electricity trading arrangements following the withdrawal of the UK from the European Union, including advising on the drafting of domestic legislation for implementation of the UK-EU Trade and Cooperation Agreement. Other matters he has worked on include advising on electricity and gas code modifications, such as gas storage and transport charging arrangements.

Biography

Kwame Asamoa-Bonsu is a Legal Adviser at Ofgem, the energy regulator for Great Britain. He advises on a wide range of electricity and gas issues as well as public and information law. He also has experience in judicial review, tax related disputes and other regulatory matters relating to financial institutions and services. Kwame's recent experience includes supporting in the drafting of licence conditions to implement the Clean Energy Package, Electricity System Operator - RIIO-2 price controls and advising on Liquefied Natural Gas (LNG) storage facilities in relation to the open season procedure to offer to the market primary capacity and the exemption from regulated Thirty Party Access. Kwame is currently supporting the design of a de-risking mechanism for the large-scale and long-duration electricity storage technologies which may play a role in the UK's transition to net zero.

With a dual-qualification as a U.S. lawyer and Solicitor of England & Wales, Kwame has experience in U.S Constitutional law and Federal Administrative law.

An overview of green finance and its actors in the context of COP26.

Giuseppe Candela

Giuseppe Candela

This article is an adaptation of the dissertation submitted by Mr Giuseppe Candela in the context of the LLM in Energy and Natural Resources Law at Queen Mary University of London (Academic Year – 2019/2020), titled 'Green, climate and sustainable finance, a fuel to support the energy transition. An evaluation of the regulations and legal instruments used in the green market'.; furthermore, a specific paragraph concerning the expectations for climate finance at COP26 in Glasgow has been included.

Introduction

Climate change is dramatically affecting our planet through catastrophic weather events, changing seasons, rising sea levels, and more adverse effects. Moreover, the changes in climate are posing significant risks for the global economy, adversely impacting on strategic sectors such as food production, water supplies, agriculture and energy security. As a global reaction, the 2015 Paris Agreement laid out ambitious goals never seen before to address climate change, aiming to limit the global average temperature to below 2 degrees Celsius above preindustrial levels and to meet zero greenhouse gas emissions by mid-century; the pattern towards a low-carbon and more sustainable economy has been irreversibly traced.

The energy transition aims to dramatically shift from a fossil fuel-based economy to a green economy. This shifting requires a massive financial resource to support mitigation and adaptation climate change policy. The Global Commission on the Economy and Climate estimated that investment of US$89 trillion between 2015 and 2030 (roughly US$6 trillion annually) is required to reach the Paris Agreement goals and prevent the worst impacts of climate change. According to the International Energy Association, for just the energy sector the investment required to achieve global sustainable energy access is equal to US$45 billion per year between 2019 and 2030.[1] In light of the above, it is evident that finance should play a crucial role in achieving energy transition; alongside the traditional green finance instruments (such as green loans and green bonds), new tools are currently being used in the climate finance market.

This article is focused on an overview of the main actors involved in climate change finance and the regulations adopted at international level regarding climate and green finance. The analysis focuses on the effectiveness of the regulations adopted by the various policymakers, and also proposes possible alternative scenarios to mitigate the drawbacks detected.

This article argues that (i) although there are generous references to climate finance in the international treaties, because of the soft law nature and the lack of harmonisation of these regulations, they appear inadequate considering the ambitious climate change goals; (ii) governments should ensure that the national commitments assumed under the Paris Agreement will be supported by systemic reform of financial regulations incentivising the use of green finance by private sectors; (iii) the remarkable initiatives provided by several multilateral organisations and multilateral climate funds should be strengthened by more incisive coordination and harmonisation in order to create a more standardised and effective climate finance system; and (iv) COP26 shall represent the perfect venue whereby a more coordinated, standardised and effective climate finance system may be made.

[1] IEA, 'World Energy Model. Sustainable development scenario' (2019) <https://www.iea.org/reports/world-energy-model/sustainable-development-scenario>.

Green finance – actors, policies and regulations

The role of climate finance under the international treaties – from the UNFCCC to the Paris Agreement

The Paris Agreement under Article 2 (c) specified: 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development'.

The Paris Agreement was adopted in December 2015 by 195 countries and represents the most important breakthrough in addressing climate change by the international community. For the first time, in fact, specific commitments have been taken by all parties, in the form of so called nationally determined contributions. These commitments have assumed the form of domestic targets and, as largely pointed out by the international community, a massive amount of funds shall be invested. The flow of money is even more urgent for developing countries since an extraordinary quantity of financial resources will be required to fill the technological and financing gap.

Historically, the United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992, has stated the need for an urgent reform of the financing system to support more vulnerable and less endowed countries. This pattern has been further followed in the Kyoto Protocol, adopted in 1997, and has explosively flowed into the Paris Agreement. Considering these remarkable examples of reference to finance under international treaties, it could be argued that finance matters should have the 'right of citizenship' under the international treaties.

Moreover, it could be argued that a new category of finance has been established under these treaties – 'climate finance'. Climate finance should be considered part of the broader category of green finance (which of course is itself a part of the broader genus of finance); however, the latter has not expressly received the same treatment under international treaties. In fact, there are no relevant references to green finance under international treaties or charts. The main reason of this asymmetric treatment could be linked to the circumstance that the traditional concept of green finance mainly referred to renewable energy projects. At the same time renewable energy has been originally viewed only as a small sector of energy compared to the oil and gas sector. Once climate change issues became a key point of all international agendas, the renewable energy sector has been seen as a crucial tool to address climate change. Therefore, it is easily predictable that the link between the renewable sector and the fight against climate change will represent an extraordinary driving force for the whole sector and could allow a flow of a massive amount of financial resources. Considering the above, it is extremely useful to briefly summarise the historical excursus of climate finance and the current stakeholders and instruments involved in this market.

The UNFCCC has established a fundamental principle that should be considered in managing climate finance: 'common but differentiated responsibility and respective capabilities'; its purpose is to underline the role of developed countries in providing financial resources to support developing countries in order to implement the objectives of the UNFCCC. This principle has been reaffirmed by the Paris Agreement especially considering the voluntary contributions assumed by all parties (including the developing countries). In the context of finance, it might be inferred that developed countries should assume a leading role in mobilising climate finance using the wide variety of instruments, sources and channels to fill the technological and financial gap with developing countries. Moreover, because of the circumstances of the parties to the Paris Agreement, as well as the nature of the various funds that have been established to implement the ambitious climate change goals, international climate change treaties mainly refer to the role of public funds.

Having premised the above, it is extremely important to identify what are the financial mechanisms set out under the international treaties and the climate finance architecture structured mainly by seven multilateral funds.

The financial mechanism was established under the UNFCCC and has been further amended and partially harmonised under the Kyoto Protocol and the Paris Agreement. In 1991, the Global Environment Facility (GEF) was established and has been used as the operating financial entity since the UNFCCC entered into force in 1994.[2] In 2001, the seventh Conference of the Parties (COP7) established two special funds: (i) the Least Developed Countries Fund (LDCF) and (ii) the Special Climate Change Fund (SCCF). Both these funds were specifically established to serve the UNFCCC[3] and are currently operated by the GEF. In the same year the Adaptation Fund was also established under the Kyoto Protocol[4] and it started its operation from 2009. In 2010, at COP16, the Green Climate Fund (GCF) was established as an operating entity of the financial mechanism. In 2015, at the Paris Climate Change Conference, the two financial mechanism operating entities (that is, the GCF and GEF) and both the SCCF and the LDCF were seen as crucial tools to achieve the ambitious goals assumed in the Paris Agreement.[5] The Paris Agreement, granted the GEF with a discrete mandate to build finance transparency.[6] The Conference of the Parties are responsible for the policies, eligibility criteria and priorities for funding under the financial mechanism.

Article 9 of the Paris Agreement is the main source for climate finance under international treaties and it could be useful to deeply investigate its contents. The most relevant provisions are the first and the third paragraphs. The first paragraph laid out that developed countries 'shall provide financial resources to assist developing countries with respect to both mitigation and adaptation' while the third paragraph refers to the leading role that developed countries should assume in mobilising climate finance using the variety of instruments available (including public funds). These provisions might have a revolutionary impact on international climate finance since they provide a direct lending obligation in favour of developing countries and expressly refer to the two main components in addressing climate change: mitigation and adaptation. On the other hand, as it has been intelligently pointed out, the lack of precision of

[2] UNFCCC 1992, art 11.

[3] UNFCCC 2001, decision 7/CP.7.

[4] UNFCCC 2001, decision 10/CP.7.

[5] UNFCCC 2015b, decision 1/CP.21 para 58.

[6] See UNFCCC 2015b, decision 1/CP.21 para 86.

this stance and the vexata questio about the nature of the Paris Agreement between hard and soft law could represent the main barrier to its implementation.

Considering the above, it could be affirmed that, although the UNFCCC and more recently the Paris Agreement have adopted remarkable measures to address climate change promoting green and climate finance, these measures do not yet appear suitable to reach the ambitious goals laid out under the Paris Agreement. Moreover, as recognised by the UNFCCC,[7] further clarification is needed on the role of each fund and how they should 'enhance the coordination and delivery of resources'. Indeed, the lack of harmonisation and coordination among the various stakeholders and among the variety of legal provisions (which sometimes have the nature of hard law but, more often, soft law) represents one of the main drawbacks of development of green and climate finance.

The role of governments

Governments should have a crucial role in managing the energy transition; since the energy transition may be effectively implemented only with a massive financial resource, governments should stimulate the private sector accordingly. The financial support could be provided in two different ways: (i) direct support and (ii) indirect support. Regarding the first aspect, governments may directly provide loans or may issue sovereign bond guarantees. Direct lending has been identified by the Paris Agreement as the best form for developed counties to stimulate the shift towards a low-carbon economy; once developing county receive a loan, they should then finance green projects through direct lending to the private sector or indirect support for the development of green projects. Regarding the indirect support, a large number of instruments may be used: supporting the green sectors by granting strong incentives (e.g. feed-in tariffs) or penalising the brown economy through the establishment of a so-called carbon tax. This kind of support is absolutely crucial for the financial sector since the bankability of green projects largely depends on the existence of stable and predictable cash flows to reimburse the debt and pay the interest. Although several green projects are being financed in a grid parity scheme (ie without state incentive), the bankability of the vast majority of green projects is dramatically linked to the existence of a state incentives package. In light of the above, it could be argued that public finance should play a crucial role in supporting both developing countries and the private sector to ensure an effective response in terms of climate change adaptation and mitigation. Although the private sector manages by far the largest resource of capital, policymakers should dramatically improve the public stake in the climate and green finance market.

The role of multilateral organisations

Multilateral organisations play a significant role in green finance; the multilateral development banks should be recognised as the principal actors. In this context it should be noted that in 2019 the World Bank launched an 'Action Plan on Climate Change Adaptation and Resilience', providing a direct commitment to finance adaptation climate finance projects up to US$50 billion within 2025. This is a commitment of more than double the amount financed by the World Bank between 2015 and 2018. As part of its plan, the World Bank has established the International Development Association (IDA), which will mainly provide finance to developing countries and intends to enable these countries to reach 30 gigawatts of renewable energy installed capacity by 2025. The World Bank also regularly funds the Climate Investment Funds as its main vehicle for providing finance in line with the Action Plan on Climate Change Adaptation and Resilience.

