



Risking the earth Part 2: Power politics and structural reform of the IPCC and UNFCCC

Adam Lucas

Science and Technology Studies, Faculty of Arts, Humanities & Social Sciences, University of Wollongong, Wollongong, New South Wales 2522, Australia

ABSTRACT

This two-part paper details the arguments and evidence that have been marshalled by both climate scientists and social scientists to critique the current procedures and methodologies deployed by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) to represent the risks of anthropogenic forcing and a continuation of business-as-usual. In the first part, the rationale for moving from an atmospheric stabilisation target to an average surface temperature target is explained. This is followed by a discussion of the IPCC's representations of nonlinear behaviour in relation to climate forcing, and the problems associated with using a single temperature target in assessing climate risk. An outline is then provided of efforts to define what can or should constitute physical, biological and socio-economic indicators of dangerous anthropogenic interference (DAI). The paper reviews the IPCC's representations of sea-level rise to illustrate the argument that it continues to take insufficient account of the paleoclimate record and improved methods of modelling. Part 1 concludes by arguing that the IPCC continues to under-represent the risks associated with DAI. In the second part, the rationale and methodologies for reconfiguring international climate governance are discussed in more detail. Part 2 argues that the currently dominant model of international policy-making is primarily an outcome of compromises made by governments under pressure from powerful polluting industries and their business allies. It is argued that the political economy of international climate governance has produced systematic biases in the kinds of expertise and evidence that national governments deem appropriate for consideration via the IPCC and UNFCCC frameworks, along with the relative importance that is ascribed to them. Drawing on the research of climate scientists and social scientists, some suggestions for how to restructure and refocus the activities of the IPCC, UNFCCC and climate governance more generally are canvassed, including the necessity of creating far more interdisciplinary and democratically accountable structures of expertise for climate policy-making at the national and supra-national levels. Part 2 concludes with a discussion of the kinds of reforms which could be undertaken to reduce the ability of incumbent actors to shape climate policy and politics to their advantage.

1. Introduction

Part 1 of this paper outlined the development of international standards for avoiding dangerous anthropogenic interference (DAI) based on research from the natural sciences. It pointed out that responsibility for assessing nation states' compliance with Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) lies with individual nation states, but very few have developed principles that could inform such assessments. The paper's primary focus was a summary of the arguments made by climate scientist critics that DAI has already been occurring across multiple biological and physical parameters for more than a decade. They argue that the gravity of the risks associated with a continuation of business-as-usual have not been given sufficient attention in successive assessment reports by the Intergovernmental Panel on Climate Change (IPCC). According to these scientists, the relevant research has either been de-emphasised or ignored in the highly technical publications of Working Group I, or remained embedded within those reports without receiving due consideration in the summaries for policymakers compiled by Working Groups II and III. In addition to these procedural criticisms are methodological criticisms: although the scenario modelling of climate risk by the IPCC has

E-mail address: alucas@uow.edu.au.

<https://doi.org/10.1016/j.crm.2020.100260>

Available online 1 December 2020

2212-0963/© 2020 The Author.

Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

improved over the last decade, it remains inadequate because it still does not take sufficient account of nonlinear behaviour, observational evidence for calibration, or the paleoclimate record as a historical control. This has led to a growing disjunction between how climate risk is characterized and interpreted by many climate scientists, and how the IPCC selects and represents relevant research findings in its summaries for policymakers. Part 1 outlined the problems associated with restricting international ambitions to global average surface temperature targets of 1.5 °C and 2 °C, and the kinds of procedural and methodological reforms that could be instituted to make them more focused and effective in reducing emissions. However, the ‘external’ political factors that contributed to these developments were not explored in detail in Part 1.

Part 2 of this paper is primarily concerned with exploring such ‘external’ factors, and how they have contributed to shaping the scope of climate change communications by the IPCC, as well as the procedures for determining the emissions attribution framework established by the UNFCCC. It argues that the political economy of international climate governance developed since the late 1980s has contributed to the narrow range of expertise and evidence deemed appropriate for inclusion in IPCC processes, along with the relative importance that is ascribed to certain kinds of expertise and evidence. The paper contends that the currently dominant model of international policymaking in relation to climate change is primarily an outcome of compromises secured by the governments of the major developed and developing countries that have been produced under systematic pressure from powerful polluting industries and their business allies that are located in those countries. With the IPCC’s primary focus on summarizing and evaluating research from the earth sciences and economics, critical and contextual perspectives and approaches continue to be excluded, an outcome which favours the interests of economically dominant industries and businesses. Social scientists’ systematic examination of changes to expert inputs into IPCC processes over the last decade indicate that neither national governments nor the IPCC administration have been sufficiently responsive to such criticisms (Hulme and Ravetz, 2009; Bjurström and Polk, 2011; Beck, 2011, 2012; Chan et al., 2015; Corbera et al., 2015; Luton, 2015; Fløttum et al., 2016; Ford et al., 2016; Okereke, 2017; Minx et al., 2017; Obermeister, 2017; Devès et al., 2018; Wohlgezogen et al., 2020). These studies indicate that the kinds of expertise incorporated into IPCC processes, the representations of climate risk by Working Group III in successive IPCC summaries for policymakers, and the entities that are currently deemed responsible for mitigation and adaptation under the UNFCCC are three areas that require significant reform.

Although there clearly are procedural hurdles to achieving such reforms, a largely neglected contributing factor to the inertia of the current system is the role of the climate change counter-movement (CCCM) in shaping the assessments of, and responses to, climate risk by national governments. The role of the CCCM in shaping international climate governance processes is therefore a key focus of this paper. Three of the countries in which the CCCM has been well-documented to have had a disproportionate influence on conservative elites and government policy play a major role in the international climate change negotiations. It is no coincidence that the governments and ruling political parties of these countries promote the continuation of the coal, oil and gas industries to 2050 and beyond, and are themselves major consumers and producers of fossil fuels. These countries’ national governments have acted as spoilers in the international climate negotiations over many years under multiple administrations. The success of fossil fuel and other polluting interests to shape the international climate governance regime to suit their own interests has arguably contributed to the lack of enthusiasm for reform of the IPCC, the minimization of risk representations in its summaries for policymakers, and the lacklustre responses that have so far been elicited from most nation states via the UNFCCC (cf. Tully, 2005; Pearse, 2007; Lewandowsky et al., 2015; InfluenceMap, 2016, 2019; Hoppe and Rödder, 2019).

Drawing on the work of climate scientists, social scientists and humanities scholars, suggestions for how to restructure and refocus the activities of the IPCC, UNFCCC and climate governance more generally are canvassed, including the necessity of creating more interdisciplinary and democratically accountable structures of expertise for climate policy-making at the national and supra-national levels. It is argued that the past successes of polluting industries in delaying climate action need to be acknowledged and countered in climate policy deliberations more generally. For strategic and geopolitical reasons, not only will ongoing reconfigurations of the modes and sources of knowledge informing the IPCC’s risk assessments be required, but revision of the articles informing the UNFCCC to acknowledge the disproportionate influence on international policymaking of nation states with rich fossil fuel resources. The paper concludes with a discussion of the kinds of reforms which could be undertaken to reduce the ability of incumbent actors to shape the policy and political landscape to their advantage.