The six most important multilateral development banks – the World Bank Group, the European Investment Bank, the European Bank for Reconstruction and Development, the African Development Bank, the Inter-American Development Bank Group, and the Asian Development Bank – have established a group, the MDBs. In 2015, the MDBs collectively financed more than US$25 billion, while the total amount of funds granted by MDBs since 2011 reached the remarkable sum of US$131 billion. The main purpose of the MDBs is to develop common methodologies and guidelines for climate finance; significant efforts have been put into the coordination of accounting rules on transparency. This work has been summarised under Common Principles issued in 2015 – guidelines on mitigation and adaptation projects that have been adopted together with the International Development Finance Club.

With reference to the climate finance architecture, it should be noticed that the public funds provided by countries and other international public organisations are being mainly raised through multilateral climate funds. As mentioned above, five of these were established under the institutional framework of the UN Framework Convention on Climate Change: (i) the Green Climate Fund, (ii) the Global Environment Facility, (iii) the Least Developed Countries Fund, (iv) the Special Climate Change Fund, and (v) the Adaptation Fund. Two other funds – the Climate Investment Funds and the Strategic Climate Fund[8] – have been established outside the UNFCCC framework. The funding of these multilateral climate funds is being realised through different instruments and the various UNFCCC mechanisms are also heterogeneous, so risk is diversified among the various projects financed by each fund. These funds have five key goals:

(i) Scale up climate finance through mobilisation of finance flows in favour of a large number of borrowers in order to ensure a systemic impact.

(ii) Stimulate country ownership: this goal is crucial since it aims to support nationally determined priorities to strengthen the autonomy of each country (especially the developing ones) to build their own strategy and national plans.

(iii) Improve financing efficiency, by minimising transaction costs, providing more simple access to funds and speeding up finance delivery especially for countries where the technological and finance gap may reduce the effectiveness of the efforts provided by these funds.

[7] UNFCCC 2015b, decision 1/CP.21 para 64.

[8] The Strategic Climate Fund has further established three different sub programs: the Forest Investment Program (FIP), the Pilot Program for Climate Resilience (PPCR), and the Scaling-Up Renewable Energy in Low Income Countries Program (SREP).

(iv) Support equitable allocation – in order to ensure that funds will be fairly allocated on the basis of national targets and taking into account the specific needs of developing countries.

(v) Increase accountability standards, through the issuance of guidelines concerning operational policies (including safeguards, fiduciary standards and grievance processes).

The role of these funds may be to:

(i) Provide direct funding (in the form of loans or equity investment).

(ii) Co-finance projects. Considering the massive amount required to implement the energy transition, often the funds may only grant a fraction of the overall financial resources needed. In this case the purpose is to improve the coordination with other public or private institutions to match the scale required. The co-financing may be ensured with a national treasury organism, or national and multilateral development banks.

(iii) Take an active role in coordination and stimulation of the various stakeholders potentially interested in granting finance.

Although these goals may theoretically ensure a scale up of green finance, it should be noted that the lack of coordination between the several funds has slowed down finance flows. However, the funds have had a positive effect in financing developing countries,[9] particularly in territories that largely depend on the oil and gas industries; indeed, even though climate finance eventually aims to protect fundamental human rights, different human rights such as protection of workers and local economies must likewise be protected.

The role of banks – central banks and private banks

In December 2017, 50 central banks (not including the US Federal Reserve) created the Network of Central Banks and Supervisors for Greening the Financial System (NGFS), a network for mutual consultation on environmental risk management practices and those associated with climate change. There are three possible justifications for central banks to engage with the topic: (i) risks to financial stability, (ii) macroeconomic impacts, and (iii) mitigation/adaptation policies.

Concerning the financial risks, it should be noted that there are two types. First, there are physical risks, that is, threats to the value of assets resulting from climate shocks – the most intense and frequent extreme weather events including floods, droughts, hurricanes and other types of storms – and from trends including rising sea levels, rising temperatures and melting polar ice caps. Such physical risks include potential direct losses on assets, and their indirect impacts on global value chains and repair costs. Furthermore, in the context of energy transition, there are 'transition risks'. The move to a low-carbon economy will change the allocation of resources, the technologies in use and the construction of infrastructure. Consequently, the strategies adopted will impact on the value of company assets.

With reference to macroeconomic impact, the Organization for Economic Cooperation and Development (OECD) suggests that what it calls a 'decisive transition' could raise gross domestic product in the long run, by up to 2.8% on average in the G20 countries.[10]

Finally, referring to mitigation and adaption policies, central banks could give special treatment to green bonds in their asset acquisition programmes, turning quantitative easing into 'quantitative greening'. Despite opposition from members of the European Central Bank (ECB) – including the president of the Bundesbank (the German central bank) – president of the ECB, Christine Lagarde, has referred to a role of the ECB in supporting the European Union's economic strategy, which includes the need to mitigate climate change. Indeed, most of the resources derived from these institutions are intended to flow through the financial sector as bank lending, project finance, institutional investing or equity investing.

Technological risks should also be considered. Indeed, many banks are reluctant to lend to green energy because many of its technologies are new. The general trend suggests the need for dedicated green finance institutions in leveraging private finance that can help close the funding gap for many low-carbon investments, especially in countries characterised by a significant technological gap. In this regard, new types of publicly capitalised green investment banks (GIBs) have been created; GIBs must be publicly funded and offer preferential lending rates to finance renewable energy, energy efficiency and other clean energy infrastructure projects in partnership with private lenders.

The role of the market – institutional investors and private equity funds

The market itself play an important role in supporting climate finance both from the issuers' and subscribers' side. It is important to consider the reasons that lead companies to issue and investors to subscribe to green bonds (or climate change bonds, transition bonds or sustainability linked bonds). Various reasons may stimulate private issuers and investors to enter into the climate or sustainable finance market, including:

(i) Social pressure and reputation. Perfectly legal company behaviours may negatively affect a company's reputation if they do not take into account social responsibility. Considering that public opinion is favourable of environmental concerns, there may be a so called 'halo effect' for companies demonstrating that they are actively involved in climate mitigation and adaption strategic plans.

(ii) Regulatory and shareholder pressure. In this regard the Financial Stability Board's Task Force on Climate-related Financial Disclosures[11] has provided a full set of rules aiming

[9] See UNFCCC Climate Finance Decision Booklet, Decision 6/CMA.2Decision 6/CMA.2 (FCCC/PA/CMA/2019/6/Add.1) 'Guidance to the Green Climate Fund', which invites the Board of the Green Climate Fund to continue providing financial resources for activities relevant to averting, minimising and addressing loss and damage in developing country Parties, to the extent consistent with the existing investment, results framework and funding windows and structures of the Green Climate Fund.

[10] OECD, 'Investing in Climate, Investing in Growth' (OECD Publishing, 2017).

[11] See Recommendations of the Task Force on Climate-related Financial Disclosures.

to promote understanding of sustainability risks. These risks are evaluated carefully by potential shareholders when assessing an investment in a company (especially for pension funds or collective investment schemes); this assessment is also done during the life of the investment and a negative outcome could imply the activation of an exit strategy.

(iii) Flexibility and accessibility. Climate finance has opened the doors of the financial market to some companies – small companies or those that don't have an adequate credit profile or track record – as they are able to access finance as long as the project to be financed is in line with the relevant guidelines and principles.

(iv) Credit profile. The main green finance guidelines provide an external review by a third party aiming to certify some ratios of issuers; this verification procedure implies that internal working practices and corporate governance meets certain high-level standards and also strengthens the credit merit of the issuer.

(v) Capital requirements. Even though there is not any regulation ensuring direct advantages on this issue, there are some initiatives purposing lower capital requirements for companies investing in climate finance. For example, the EU Commission pointed out that lowering capital requirements will be considered for sustainable finance and the assessment of this 'green supporting factor' is part of the EU's Action Plan on Sustainable Finance.

Finally, it should be underlined that a relevant initiative was launched in 2016 by the Luxembourg Green Exchange establishing a specific trading platform to allocate green bonds separately from general bonds. A similar remarkable initiative has been adopted by the London Stock Exchange, which has established a dedicated platform for green securities – a sort of green bond segment. These initiatives could stimulate the interest of short-term investors allowing green and climate bonds to be traded as an ordinary commodity; as long as a green yield would be gained by investing in green bonds, the secondary market may sharply increase its volume further supporting climate change plans alongside medium- to long-term investors who normally operate in the primary market.

Expectations of COP26

COP26 has been defined by several experts as the last chance we have to really shift from pledges to actions. Climate finance has been historically seen as a topic where tons of words have been spent and too small actions have followed. The topic itself, of course, is tough to manage because it is very often connected with the geopolitical issues and economic concerns that jeopardise the effectiveness of this international event. Nevertheless, for COP26 it seems that all the pieces of the puzzle are there. The challenge will be to put them together in a legal framework that should be (i) mandatory (hard law), avoiding addressing this matter mainly with soft law regulations; (ii) precise and concrete (ambitious goals are welcomed but even better if those goals are also achievable); and (iii) harmonious, taking into account the differences among developed and developing countries (we cannot afford for the price of climate change to be paid by developing countries leaving them even further behind).

In light of the above, COP26 should promote and incentivise:

(i) Private initiatives aiming to mobilise private funds (asset management, pension funds, private equity funds)

(ii) Developing counties to issue sovereign green bonds secured by multilateral agencies (ie multilateral financing guarantees)

(iii) International diplomacy in the issuance of a harmonious framework concerning climate finance

(iv) Natural-based solutions and offset markets

(v) Brown companies to shift towards a greener economy using adequate financial instruments to finance this pathway

(vi) Governmental initiatives aiming to set mandatory goals to be reached by a specific time (as put in place by the UK government)

(vii) The involvement of local communities, which are required more and more for a greener society and economy.

Of course, the list above is not exhaustive and does not cover all the aspects to consider in addressing climate change; however, it represents a line to be followed by all the participants at this crucial event.

Conclusion

This article is focused on the main actors of climate finance and their role in addressing climate change. As it has been affirmed, climate finance should play a crucial and indispensable role in supporting the shift towards a low-carbon economy.

To summarise, in this article it has been argued that:

(i) The provisions laid out under international treaties, are soft law in nature (which implies that they are not binding or enforceable and are even vague and imprecise), and therefore seem unsuitable to ensure the achievement of climate change objectives. Countries should assume more responsibility and provide hard law provisions as the legal form to establish climate finance regulations. To some extent, what the UK government is doing should be replicated at an international level through the inclusion of binding commitment directly under international treaties.

(ii) At the national level, governments should fix their national commitments alongside a reform of financial regulations. Indeed, to strengthen the effectiveness of national climate action plans, policymakers should act jointly on incentive policies (to promote the shift to renewable energy and sustainable projects) and on green finance regulations. Moreover, granting incentives in favour of green projects positively affects their bankability, which will stimulate the private sector.

(iii) The multilateral organisations (mainly multilateral developing banks) are being remarkably supportive of climate change mitigation and adaptation plans, particularly with reference to financing of developing countries. Indeed, as it has been indicated, in order to scale up green projects, developing countries must fill the technological and financing gap and this requires massive external support. However, it would be useful to better coordinate and

harmonise the roles of the several climate funds to avoid overlapping of activities, which may adversely affect, among other things, the allocation of risk among these funds, slowing down the flow of financing.

Adequate and effective interventions to address climate change can no longer be postponed. The level of climate change reached does not allow us to waste any more time (especially considering the recent Covid-19 pandemic, which could inexorably distract funds originally intended to finance climate finance mitigation and adaptation plans). The climate change mitigation and adaptation objectives cannot, however, be achieved without extraordinary and incisive support from the financial sector. A greater effort must be imposed on all actors. COP26 in Glasgow must represent the breakthrough of climate finance, setting out concrete, measurable and effective policies and instruments to be implemented by financial actors in the coming years.

Biography

Giuseppe Candela is a managing associate at the London office of L&B Partners Avvocati Associati, a leading Italian law firm with a strong focus on energy and infrastructure. He has significant experience in extraordinary transactions advising major industrial and financial players, and international private equity funds in renewable energy industry in both merger and acquisition and banking and finance transactions.

Giuseppe is conducting a PhD at Queen Mary University of London, focusing on climate finance and climate bonds. He concluded a LLM in Energy and Natural Resources Law at Queen Mary University of London in 2019/2020 with a distinction. His previous studies include a Master's in business law at Business School Il Sole 24 Ore, Milan and Business School, LUISS Guido Carli in Law, and a Bachelor's in Law at University of Salerno, Italy.

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Do directors' duties deliver on climate change: useful tool or empty framework?

Tara Theiss

Tara Theiss
Winner of the Lord Browne Essay Prize 2021

Introduction

As weather disasters occur with an increased frequency of four to five times than in the 1970s,[1] Greta Thunberg continues to divide opinion,[2] and a sense of urgency begins to develop amongst the public,[3] climate change has emerged as the hot topic of the decade and for the rest of the century. Scientists continue to warn of the devastating effects climate change will soon have if insufficient efforts are made to successfully keep the rise in temperature under 2° Celsius,[4] and the 2020 World Economic Forum's Global Risk Report ranks the potential failure to act on climate change as the most impactful and second most likely global potential risk.[5] Expedient measures across industries must be taken to prevent this outcome.

This article will consider the doctrine of directors' duties and assess to what extent it may be a useful legal tool to aid in the response to climate change, before considering various improvements to the incumbent framework intended to make it better suited to this purpose.

Part one identifies the unique needs climate change presents as a problem, before analysing why and how companies, directors and company law should accommodate these needs. This section explains that for a legal tool to be capable of responding to the nature of climate change it must prioritise the issue, provide timely and effective solutions, involve sufficient stakeholders and ensure substantial expertise from people engaging with the issue.

In part two, existing directors' duties under the jurisdiction of England and Wales are assessed against these requirements for their suitability and potential to be used as a legal tool in the fight against climate change.

After identifying several shortcomings of the directors' duties framework, this article first considers whether directors' duties will develop organically due to increasing investor pressure to accommodate climate change, before considering a variety of options to extend or develop directors' duties, including a new tailored duty with public enforcement, a mandatory 'climate change director' and an alteration of corporate purpose upon which directors' duties are based.

While some authors have previously considered some of these options, this article aims to provide a comparative analysis of the bulk of possibilities in order to identify the optimal option in the context of climate change. This article concludes that a combination of an extension to directors' duties – including creation of a new directors' duty with public enforcement – and a reformation of corporate purpose will increase the framework's utility as a tool in combating climate change.

Climate change, companies and directors

In order to address climate change effectively and keep the rise in temperature 'well below 2°',[6] the problem must be tackled effectively from various angles of society. Since law underpins relationships between people, corporates and the environment

[1] Associated Press, 'Weather disasters 'stronger and more frequent than in 1970s' (The Guardian, 1 September 2021) <https://www.theguardian.com/world/2021/sep/01/weather-disasters-stronger-and-more-frequent-than-in-1970s> accessed 2 September 2020.

[2] Larry Elliot, 'Carney sides with Greta Thunberg against Trump over climate' (The Guardian, 22 January 2020) <https://www.theguardian.com/business/2020/jan/22/carney-sides-with-greta-thunberg-against-trump-over-climate> accessed 12 August 2020.

[3] Matthew Taylor, 'Climate crisis seen as 'most important issue' by public, poll shows' (The Guardian, 18 September 2019) <https://www.theguardian.com/environment/2019/sep/18/climate-crisis-seen-as-most-important-issue-by-public-poll-shows> accessed 12 August 2020.

[4] IPCC, 'Sixth Assessment Report' (IPCC, 9 August 2021) <https://www.ipcc.ch/assessment-report/ar6/> accessed 9 August 2021.

[5] World Economic Forum, The Global Risks Report 2020 (Edition 15, 2020) 3 <https://www.weforum.org/reports/the-global-risks-report-2020> accessed 12 August 2020.

[6] Intergovernmental Panel on Climate Change, Special Report: 1.5 degrees Summary for Policy Makers (2018) <https://www.ipcc.ch/sr15/chapter/summary-for-policy-makers/> accessed 12 August 2020.

and regulates their impacts on the climate, it should be part of the solution.

The unique issues and requirements that arise from the problem of climate change

Climate change has often been referred to as a tragedy of the commons,[7] because it gives rise to a conflict of interest between every citizen of the globe with regard to the resource that is our global carbon budget. As the supply of the resource becomes depleted, each person that consumes more of it directly reduces others' ability to use it.

Moreover, climate change is a problem with a plethora of causes, great breadth of impact, and an ultimately deadly magnitude, which inevitably blurs the lines of who is responsible, who the victim, where cause and effect may be established, and how conflict should be remedied.[8] Lazarus has notoriously defined climate change as a 'super wicked problem',[9] because it is not only a wicked problem for defying resolution due to 'the enormous interdependencies, uncertainties, circularities, and conflicting stakeholders implicated by any effort to develop a solution', [10] but also possesses 'further exacerbating features'.[11] These include the fact that there is no direct legal framework or body to govern over its treatment in law and society, and that the entities best placed to remediate the problem are often also the primary perpetrators of the problem and those whom continue to have the least incentive to react to it.[12] On top of that, climate change is a problem with great documented urgency.[13]

In summary, climate change is a complex tragedy of the commons with a wide breath of impact, transboundary effects, blurred understandings of perpetrators and victims, an all-pervasive nature, and an urgent need for resolution. Therefore, it must be prioritised and requires a multi-disciplinary approach, involvement from various stakeholders and sufficient expertise or understanding from people engaging with the problem.

The responsibilities, risks and opportunities of companies

Looking at company law is important because it is not sufficient to consider only environmental, energy or public law (the usual spheres in which climate change is addressed) and it is a step in the right direction towards a multi-disciplinary approach.

Moreover, companies are relevant in the context of climate change because: (i) they are one of the largest emitters and contributors to climate change, historically and currently (in fact, according to the Carbon Majors Database, only 100 companies worldwide have contributed to 71% of the global greenhouse gas emissions that have been causing global warming since 1998[14]); (ii) they will be severely impacted by physical, transition and liability risks that climate change gives rise to; and (iii) it is in their interest to capitalise on the opportunities that come with being a climate-conscious company.

The importance of directors

Beyond the importance of considering the role of companies in the fight against climate change, the importance of corporate directors is in turn derived from: (i) their power to govern companies; (ii) their mandate over tensions that arise out of conflicting stakeholder interests; and (iii) the weight of their personal liability.

First, the role of directors is to lead and govern a company, to 'establish the goals of the organization, the means to pursue them and the ability to understand any associated risks'.[15] Considering and integrating climate-related risks and opportunities therefore squarely fall within the remit of the board. As decision makers of the company, directors should bear the responsibilities of the decisions they make, and their decisions should be scrutinised directly, rather than indirectly as decisions of the company.

Second, when tensions between competing interests arise, it is the board's mandate as the legitimate forum to navigate and act on these.[16] For example, where short-term investors' interests are at odds with long-term investors' interests to hedge against climate change liability risk, it is the board of directors who will be in charge of handling this conflict.

Finally, due to the magnitude of impact of directors' decisions, an explicit and direct point of contact that is more tangible and accessible than 'the company' is needed for accountability. While companies can more easily set off any action taken against them, such as fines, and are thus more willing to take the risk of committing a breach, an individual director will be less likely to take such a risk where her income, future career prospects and even physical freedom may stand at risk.

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[7] Garret Hardin, 'The Tragedy of the Commons' (1996) 162 Science 1243.

[8] Brenda Zimmerman and Sholom Glouberman, Complicated and Complex Systems: What Would Successfully Reform of Medicare Look Like? (Commission on the Future of Health Care in Canada, 2002) 2 <http://publications.gc.ca/site/eng/235920/publication.html> accessed 12 August 2020.

[9] Richard Lazarus, 'Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future' (2009) 94 Cornell Law Review 1553.

[10] ibid, referring to Horst Rittel and Melvin Webber, 'Dilemmas in a General Theory of Planning' (1973) 4 Policy Science 155, 160–69.

[11] Lazarus (n 9) 1160.

[12] ibid.

[13] IPCC (n 6).

[14] Tess Riley, 'Just 100 companies responsible for 71% of global emissions, study says' (The Guardian, 10 July 2017) <https://www.theguardian.com/sustainable-business/2017/jul/10/100-fossil-fuel-companies-investors-responsible-71-global-emissions-cdp-study-climate-change> accessed 12 August 2020.

[15] The Committee of Sponsoring Organizations of the Treadway Commission (COSO) and World Business Council for Sustainable Development (WBCSD), 'Enterprise Risk Management: Applying enterprise risk management to environmental, social and governance-related risks' (October 2018) 13 <https://www.wbcsd.org/Programs/Redefining-Value/Business-Decision-Making/Enterprise-Risk-Management/Resources/Applying-Enterprise-Risk-Management-to-Environmental-Social-and-Governance-related-Risks> accessed 12 August 2020.

[15] WBCSD, 'Modernizing governance: ESG challenges and recommendations for corporate directors' (January 2020) 4 <https://www.wbcsd.org/Programs/Redefining-Value/Business-Decision-Making/Governance-and-Internal-Oversight/Resources/Modernizing-governance-key-recommendations-for-boards-to-ensure-business-resilience> accessed 12 August 2020.

[16] Companies Act 2006.

An assessment of directors' duties in the context of climate change

Existing directors' duties and their uses

The responsibilities carried by directors as agents of a company takes the form of directors' duties, which they owe to the company. In England and Wales, the Companies Act 2006(CA)[17] is the statutory law that codifies these duties, although it can be contextualised by case law preceding it.[18] Under the CA, a director is a fiduciary to the company, whom 'has undertaken to act for or on behalf of another in a particular matter in circumstances which give rise to a relationship of trust and confidence',[19] wherein 'the principal is entitled to the single-minded loyalty of his fiduciary'. [20]

Although there are seven main duties under the CA,[21] the duty under Section 172 to promote the success of the company has often been described as the core duty.[22] Under Section 172, a director must take action in a way that she considers, in good faith, will be best and most likely to drive a company's success and increase the benefit to its members as a whole.[23] While the duty to act in the interest of the company is owed to the company,[24] since the codification of the CA (which was aimed to align what was of benefit to the company with what is beneficial for society[25]), the promotion of the success of the company must not only be in the interest of the company, but also for the benefit of all shareholders and other interested parties.[26] As such, Section 172 formally introduces the concept of enlightened shareholder value[27] where the scope of parties that stand to benefit from this duty has been widened.

In theory, Section 172 of the CA introduces a more stakeholder-centred model of governance where a broader range of long- and short-term interests of parties beyond shareholders, such as employees, suppliers, customers, community, and crucially the environment, should be taken into account.[28] In fact, the subparagraphs of Section 172 explicitly stipulate several factors that must be taken into account by directors in exercising this duty, including the community and the environment (and thus the climate) in Section 172(d). As such, the directors' duty regime is conceptually capable of being utilised to promote the continuous identification, assessment, oversight and disclosure of climate change risks and opportunities.[29] However, although this requirement should make directors, and by extension companies, aware of the environmental impacts of their decisions on climate change, many scholars opine that the concept of enlightened shareholder value has only had limited success[30] and several issues arise in practice.

Issues with existing directors' duties in the context of climate change

The first issue is that, although the Companies Act introduced the requirement to consider a wider class of stakeholders, including the environment, this stands at odds with the usual interpretation of company purpose. The continued prevalence of the concept of shareholder primacy reduces the value of Section 172(d) to a soft statement. In practice, it only has effect where it is in the interest of shareholders,[31] despite the fact that the reason companies are granted benefits under the law – including limited liability of shareholders, corporate tax rates and perpetual life as a legal entity – is because they are intended to help drive society's communal wealth.[32]

The concept of shareholder primacy, where the profit of shareholders is superior to all other considerations, has been applied with a short-term view and on the assumption that a company's shareholders are owners not just of shares but of the company itself. In practice, directors are thus directly accountable only to shareholders, and a company's responsibility to other stakeholders such as the climate are ignored.

The second issue is that, even where the shareholder primacy norm is overcome and the climate is considered, the threshold of the Section 172 duty, 'to have regard to', is very low and 'certainly stops short of mandating internalisation of externalities'[33] such as climate change. This standard is subjective and merely requires that a director consider certain

[17] Explanatory Notes to the Companies Act 2006.

[18] Bristol and West Building Society v Mothew [1998] EWCA Civ 533, 158.

[19] ibid.

[20] The duty to act within the powers conferred onto the director and in accordance with the company's constitution (Section 171); the duty to promote the success of the company, having regard to various factors (Section 172); the duty to exercise independent judgement (Section 173); the duty to exercise reasonable care, skill and diligence (Section 174); the duty to avoid conflicts of interests (Section 175); the duty not to accept benefits from third parties (Section 176); and the duty to declare an interests in a proposed transaction or arrangement (Section 177). See Explanatory Notes to the Companies Act 2006 Chapter 2 Part 12.

[21] Alexia Staker and Alice Garton, 'Directors' Liability and Climate Risk: United Kingdom - Country Paper' (Commonwealth Climate and Law Initiative, 2018) 5.

[22] Companies Act 2006 Section 172.

[23] Foss v Harbottle [1843] 2 Hare 461.

[24] Georgina Tsagas, 'Section 172 of the Companies Act 2006: Desperate Times Call for Soft Law Measures' in Nina Boeger and Charlotte Villiers (eds) Shaping the Corporate Landscape: Towards Corporate Reform and Enterprise Diversity (Hart Publishing 2018) 136.

[25] ibid.

[26] ibid.

[27] Ceres, 'Systems Rule: How Board Governance can Drive sustainability Performance' (Ceres and KKS advisors, 2018) 161 <https://www.ceres.org/resources/reports/systems-rule-how-board-governance-can-drive-sustainability-performance> accessed 12 August 2020.

[29] Sarah Barker and Ellie Mulholland, 'Directors' Liability and Climate Risk: Comparative Paper' (Commonwealth Climate and Law Initiative, 2019) 5 <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjz3byZ26HrAhXISxUIHZ9iDl4QFjABegQIAhAB&url=https%3A%2F%2Fccli.ouce.ox.ac.uk%2Fwp- content%2Fuploads%2F2019%2F10%2FCCLI-Directors%25E2%2580%2599-Liability-and-Climate-Risk-Comparative-Paper- October-2019-vFINAL.pdf&usg=AOvVaw2hOkeualhDl9A_6hI5pAxf> accessed 12 August 2020.

[30] Janet Dine, 'Corporate Regulation, Climate Change and Corporate Law: Challenges and Balance in an International and Global World' (2015) 26 European Business Law Review 173, 173.

[31] John Quinn, 'The Sustainable Corporate Objective: Rethinking Directors' Duties' (2019) 11 Sustainability 6734, 6736.

[32] John Cohan, '"I Didn't Know" and "I Was Only Doing My Job": Has Corporate Governance Careened out of Control? A Case Study of Enron's Information Myopia' (2002) 40 Journal of Business Ethics 271, 291.

[33] David Collison and others, 'Shareholder Primacy in UK Corporate Law: An Exploration of the Rationale and Evidence' (Association of Chartered Certified Accountants, 2011) 44 <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjHwK-L2aHrAhXqURUIHRAaAJ4QFjAAegQIBBAB&url=https%3A%2F%2Fwww.accaglobal.com%2Fcontent%2Fdam%2Facca%2Fglobal%2FPDF-technical%2Fbusiness-law%2Frr-125-001.pdf&usg=AOvVaw1dx_h-SHAim7PtaFdQhDru> accessed 12 August 2020.

factors, according to her own subjective opinions in making decisions for the company.[34] Moreover, it is irrelevant how 'ridiculous and absurd' the director's decisions or decision-making processes are, and it is considered the 'misfortune of the company', and by unfortunate extension the climate, that such directors were selected.[35] As such, the Section 172 duty has a low and subjective test for breach that does not incentivise companies to ensure they select directors who understand the risks that climate change poses to companies and engage with the problem appropriately. While a company may be willing to take the risk of selecting a director that fails to take account of climate change, the climate should be protected from the resulting damage of this decision.

Thirdly, although enforcement is only one aspect of ensuring directors' duties can be used as a legal tool in combating climate change, without any potential for litigation to create an environment where these duties are taken seriously, they cannot be effective. Unfortunately, even where a supposed breach is identified despite the low threshold and the prevalence of shareholder primacy, litigation of the breach of duty is highly unlikely for several reasons. To begin, it is very difficult to obtain evidence of directors' breaches.[36] 'It is very difficult to show that the directors have breached this duty of good faith, except in egregious cases or where the directors have, obligingly, left a clear record of their thought processes leading up to the challenged decision.'[37] Disproving a director's assertion that she has acted in good faith is very difficult and likely only possible in obvious cases.[38]

In addition, the scope of potential claimants is limited to the company and its shareholders, and it is difficult to see, from a commercial standpoint, what they stand to gain in making a public claim. This is because to do so would be to admit to the public that the company is in a worse position than it should be due to the director's breach of duty. A claim would demonstrate weakness of the company and likely produce losses in market capitalisation due to investor perception. For a shareholder to make a derivative claim she would therefore have to prioritise the climate interest in question over her (at least short-term) financial benefit.

Furthermore, to the extent a claim is made, either by the company or via a derivative claim,[39] the courts are unlikely to proceed with the case. In the first instance, this is because courts have generally adhered quite closely to the business judgment rule, which provides that it is not for the court to assume a supervisory role over the business decisions of a company.[40] A claim is only feasible if the case appears especially clear and serious from the start. In addition, the courts will consider whether there is a business case for the pursuit of the claim – that is, whether a hypothetical individual would continue to make the claim if she was intending to act in the financial interest of the company.[41] This means that even where a company or a shareholder has identified the long-term benefit to ensuring regard for the climate despite any short-term losses the claim might cause and is pursuing a claim on that basis, this argument must be accepted by the court for a claim to proceed. In assessing whether there is a business claim, consideration must be taken of the size and strength of the claim, the costs of the proceedings and the ability of the company to pay them, the ability of the defendant director to satisfy any judgment, and, most importantly, what the impact will be on the company by way of costs and disruptions.[42] Therefore, there is vast chasm between corporate law in theory compared with corporate law in practice, and it has been found that the 'chances of a director of a publicly traded UK company being sued under corporate law are virtually nil'.[43]

As such, the director duty under Section 172 of the Companies Act is unsuitable as a legal tool to help combat climate change. Although in theory it provides that directors must take the climate into account in their strategic decisions on behalf of the company, in practice it only takes limited account of this, the legal expectation is not especially high, and the potential for enforcement, which is vital to ensure the legitimacy and respect for this law, is too low.

Extending the directors' duties

An analysis of the directors' duties doctrine under Section 172 of the Companies Act 2006 demonstrates that its suitability in practice with regard to climate change is limited. Considering that there are some theoretical benefits and suitability of directors' duties in preventing the effects of climate change, including the unique positions of directors with respect to companies, the ability of directors to navigate conflicting interests with care, and the increased potential of compliance due to personal liability, the argument is explored below whether the duty will become more effective organically over time, or if an extension to it should be added.

Taking a 'just wait and see' approach

Although the science around climate change has been available for several decades (albeit less extensive and precise) without much corporate action, corporate reactions to this have now been gaining momentum over the past few years. As it stands, the potential of the doctrine of directors' duties as a legal tool could be sufficient to cause this doctrine to take off on its own.

Considering regulatory and industry body momentum on the subject, as well as increasing investor awareness and activism, it may be possible that companies change their conception of the duty, and ignore the shareholder primacy norm, self-impose a higher threshold and comply with the duty out of fear of losing investors rather than of enforcement.

[34] Henry Hansmann and others, The Anatomy of Corporate Law: A Comparative and Functional Approach (3rd edn, Oxford University Press 2017) 12.

[35] Turquand v Marshall [1869] 4 Ch App 376 at 386

[36] Paul Davies and Sarah Worthington, Gower and Davies Principles of Modern Company Law (9th edn, Sweet & Maxwell 2012) 543.

[37] ibid.

[38] Paul Davies, Gower and Davies Principles of Modern Company Law (8th edn, Sweet and Maxwell 2008) 509.

[39] Companies Act 2006 Explanatory Notes 484-487.

[40] Howard Smith v Ampol Petroleum [1974] UKPC.

[41] Franbar Holdings v Patel and other [2009] 1 BCLC 1.

[42] Iesini v Westrip [2011] 1 BCLC 498.

[43] John Armour and others, 'Private Enforcement of Corporate Law: An Empirical Comparison of the UK and US' (2009) 6(6) Journal of Empirical Legal Studies 687, 690.

Scholars including Staker and Garton think it is likely a matter of time before directors' duties are utilised to their fullest potential to ensure that directors have proper regard to climate risks and opportunities, both for the company and society at large.[44] Considering that the fiduciary duty in Section 172(d) is intentionally malleable and capable of being developed alongside the changes in industry and the development of new standards,[45] it seems likely that as the political climate changes and the urgency of climate change is acknowledged universally, more attention will be paid to the topic in the board room. Already now, some investors 'look to corporate disclosures to inform them of how companies are navigating these changes'[46] and seek to identify whether 'companies are "walking the talk" on these issues'.[47] As this trend grows, and more disclosure requirements are developed that require transparency and the measurement of certain aspects including board oversight of sustainability, materiality assessments of potential threats, quality of stakeholder engagement and external assurance,[48] the more 'teeth' the directors' duties doctrine will have.

Many regulatory and trade bodies have already responded with measures ancillary to directors' duties that target the corporate response to climate change, such as the Business, Energy and Industrial Strategy department's green finance strategy,[49] the EU's sustainable finance package,[50] and the G20 Financial Stability Board launch of the Task Force on Climate-related Financial Disclosure.[51] It is likely that such regulatory and trade body support will continue to advance the area of corporate responsibility and accountability, which will have a spill-over effect on directors' duties. Not only do such efforts reinforce the need to have regard to the climate and the environment, thus legitimising the intention behind Section 172(d), but they will also impact the interpretation of Section 172 itself. As a fiduciary duty that can develop alongside market norms, if norms surrounding the corporate treatment of climate change establish the expectation that true regard must be had for the climate and proof thereof must be demonstrated by way of disclosures, the evidentiary difficulties will be easier to overcome, and the business judgment deference on issues regarding the climate will no longer prevail in courts adjudicating on directors' claims.

However, despite this recent trend, and considering the urgency of the issue, it would not be prudent to rely on the natural progression of commercial interests continuing to align themselves with the preservation of the climate to ensure that corporates take climate change into account.

Creating a more robust duty…

If we are not to 'wait and see', what other options are there to extend directors' duties in a way that creates a useful tool in combating climate change? One option is to extend the existing duty, another to create a new more robust duty. This section will make the argument for the creation of a new duty but notes that if the details of that duty were to be incorporated into the existing one, thus amending and extending it, this would have the same effect as creating a new one. The argument for a more robust directors' duty rests on the assertion that a legal tool is only helpful in so far as it produces compliance.[52] It is not necessary to create a culture where litigation against directors is routine. In fact, this would rather be unfavourable as it would likely cause a paralysing chilling effect on directors and prevent them from being able to take business decisions effectively for the company. Crucially, however, a legal tool such as directors' duties must at least have the potential of enforcement to gain legitimacy and adherence.[53] Therefore, a broader and objective obligation with public oversight would be a welcome addition to the framework.

…with a broader and objective obligation…

Creating a new duty that explicitly requires directors not only to 'have regard to' or take into account the climate and sustainability considerations as a procedural requirement, but to 'ensure sustainable value creation'[54] could make the directors' duties framework a much more useful tool to combat climate change. Creating a bigger requirement than 'to have regard to' the climate could ensure that directors no longer prevent the internalisation of the environmental externalities by the companies.[55] This could be complemented by an objective test of reasonableness – that is, where it would be assessed whether a reasonable director would honestly believe that the decision taken was intended to promote sustainable wealth creation.[56] This would ensure that the duty is not too prescriptive so as to prevent companies from taking individual approaches, but broad and objective enough to make it useful.

…and public oversight

Even if the new duty on directors is broad and measured objectively, the slim chance of enforcement due to the economic disincentives of the company and its shareholders to claim against a director would also need to be addressed.

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[44] Staker and Garton (n 22) 52–53.

[45] Joan Hemingway, 'Shareholder Wealth Maximization as a Function of Statutes, Decisional Law and Organic Documents' (2017) 74 Washington and Lee Law Review 939, 947

[46] Ceres, 'Disclose What Matters: Bridging the Gap Between Investor Needs and Company Disclosures on Sustainability' (2018) 1 <https://www.ceres.org/resources/reports/disclose-what-matters-bridging-gap-between-investor-needs-and-company-disclosures> accessed 12 August 2020

[47] ibid.

[48] ibid.

[49] HM Government, Business, Energy, and Industrial Strategy department, 'Green Finance Strategy: Transforming Finance for a Greener Future' (July 2019) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820284/190716_BEIS_Green_Finance_Strategy_Accessible_Final.pdf> accessed 12 August 2020.

[50] European Commission, 'Sustainable finance' <https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en> accessed 12 August 2020.

[51] Task Force on Climate-related Financial Disclosures, 'TCFD Publishes Second Status Report' (2020) <https://www.fsb-tcfd.org> accessed 12 August 2020.

[52] Hansmann (n 34).

[53] John Parkinson, Corporate Power and Responsibility: Issues in the Theory of Company Law (Clarendon Press, 1993) 73.

[54] Ellie Mulholland and others, 'Climate Change and Directors' Duties: Closing the Gap Between Legal Obligation and Enforcement Practice' in Richard LeBlanc (ed), The Handbook of Board Governance (2nd edn, John Wiley & Sons Inc., Forthcoming) 10 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3401795> accessed 12 August 2020.

[55] Nick Grant, 'Mandating Corporate Environmental Responsibility by Creating a New Directors' Duty' (2015) 17(4) Environmental Law Review 252, 252.

[56] Mulholland (n 54).

This could be done by ensuring public oversight by a regulator. Despite the fact that directors' duties are only owed to the company and its shareholders, public oversight by a regulator could be justified because climate change is now also a financial stability and efficient markets issue.[57] If the 'finite and closing' chance to ensure an orderly transition from a high- to a low-carbon economy is missed[58] and climate risks come to fruition they will likely have first-, second- and third-order economic impacts and lead to a fast repricing of assets. Thus, climate-related issues fall within the supervisory mandate of regulators.[59]

Furthermore, taking the analogous example of enforcement of criminal law against directors, oversight by a public regulator of directors' duties is not a novel suggestion[60] and should be allowed for the same reason: the weight-bearing necessity for compliance on the issue of climate change merits the same public oversight as the issue of fraud. This is because the risks that arise for companies and the financial system from the physical, transition and liability risks of climate change are very significant[61] and make up all of the 'top five risks' to the global economy.[62]

Therefore, in addition to the social argument that taking climate risks into account will be beneficial to the climate, society and the company itself in the longer term, public oversight of an enlarged duty would also stabilise the economy by preventing corporate collapses caused by short-termism and prolific risk-taking.[63]

Interestingly, Australia has taken just this approach and allows the investigation of possible breaches and public enforcement of alleged breaches of directors' duties – both through criminal sanctions and declarations of contraventions and civil penalties.[64] While the Australian Securities and Investments Commission, the relevant regulator, only has the power to pursue the civil penalties, which include pecuniary penalties up to a maximum of AUD $200,000 (£110,000), disqualification orders for unlimited periods of time, and compensation orders for the benefit of the company against which the offending conduct occurred,[65] it can also refer cases to the Commonwealth Director of Public Prosecutions for it criminal sanctions.

Therefore, this suggestion is not out of grasp for England and Wales and would add to the establishment of a more expansive duty by delivering on the needs of climate change as a problem by widening the scope of participation and providing a framework that can be applied swiftly and effectively.

Mandating a specific 'climate change director'

Another option to enhance the current framework of directors' duties could be to require the appointment of a qualified and specifically mandated climate change director. As emanates from the analysis of Section 172, it is clear that weighing up the different aspects in making a business decision for a company is not an easy matter. In Kohli v Lit & Ora, for instance, being a director is described as 'not an easy matter' that 'requires a responsible approach'. 'The degree of regulation can catch even the most sophisticated of directors unaware, and most directors do not have the requisite level of sophistication and skill to cope.'[67] Adding the complexities of climate change to this, acting as a director who must consider climate change risks alongside other risks to the company appears to be a very onerous job requiring substantial expertise. Formalising the expectation of competence and skill with regard to the topic is therefore a logical solution. Making it obligatory to contract a specific climate change director may be a useful extension of the already established practice of corporate social responsibility (CSR) contracting.[68] From analogous analysis of the results of CSR contracting, doing so could not only incline companies to create more climate change initiatives and green innovations, but also reduce emissions while increasing firm value through a more long-term oriented approach.[69] Having to employ and remunerate a director specifically to engage with climate risks, and integrating climate criteria into her executive compensation, would thus prevent a distorted short-term view of the success of the company. As this approach is not very radical, and easily fits within existing corporate governance structures,[70] it could likely be employed very quickly and effectively.

Changing corporate purpose

Finally, the last option to reform the directors' duty framework is not to alter the scope or functioning of the duties themselves, but the context within which they are placed: the company's purpose. Perhaps the recognition that corporations 'have become global and extraordinarily powerful organisations… [that] can threaten social equilibria as well as life itself on our

[57] ibid 3.

[58] Bank of England Prudential Regulation Authority, 'Consultation Paper 23/18: Enhancing Banks' and Insurers' Approaches to Managing the Financial Risks from Climate Change' (October 2018) 4 <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2018/cp2318.pdf?la=en&hash=8663D2D47A725C395F71FD5688E5667399C48E08> accessed 12 August 2020.

[59] See for example Central Banks and Supervisors Network for Greening the Financial System, 'A call for action: Climate change as a source of financial risk' (April 2019) 2 <https://www.ngfs.net/sites/default/files/medias/documents/synthese_ngfs-2019_-_17042019_0.pdf> accessed 12 August 2020.

[60] Davies (n 38) 510.

[61] Ceres Accelerator for Sustainable Capital Markets, 'Blueprint for Responsible Policy Engagement on Climate Change' (July 2020) 4 <https://www.ceres.org/resources/reports/blueprint-responsible-policy-engagement-climate-change> accessed 12 August 2020.

[62] World Economic Forum (n 5).

[63] Andrew Keay and Leslie Kosmin, Directors' Duties (2nd edn, Jordan Publishing Ltd 2014) 148.

[64] Andrew Keay and Michelle Welsh, 'Enforcing Breaches of Directors' Duties by a Public Body and Antipodean Experiences' (2015) 15(2) Journal of Corporate Law Studies 255, 255.

[65] Corporations Act 2001 (Australia), ss 1317J, 1317G, 1317H(1) and 206C.

[66] Kohli v Lit & Ora [2009] EWHC 2893 Ch at 6.

[67] ibid.

[68] Caroline Flammer and others, 'Corporate Governance and the Rise of Integrating Corporate Social Responsibility Criteria in Executive Compensation: Effectiveness and Implications for Firm Outcomes' (2019) 40(7) Strategic Management Journal 1, 1.

[69] ibid.

[70] Caroline Flammer, 'Does Corporate Social Responsibility Lead to Superior Financial Performance? A Regression Discontinuity Approach' (2015) 61 Management Science Journal 2549, 2550.

planet',[71] gives rise to an emerging trend where businesses are choosing to hold themselves to a higher standard of care that goes beyond defining their purpose solely as the trade of wealth. Against this background, it may be possible to subvert the shareholder primacy norm by requiring a change of corporate purpose by law.[72] Perhaps if directors are motivated not by the fear of litigation but by a robust corporate purpose this would allow them to have enough serious regard for the climate whilst not constraining them to the point where their motives are diverted away from strategic risk-taking.[73] It must be ensured that directors can act in an environment that is safe and strikes the right balance, and this may be best done by amending the corporate environment that directors act within as this will inform their duties and execution thereof.

In France, such a reform has been applied, where the legal definition of the corporation has been amended to state that a company must 'be run with due regard to the social and environmental impacts of its activity'.[74] Furthermore, it creates the option for a company to self-assign a social or environmental purpose within its by-laws, a so-called raison d'etre.[75] In codifying the alignment of financial interests with climate interests, any tensions between the short-term financial prospects of profit and longer-term sustainable goals or climate considerations would be ameliorated by a formal understanding of what must be prioritised.

Furthermore, if one is to draw a parallel to the recent sustainable finance package of the EU, and specifically the Sustainable Finance Directive Regulation[76] (SFDR) and the Taxonomy Regulation,[77] the French model seems quite a possible future. The SFDR and Taxonomy Regulation sees asset managers and funds having to classify their products into those that have at their core the purpose of promoting a social or environmental goal[78] and those that simply 'take into account' sustainability impacts to varying degrees.[79] With the expectation that, with time, those funds and products electing a more stringent classification will gain more interest from investors, an analogous model for the classification of companies, based on how companies choose to define their purpose as in France, could be a way of fully marrying the economic and environmental or social interests of a company. This would be taking a high-level approach to adapting directors' duties, which could prove very useful in combating climate change.

Choosing an extension

Considering the various options to extend directors' duties and specifically Section 172, this article concludes that a combination of reforming corporate purpose and creating a new more robust duty with public enforcement would elevate the existing legal framework to be more useful with regard to climate change. While a new objective duty would rest easily within the existing framework and thus be capable of being created and applied swiftly, public oversight and enforcement would ensure that the duty is effective and 'has teeth' by involving sufficient stakeholders. If this were to rest upon the super structure of a new corporate purpose, which makes clear that climate change must be prioritised and may not be disregarded in the pursuit of short-term profit, this would provide another safeguard for the system and address climate change holistically within corporate law. Although mandating a new 'climate change director' also has its merits for requiring the necessary expertise, it is argued that when a more robust, expansive and objectively tested duty is introduced that actually has the potential of being enforced by a public regulator, it will be logical for the directors in charge to educate themselves on the subject regardless in order to prevent accidental breaches of the duty.

Conclusion

It is important to note that academic discussion of the topic of climate change should not merely remain as such – theoretical and academic. Considering that 'by 2050 under [a Representative Concentration Pathway (RCP)] 8.5 scenario, the number of people living in areas with a non-zero chance of lethal heat waves would rise from zero today to between 700 million and 1.2 billion',[80] the stark reality of climate change should warrant immediate and drastic action. Suggestions such as the one I have made, to adapt a legal system ever so slightly to accommodate the needs that climate change presents as a global problem, no matter how drastic or unlikely it may seem for the England and Wales jurisdiction, should therefore not be considered a rogue idea. On the contrary, many such small changes should be made urgently to accommodate the problem of climate change. This dissertation concludes that a combination of an extension to directors' duties – including creation of a new directors' duty with public enforcement – and a reformation of corporate purpose, will make the framework a useful tool in combating climate change.

[71] Blance Segrestin, Armand Hatchuel, and Kevin Levillain, 'When the Law Distinguishes Between the Enterprise and the Corporation: The Case of the New French Law on Corporate Purpose' (2020) HAL Archives 3 <https://hal-mines-paristech.archives-ouvertes.fr/hal-02465609/document> accessed 12 August 2020.

[72] ibid, 1.

[73] Ibrahim Shaikh, Mohamed Drira and Sana Ben Hassine, 'What Motivates Directors to Pursue Long-term Strategic Risks? Economic Incentives vs Fiduciary Duty' (2019) 101 Journal of Business Research 218, 218.

[74] Segrestin (n 71) 12.

[75] ibid.

[76] Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability‐related disclosures in the financial services sector.

[77] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.

[78] Regulation 2019/2088 (n 76) art 9.

[79] ibid, art 6–8.

[80] McKinsey Global Institute, 'Climate risk and response: Physical hazards and socioeconomic impacts' (January 2020) viii <https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/climate%20risk%20and%20response%20physical%20hazards%20and%20socioeconomic%20impacts/mgi-climate-risk-and-response-full-report-vf.pdf> accessed 12 August 2020.

Biography

Tara Theiss is a young professional working at the intersection of climate, ESG and corporate law. Her recent experience includes working on various renewable energy fund IPOs and share issuances, as well as contributing to the analysis and implementation of various

recent ESG regulations, such as the EU Sustainable Finance Disclosure Regulation and the EU Taxonomy. Tara holds an LLM in Energy and Natural Resources Law from Queen Mary University of London and has received awards for her academic research on the role different

legal frameworks may play in tackling climate change. Tara also acts a Trustee for InterClimate Network, a charity which aims to educate and empower young people to take action on climate change.

Climate change and ethics.

Professor James Dallas and Tara Theiss

Professor James Dallas

Tara Theiss
Winner of the Lord Browne Essay Prize 2021

Introduction

What are the issues around climate change that have an ethical aspect and what role does ethics have to play in fashioning the policies and measures to tackle it? And why does ethics, or justice and fairness, attract so much attention and loom so large in the climate change debate? The answer, I think, lies in the unique and heterogeneous combination of features that the problem encompasses: its global reach and importance; its timescale and urgency; and its varied causes and effects. Every country will feel the impacts of climate change differently based on geography, resilience and resource, and every country has and continues to contribute differently to the problem. As a result, nearly all aspects of the problem – what action is required, by whom and when – throw up issues that cannot be resolved by resorting to either principles of economics, politics or a care for the environment in isolation.

I will examine three issues:

1. The impact of geography on the experience of and responses to the effects of climate change in different countries
2. The effect of countries' financial capacity on the impact of and responses to climate change
3. The imperfect balance between those responsible for the causes of climate change, and those who will suffer most from its effects.

1. Geography

The changes in temperature and the incidence of unusual weather events caused by climate change will have different consequences depending on where you live. For those who live in drylands – approximately 2.5 billion people,[1] – rising global temperatures (amongst other factors) will lead to reduced rainfall, groundwater depletion, crop failure, damage from insect infestation and invasive plants, and fatal dust storms.[2] A significant increase in the probability and magnitude of wild fires may also be experienced in such areas. Other parts of the world will experience an increase in evaporation and more and heavier-laden cloud formations as a result of increasing temperatures, which in turn will lead to 'an increase in precipitation intensity, duration and/or frequency'[3] and may render land uninhabitable. Rising temperatures are also melting glaciers, icebergs and the polar ice caps, leading to rising sea levels. Inhabitants of low-lying coastal areas may find their homes threatened by inundation and be forced to consider relocation to higher ground – although whether they have the resources to be able to complete such a migration is another question. For yet others at a different latitude or location, the effects may be neutral or even benign.

2. Financial capacity

If a developed nation is affected badly by climate change, it is likely that it will be able to afford the adaptation measures required to protect itself against the worst consequences. If sea levels are rising the country can build sea walls; if its crop yields are falling due to reduced rainfall and related disease it may be able to build better rainwater harvesting and storage facilities and/or fund scientists to develop disease-resistant crops that can cope with the changed weather. If the livelihoods of some of the countries' communities are threatened, it may be able to compensate those affected, retrain them with new skills and assist them in developing alternative employment. The wildfires in California in 2020 – some of the worst wildfires ever seen – are a good demonstration of the US's ability, as the wealthiest country in the world, to respond to an extreme weather event

[1] UNCCD, 'The World's Dry Areas' (16 March 2021) <https://knowledge.unccd.int/publications/worlds-dry-areas> accessed 25 August 2021.

[2] C Mbow and others, 'Food Security' in PR Shukla and others (eds), Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems (2019, forthcoming).

[3] UNEP, 'How climate change is making record-breaking floods the new normal' (3 March 2020) <https://www.unep.org/news-and-stories/story/how-climate-change-making-record-breaking-floods-new-normal> accessed 25 June 2021.

quickly and effectively. The resulting economic loss was calculated to be approximately US$19 billion.[4] But since then, much of the destroyed real estate has been rebuilt (some in safer locations) and Governor Gavin Newsom announced in January 2021 that state leaders would allocate US$536 million for adaptation steps to prevent a recurrence.[5] Thus, as a wealthy country, the US was able to dedicate significant efforts to respond to the devastating fires. However, for many countries, responding as quickly or allocating as much capital to combat a climate-driven crisis may not be possible: many countries lack the financial capacity to respond in this way and certainly not without having to compromise their efforts to improve the wellbeing of their population in areas such as health, education or energy security.

Unfortunately, it is not only that developing countries lack the financial capacity to put in place alternative arrangements; it is about relativities. If a consequence of climate change on a country is an increase in food prices, for an Organisation for Economic Co-operation and Development (OECD) country (where the average income per capita is over US$30,000) this effect may be inconvenient and unwelcome, but it is not life threatening. If, however, one of the ten poorest countries in the world (all of which are in Africa), where the average income is barely above US$1,000 per annum, is faced by increased food prices as a knock-on effect of climate change, this presents a disproportionately greater problem to its population. Citizens in the wealthiest ten countries in the world spend less than 10% of their income on food; citizens in Nigeria and Kenya spend approximately 56% and 46% of their income on food, respectively.[6] Increases in world food prices therefore operate on the developing world like a regressive tax. Taking food prices as an example, it is evident that less-wealthy countries will suffer from the effects of climate change disproportionately, with a risk of knock-on effects and instabilities not faced by richer countries.

3. The balance of responsibility and effects

The consideration of who caused the problem in the first place and who continues to contribute to it reveals further inequities. Some countries have contributed very little to the problem, while others have a long history of industrial development and corresponding emissions. Most of those countries whose historic emissions have been highest continue to be major emitters. Although there are certain newcomers, such as China, whose emissions are also contributing significantly to the problem, many developing countries' emissions remain negligible in the context of the whole. Considering that many of these developing countries are likely to experience disproportionately grave effects from climate change, despite contributing least to the problem, there is clearly a stark and unfair imbalance between those responsible and those facing the consequences.

Finally, there is the fact that the consequences of climate change are so long-lived. In the absence of technology to extract emissions already in the atmosphere, we are confronted with the consequences of the emissions already in the system, for decades and probably centuries to come. This means, inevitably, that future generations will be impacted by what action or inaction characterises our response to climate change and, crucially, how quickly any action is taken. This is at variance with the ethical concept of intergenerational equity, which seeks to ensure that 'each generation has the right to inherit the same diversity in natural, cultural, health and economic resources enjoyed by previous generations'.[7]

As the above demonstrates, the causes and effects of climate change are uniquely uneven. It may be possible to find solutions to climate change, but if these inequalities are not taken into account in the development of such solutions, the results will be manifestly unfair. The concept of fairness, the 'impartial and just treatment or behaviour without favouritism or discrimination',[8] demands that the differential effects on nations and their respective capacities and capabilities are taken into account. This is an ethical not an economic or environmental requirement. A global strategy to tackle climate change that ignores such a concept of fairness will leave the poorest and weakest in society to bear the greatest burden; such a strategy would likely foment the existing inequities of the world as felt by the minorities and the systematically disadvantaged, whether that is due to their wealth, ethnicity, gender or another factor.

The international framework

Having established the inequalities that arise in the context of climate change through the use of an ethical lens, the question therefore becomes to what extent does the international community recognise them and the need to take account of them in developing solutions?

To illustrate the breadth of ethical issues recognised by the international legal framework, I will examine the United Nations Framework Convention on Climate Change (UNFCCC) of 1992.[9] As the foundation stone of international law on climate change, it provides the framework within which the international solutions to climate change are to be fashioned.[10] Specifically, I will analyse the Preamble to the Convention, which provides the backcloth, context and purpose that underpin its substantive provisions. I should make it clear however that the Preamble to the UNFCCC is just that – it is in no way a definitive summary of international law in respect to climate change;

[4] Aon, 'Weather, Climate and Catastrophe Insight: 2020 Annual Report' <https://www.aon.com/global-weather-catastrophe-natural-disasters-costs-climate-change-2020-annual-report/index.html> accessed 25 June 2021.

[5] The Guardian, 'California Wildfire Season 2021' (14 April 2021) <https://www.theguardian.com/us-news/2021/apr/14/california-wildfire-season-2021> accessed 25 June 2021.

[6] World Economic Forum, 'The Future of Jobs and Skills in Africa: Preparing the Region for the Fourth Industrial Revolution' (May 2017) <http://www3.weforum.org/docs/WEF_EGW_FOJ_Africa.pdf> accessed 25 June 2021.

[7] The concept also sets out that future generations should have the right to equitable access to the use and benefits of these resources. See Kevin Summers and LM Smith, 'The Role of Social and Intergenerational Equity in Making Changes in Human Wellbeing' (2014) 43(6) Ambo 718.

[8] Lexico, 'Fairness' <https://www.lexico.com/definition/fairness> accessed 25 June 2021.

[9] United Nations Framework Convention on Climate Change 1992

[10] It is worth noting that, while the preamble is demonstrative of the acknowledgement of ethical issues in the context of climate change international law, such acknowledgement is not always reflected in substantive or binding obligations on nations, ie, although international law may recognise the importance of different ethical dimensions, there is not yet an international law that provides an infallible approach as to how to take these features into account in practice.

it is not even a good indicator of the obligations to follow in the main body of the UNFCCC itself. It is simply a convenient starting point.

Let us begin with geography. That the physical effects of climate change are not evenly felt, amongst other reasons because of geography, is clearly acknowledged. The Preamble notes that certain countries are, by virtue of their geography, particularly exposed to the consequences of climate change.

The Convention also addresses countries' relative capacity and resilience. The Preamble acknowledges that, whilst the problem of climate change is a shared one, the capacity of countries to offer solutions to the future mitigation of emissions and to undertake steps to adapt to the unavoidable consequences of climate change are different. The Preamble also notes that the impact of tackling the problem and reducing reliance on fossil fuels will create particular challenges for petro-economies.

The Convention also highlights the importance of historic emissions. Paragraph 5 of the Preamble records that certain countries have contributed more to emissions than others.

Finally, there is a recognition that the challenge of climate change is intergenerational. The Convention acknowledges that the protection of the climate system is a duty owed to future generations, not just the present.[11]

It is thus clear, even from the first faltering steps taken by the international community to tackle climate change, that the different ethical considerations must be recognised as important and need to be considered.

Why is it important that ethical considerations play a role?

As mentioned above the unfairness of solutions that do not take account of the uneven impact of climate change and leave the weakest to shoulder the greatest burden is so patent it might be assumed that any right-minded person would regard them as unconscionable. But there are other reasons for adopting just solutions, which are not based on pure altruism and morality. First, if these differences in geography, capabilities, capacity and impact had not been recognised then, from a purely pragmatic viewpoint, there would be no framework convention within which to start developing a global response to the problem. Public international law is unlike domestic legislation. There is no legislative body mandated to make laws to address the issues of the day; no fully developed court system to resolve disputes backed up by a framework for enforcement, including a police force and other machinery of the modern state to ensure compliance with the laws so enacted. It requires mutual agreement to create a global treaty and if what is proposed is not to the liking of a state, if it fails to address concerns that the state mandates must be covered, then there is little, beyond international opprobrium and isolation, that can force it to agree. Thus, if a proposal is put forward that is manifestly unfair and will disproportionately disadvantage the citizens of a certain country you can expect its government not to accede to a request to adopt it.

It is also possible to justify the recognition of different capabilities based on enlightened self-interest. If there is a failure to recognise that certain countries are richer than others or have a greater industrial and technological base from which to tackle the challenges of climate change, the cooperation or coordinated response that the problem requires will not be achieved. For example, to make decisions on the basis of the best data, it will be necessary to identify what data is required from all countries and ensure that rich countries provide financial and technical assistance to those countries that cannot gather the required data without such support. This was the outcome of the UNFCCC negotiations back in the 1990s.[12] In order to have all or most countries participating in the task of combating climate change then this reality must be recognised.

Pragmatism or self-interest may therefore justify, without resort to ethical arguments, many of the propositions and solutions advanced in respect of climate change. Nonetheless, others may need the reinforcement of ethics to ensure the right outcome. For example, there are some economists (though not Lord Stern) who would argue that it is future generations who should foot the climate change bill on the basis that this is the best economic outcome. They maintain that if action to address the problem (and with it the cost) were delayed, the world would, following such postponement, likely be richer and better able to afford the deferred costs of tackling climate change. But even if the economics of this argument were correct, I suspect most would reject the idea as morally unsupportable. The notion of continuing to damage our planet in the hope or belief that our successors may be better able to absorb the cost, would be judged as repugnant and a derogation of responsibility.

What are the limits of ethics?

Let me begin by looking at the question of who should be the primary beneficiaries of solutions on climate change – what I might call the stakeholder representation issue. Who has legitimate interests that should be taken into account? Should the aim of the international community, through its various governments, be to protect the interests of its living adult population, voters in democracies and their families, or should this aim extend to future generations as well? Furthermore, should we be concerned only with humans or should we consider the interests of the millions of other species with whom we share this planet? Once the relevant stakeholders are identified or elected, it then becomes necessary to determine whether their rights are equal or whether a different weight should be given to the interests of different groups: born versus unborn; human versus non-human; animal kingdom versus plant kingdom; and so on. Finally, it must be asked: for those without a voice in international discourse, children, the unborn and non-human species, who should be their advocates? These are very important issues on which views from an ethical perspective may legitimately differ and even be irreconcilable. Nonetheless, despite the importance of these different perspectives, it may be argued that they should not stand in the way of meeting the urgent need to find a solution to climate change. To the extent that an analysis of the problem from these differing perspectives facilitates the process of developing solutions, this exercise is of real value, but finding such solutions should not be dependent on their reconciliation.

[11] UNGA Res 44/228 (22 December 1989).

[12] UNFCCC, art 4.3

One example where the use of ethical arguments to reconcile competing views may not be productive is the debate about historic emissions. I believe that the consideration of ethics in this debate risks being counterproductive by leading to polarised views and operating as a barrier to solutions. The moral debate centres on who has emitted most and what their responsibility to others is as a result. It may not seem particularly contentious to look at historic emissions to justify the allocation of remaining emissions and the costs of reducing emissions, and to validate measures of adaptation and the sharing of loss and damage. Such a notion indeed appears consistent with the environmental principle of 'the polluter pays'. In addition, since many of the greenhouse gases, including CO2, remain in the atmosphere for centuries, the use of aggregate cumulative emissions from the beginning of the Industrial Revolution in the calculation of further emissions allowances or liability payments for adaptation measures and loss and damage, may also appear justified.)

Assuming there is general agreement that historic emissions are to be used, in one form or another, as the basis to fairly allocate 'responsibility' and 'culpability', this gives rise to the question: what data set do you use? One option is to take aggregate emissions up to 1990 to establish the relative responsibility (I will call this the Base Case), as this would broadly coincide with UN activity on the subject (the IPCC was formed in 1988, the UNFCCC was adopted in 1992, and the Kyoto Protocol was adopted in 1997). Applying the data up to 1990 would place a relatively heavy burden on the citizens of the US – with over 30% of accumulated emissions worldwide. By contrast, India's aggregate emissions of 11.02 billion tonnes would mean that it would be responsible for 1.37% – a twentieth of the burden of the US.

However, these two data points alone would give rise to significant conflict and call into question whether this could be considered a fair allocation of responsibility. Despite the fact that India would only have to account for approximately a twentieth of the burden of the US using this model, India may still argue that the US got off 'too lightly' as, on a per capita basis, the average US citizen was emitting over 30 times more (rather than only 20 times more), through their extravagant lifestyles. The US, on the other hand, might counter by arguing that data from 30 years ago no longer bears relevance, especially considering that by 2019 India's aggregate emissions had grown 471%, from 11.02 billion tonnes to 51.94 while the US's emissions only grew 166%, from 246.92 to 410.24 billion tonnes. Based on calculations in 2019 the US would therefore be responsible for 'only' eight times the volume of emissions of India.

Furthermore, the year 1990 represents the time the world first recognised that we were doing damage to the climate, prior to which we might claim ignorance of the harm. For many, what we knew and when has a bearing on the fair allocation of responsibility. Many compare the situation to that of the tobacco companies and the litigation over the links between smoking and lung cancer. A key issue for liability (and in most people's minds, in determining moral culpability) was whether, when and to what extent the tobacco companies knew about the dangers of smoking. Many would say the same is true with emissions liability and responsibility. It is crucial, in establishing responsibility for emissions, to identify when mankind first became aware that there was a real likelihood that anthropogenic emissions were causing or would likely cause global warming. This gives rise to the argument that emissions prior to that date should be ignored: first, because no one knew of the potentially harmful consequences; and second, because if we had stopped emitting greenhouse gases once we knew of the perils, climate change would not have reached its current magnitude and less damage would have occurred. If this approach of looking at emissions only after 1990 were adopted, the allocation of responsibility would look very different, as approximately 51.5%[13] of emissions have occurred since the passing of the UNFCCC in 1992 when 154 (now 197) countries in the world declared 'that change in the Earth's climate and its adverse effects are a common concern of mankind'[14].

On the other hand, it may also be argued that to look at aggregate emissions whilst ignoring the size of a country's population is manifestly unfair since such an approach would mean that a highly populated country with a low per capita emissions level (and correspondingly low energy usage and standard of living) would be penalised as much as a country with half its population whose citizens emit twice as much. If you look at the Base Case, whilst the aggregate emissions of India were one twentieth of the US in 1990, the average citizen of the US was emitting 30 times that of the average Indian. You may conclude, based on this analysis, that some version of per capita emissions is a more appropriate benchmark, rather than aggregate country emissions, although this will yield yet further different allocations of responsibility. Furthermore the issue of what year you take as your base remains. In 1990 the per capita emissions of China were 2.06 tonnes of CO2 to the US's 20.34 (approximately one tenth); their relative populations were 1,143 million for China and 246 million for the US. By 2019, however, the per capita emissions of China were fast approaching half of that of the US (China reaching 7.1 tonnes of CO2 and the US reaching 16.06 tonnes). When the change in population is taken into account, the position becomes even more complicated: in the period from 1990 to 2019, the US grew faster than China with a 64% increase (from 249.62 million to 410.24 million people) versus China's 23% (1,135.00 million to 1,398.00 million people), but in absolute terms China's population grew by an amount equal to the whole of the US population in 1990. Russia's population, on the other hand, shrank by 2.5% in the period from 1990–2019 and their per capita emissions reduced by an even greater extent (over 30%).

The problem is, of course, even more nuanced than this portrayal. For example, even if you ignore pre-1990 emissions and account for country population sizes, this would not take account of other relevant factors, such as differences in trade. For example, is allocation of responsibility based purely on a country's internal emissions as fair and ethical as allocation focused on industry-based and service-based economies? If one country imports all its steel and cement to build its infrastructure, is it any less responsible for the emissions resulting from the manufacture of the steel and cement than the country that supplies it?

[13] ibid.

[14] UNFCCC, Preamble, para 1.

The complexities are endless and the likelihood that countries with large emissions will readily and quickly accept one particular allocation methodology over another, when so much is at stake, is unrealistic. It must be noted that accepting such responsibility is not just about money; it's far more than that. It is also about morality. No one wants to be told that the world is imperilled, and it is your fault. The fact that, for some, it is essential to apportion blame rather than responsibility, inevitably makes finding common ground on the issue of historic emissions much more challenging.

I am not dismissing the relevance of historic emissions and I think it will be a central theme in climate change litigation and the allocation of reparation costs for loss and damage. My concern is that a focus on the culpability of governments, oil companies and others based around historic emissions will frustrate the process to achieve consensus on the way forward for emissions mitigation and adaptation as the key protagonists repair to their bunkers. This is much more complicated than the tobacco litigation and with even more at stake. A number of reports identified the link between smoking and lung cancer in the 1950s and 1960s – the courts are still hearing cases against the tobacco companies 80 years later. This is not a timescale we can contemplate for climate change action.

Importantly the same destination can be reached without, I believe, recourse to historic emissions. Conveniently, the same countries who have historically emitted the most are also the richest. A just solution is much more likely to be achieved if developed countries are asked to assume the largest share of responsibility based on their relative wealth rather than on their ostensible guilt. Such a framing considers that such countries bear the ethical responsibility to take action due to their wealth rather than due to an apportionment of responsibility founded on historic emissions.

Conclusion - 'Had we but World enough and Time'[15]

In conclusion, it is clear that the pursuit of solutions to climate change throws up a huge constellation of ethical challenges. It is also clear that the global nature of the problem necessitates international cooperation and agreement. This cooperation will often require states to act in ways that are not in the short-term interests of their citizens – including, for developed countries, providing financial support for developing countries – but which serve a greater overall goal: the protection of the planet for future generations. Governments will not, however, adopt such a course without the mandate of their citizens.

But there is also a need to recognise the limitations of the application of ethics: a failure to recognise that even with ethics there are few absolutes risks polarising opinion and consequently inhibiting progress. The debate on historic emissions and culpability is an example of the challenges thrown up by climate change. There is no one right and morally impregnable answer, but rather a kaleidoscope of positions that each proponent will judge is morally defensible. So, the assessment of ethical considerations in the context of climate change is a crucial exercise in identifying the different stakeholder views and ensuring the problem is assessed fairly and honestly, but the dogged pursuit of one right and morally irreproachable answer to each of the ethical questions thrown up by climate change is a search for the Holy Grail, which will merely inhibit the identification of pragmatic, effective and efficient solutions.

Biography

Professor James Dallas joined Queen Mary University of London as Executive Director of the Energy Law Institute in 2014. James was also a partner at Dentons until earier this year and has more than 35 years experience in energy and infrastructure during which he has worked for a wide range of clients across the world.

James has a BA and MA from Oxford University in Jurisprudence. He trained to be a solicitor with Herbert Smith Freehills. In his early career he joined an oil exploration company involving him in upstream transactions around the world, particularly in the Middle East and Africa.

James returned to private practice in 1984 with Denton Hall (now Dentons), a firm with a leading energy practice, where he was Chairman from 1996-2009.

He was also a non-executive director of AMEC plc from October 1999 to May 2007 and was Chairman of their Remuneration Committee for six years.

The extended version of this paper will be included in the **Research Handbook of Energy, Law and Ethics**, *to be published by Edward Elgar Publishing in 2022.*

[15] Andrew Marvell (1621–1678), 'To his Coy Mistress'.

The role of women in managing climate change.

Emma Howard Boyd CBE

From the Annual Clifford Chance Lecture 21 October 2021

Emma Howard Boyd CBE

Here we are in Canary Wharf overlooking the incredible Thames Barrier which – just this morning – closed for the two hundredth time.

The Barrier was opened in 1982 - and was expected to last until 2030.

A marvel of adaptation, it will now protect London until 2070 - 100 years after it was designed - because the embankment foundations were built to allow them to be raised.

But, I'm not here to talk about engineering.

Tonight is about the role of women in managing climate change.

Female leadership in local, national and international policy making is vital.

IIf you are someone who wants to take climate action, I expect you would want to learn from those who are already delivering results.

But, as I will explain, women have to shout louder than men to be heard.

And, in an emergency this is a game-changing mistake.

With the climate emergency accelerating, it is in no one's interest to run this extra compound risk.

Men and women alike should demand change.

-

Last autumn, I was a judge on the Woman's Hour Power List.

The theme was "Our Planet".

Woman's Hour said: "Our planet is a home for us all. But globally, women are on the frontline when it comes to the consequences of environmental change.

"They are the people most likely to collect water, food and fuel – all of which are becoming scarcer or more expensive. Women are also more likely to face poverty and financial insecurity, making them less able to adapt to a changing world.

"This list aims to recognise and champion the women who are doing something about these issues."

We received the largest ever number of nominations for a Woman's Hour Power List.

We wanted to make sure that every woman listening to the programme would recognise the people and their achievements as within reach.

We don't hear about such women in the media enough.

In 2017, the company Lissted carried out analysis to find out why British female political journalists are less influential on social media than men.

It showed there wasn't a single female voice in the top ten British political influencers on Twitter during the 2017 general election campaign.

Consider that - by that point - Laura Kuenssberg had been the BBC's political editor for two years.

There was an outcry from female politicians, but when their Twitter feeds were analysed, they found they too were not profiling women's voices.

The journalist Mary Ann Sieghart wrote about this in the New Statesman.

She said:

"If men's voices are heard more often and spread more widely than women's, then our political conversation is being distorted and women's views are being drowned out."

Just this month, on her blog, Luba Kassova - the author of "The Missing Perspectives of Women in News", commissioned by the Bill and Melinda Gates Foundation - points to analysis, by AKAS, of global online news between 2017 and now.

Women have held just 28 percent of the share of voice in news articles about climate change.

She said: "In fact, women's share of voice peaked at 31 percent in 2019, but has been creeping down ever since. Yet again, we are seeing women's visibility hit an invisible ceiling at under a third of all the voices out there."

Given the roll call of brilliant women working on the biggest story of our lifetimes, I find this extraordinary.

-

At the end of "Invisible Women", Caroline Criado Perez writes that after a climate disaster - like Hurricane Katrina in New Orleans, or Hurricane Maria in Puerto Rico - relief workers are usually portrayed in the media as muscular and masculine.

Of course, it is right to celebrate the heroism of the guys in the pictures…

But, Caroline quotes Adi Martinez-Roman - an executive director for a non-profit helping low-income families – who said:

"The reality is that when you go to communities, mostly it is women as leaders and as community organisers."

She talks about women who wade into flooded communities, raise money and rebuild roads.

She talks about women who have distributed "solar-powered lights, generators, gas, clothes, shoes, tampons, batteries medication, mattresses [and] water."

This is a key part of what we talk about when we talk about managing climate change.

As we build infrastructure to better protect people from floods and heatwaves…

People also need to be better prepared to move on from climate shocks with the minimum disruption.

This quick recovery time is crucial to a well-functioning economy.

The women who help communities build back better have skills, expertise and leadership experience we all need.

-

Ahead of a visit to Manchester on Monday, I learned about a group called Community Savers that is learning from the approaches of the women-led movement Slum Dwellers International.

Both groups help low income women - often the most active at a community level, but with limited influence over local decision-making - to come together.

As well as running weekly savings meetings and monthly markets, they worked with residents to create a women-friendly free meeting space, and a food membership club.

This increases resilience when residents are hit by shocks or stresses, whether these are personal and domestic - or climate impacts.

The partnership of Community Savers and Slum Dwellers International shows people in the global north and south have a lot to learn from each other.

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Building on her observations about women's voices, Mary Ann Sieghart recently published a book called: "The Authority Gap: Why Women are Still Taken Less Seriously Than Men, and what We Can Do about it".

It shows how all of our personal and professional lives would be much more fulfilling if we allowed women equality of ambition, expertise and success.

On the climate, Mary Ann writes this:

"Women are more likely to worry about climate change and to believe that it will harm future generations. They are also more likely to believe that it will affect them personally. So having more women in positions of decision-making power, with people listening to them, would help to reduce global warming."

An upcoming report - "The Climate Action Gender Gap" - from the 30% Club and the Oliver Wyman Forum, shows companies can get ahead in the race to net zero by actively considering women in three roles:

1. As leaders.

Women in leadership positions are often more open than men to changes that will drive climate action but are currently underrepresented in decision-making positions, especially in carbon-intensive industries.

2. As investors.

Women have a stronger preference than men for investing that prioritizes environmental, social, and corporate governance factors.

3. As Influencers.

Women make a large proportion of household purchase decisions in areas that generate high emissions, such as food, travel, and energy. They are also more likely on average than men to change their habits in ways that contribute to emissions reduction.

Interestingly, the report also says that according to one study of 130 countries, women in government positions are more likely to sign on to international treaties to reduce global warming than men.

It concludes:

"In the end, companies that are good at diversity are likely to be good at climate action. Those that combine the two will find they are in a better position than others to do business in a low-carbon economy."

Investors who engage corporate boards on their diversity policies are showing sound economic judgment and environmental stewardship.

Real progress on diversity will be made not by "fixing the women" or "beating up the men", but through men and women working together to improve business culture and achieve more diversity of thought at all company levels.

-

So let's explore business culture - and as we are at Clifford Chance - I would like to briefly talk about environmental law.

The ambitions of COP26 will be held back unless there is strong regulation to underpin them.

Ambition creates opportunity, but rules give everyone clarity, consistency and certainty.

Well-funded regulators can provide investors with data about which companies are performing well and which aren't.

But, they also need to ensure that crime doesn't pay.

Sanctions for environmental crimes must pose a threat.

This year, the Environment Agency's £90 million fine against Southern Water for deliberate pollution, potentially shifted the dial on the levels of penalties for corporate environmental crime in England.

I would like to see the courts apply sanctions consistently and proportionately.

With the most serious breaches by very large companies attracting sanctions based on a percentage of turnover.

More attention should be paid to the directors of companies that are guilty of repeated, deliberate or reckless breaches of environmental law.

It is a failing of the current system that some people can move from company to company, without fear of recrimination.

Such directors should be struck off - and in the most grievous cases, custodial sentences are right.

However, despite constant refinement of regulatory enforcement, it remains the case that some people are getting rich while the environment pays the price.

Society-wide change depends not just on deterrence actions but also a change in corporate culture under pressure from shareholders.

The Environment Agency has huge oversight of many sectors in the UK.

Perhaps, we could start to think about giving not just shareholders but also insurers and lenders a fuller picture of how the companies are actually performing on the ground.

A decade on from the financial crisis, and many investors still do not fully understand the esoteric financial products their money is tied up in, let alone how their investments connect to environmental degradation.

Environmental regulators need to keep in lockstep with economic and financial regulators, ensuring that everyone is clear about the required pace of action.

To deliver the vision of COP26 the world needs strong green regulation.

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In December, I put my name to an open letter from the campaign group "She Changes Climate", as did Claire (Perry O'Neill) calling for 50:50 balance of women at COP26 and all future COPs.

The letter says:

"Women and girls more often face the brunt of climate related disasters than men. They are the 'shock absorbers' of climate change: impacts disproportionately hit their livelihoods and food security, drive up levels of the violence they experience, and hold them back from engaging in education and the green economy.

"For their interests to be appropriately considered in climate change policy responses, women need to be involved in strategic planning and decision-making."

-

On Tuesday, I attended the UK Government's Global Investment Summit at the Science Museum, where global business leaders, Secretaries of State and the Prime Minister spoke about how to build a greener future together.

You will find the speaker list published on Gov.uk.

Of the 30 speakers listed 15 were men, 15 were women.

So, we know what gender balance looks like.

-

The UN Secretary General António Guterres has said:

"Women's equality is essentially a question of power. We must urgently transform our male-dominated world and shift the balance of power, to solve the most challenging problems of our age.

"That means more women leaders in parliaments, cabinets and board rooms. It means women fully represented and making their full contribution, everywhere."

Recently, a lot of people have described COP26 as our "last best chance" to save the planet.

But, maybe it would be helpful to imagine it is our "first good chance" to save the planet.

COP26 must deliver real action for everyone in the world - at least 50 percent of whom, are women.

As the former Irish President Mary Robinson said:

"Climate change is a man-made problem and must have a feminist solution."

Thank you very much.

Biography

Emma Howard Boyd is Chair of the Environment Agency, an Ex officio board member of the Department for Environment, Food and Rural Affairs and interim Chair of the Green Finance Institute. She is also an Adviser to the Board of Trade, and a UN Global Ambassador for Race to Zero and Race to Resilience ahead of COP26. Emma serves on several boards and advisory committees which include:

- The Coalition for Climate Resilient Investment (co-Chair)
- The European Climate Foundation
- The Council for Sustainable Business
- The Prince's Accounting for Sustainability Project
- Menhaden PLC

Emma was the UK Commissioner to the Global Commission on Adaptation from 2018 until January 2021.

Queen Mary
University of London

ISSN 2632-0258
Published by Queen Mary University of London.

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https://www.qmul.ac.uk/ccls/research/energy/

709_21