2. The modes and sources of knowledge currently informing climate governance

Since the earliest phases of industrialization, political and commercial elites have recognized that, when dealing with controversial areas of government decision-making that involve significant scientific content, if they are able to limit policy inputs to supposedly ‘apolitical’ technical issues, they can clothe their politically contentious policies and actions in the mantle of ‘objectivity’ (cf. Barnes, 1985; Bäckstrand and Lövbrand, 2007; Bauer, 2009; Malm, 2016; Thorpe, 2017; Thorpe and Figge, 2018). Because they have an overwhelming advantage in marshalling such technical expertise over less well-resourced critics, rivals and opponents, it is relatively simple for them to shape technical inputs into decision-making in their own favour (Barnes, 1985). A long-standing criticism of both the IPCC and UNFCCC is that because they are not quarantined from such influences, their current structures too easily lend themselves to promoting policies and programs grounded in the principles of neoliberal economic dogma, including emissions trading, the so-called ‘Clean Development Mechanism’, and other supposedly ‘low cost’ economically-focused policies (cf. Okereke, 2007; Castree, 2009; Paterson et al., 2011; Lohmann, 2017; Paterson, 2019).

Because most of the policy responses by national governments to anthropogenic forcing have been framed with reference to IPCC findings and recommendations (IPCC, 1990, 1990a, 2001, 2007, 2007a, 2007b, 2007c, 2013, 2013a, 2014, 2014a, 2014b), it is strategically important that more determined efforts be made to reform the structure and functions of the IPCC to reflect the range of expert knowledge and experience that currently exists. Content analysis of successive IPCC reports has revealed that its three working

groups are dominated by the advice of earth scientists and economists (Bjurström and Polk, 2011; Carey et al., 2014; Corbera et al., 2015; Callaghan et al., 2020; Einecker and Kirby, 2020): a situation that prevails to this day (Tables 1–6). This is despite calls by researchers from the interpretive social sciences and humanities for well over two decades to open up the policy process to multiple disciplines and forms of expertise. A significant number of these scholars have persuasively argued that as long as the current situation prevails, the IPCC's assessments of anthropogenic climate change and its recommendations for action will remain seriously inadequate (Shackley and Skodvin, 1995; Shackley and Wynne, 1995; Shackley, 1997; Hulme, 2010; Hulme and Mahony, 2010; Carey et al., 2014; Blue, 2015; Fløttum et al., 2016; Ford et al., 2016; Minx et al., 2017; Devès et al., 2018; Obermeister, 2017; Okereke, 2017; Thorpe and Figge, 2018; Einecker and Kirby, 2020).

If carbon-intensive industries and national governments are able to restrict disciplinary inputs into the IPCC primarily to the contributions of physical scientists and economists, who lack any specialized knowledge of politics, sociology, anthropology, history, literature, art or ethics, they can arguably better fashion the highly technical content of IPCC communications to suit their interests. Those interests are well served by the epistemic culture of physical scientists, which tends to be narrowly technically focused and to 'err on the side of least drama' (Brysse et al., 2013; cf. Hansen, 2007; Lahsen, 2013). Consequently, although there are serious deficiencies in the methodologies used by the IPCC to evaluate and represent the current state of climate change research, these deficiencies can in part be attributed to the asymmetrical power relations brought to bear upon its constitution by nation states representing those polluting interests.

It is therefore not credible to attribute the inadequate responses of nation states to IPCC risk assessments as the product of a 'knowledge deficit' amongst policymakers and the governments they serve. Fossil-fuelled elites have been able to place normative and financial constraints on the kinds of research on anthropogenic forcing of the climate that receives funding and recognition. They have also been effective at ensuring those officials who represent their countries at the international level are adept at restricting the kinds of knowledge and expertise that inform policy- and decision-making in the climate governance space (Pearse, 2007; Hein and Jenkins, 2016). In other words, these officials do not suffer from a surfeit of knowledge, but rather, are engaged in motivated reasoning informed by values and preferences which are aimed at closing down the debate, rather than opening it up (Stirling, 2008; cf. IPCC, 2014: 165; Blue, 2015).

If we are prepared to accept that the political interests of powerful nation states have played a decisive role in climate risk communications, it is pointless to insist that climate scientists should be 'shouting more loudly' about the potential risks. It is not pointless, however, to call for reform of the disciplinary approaches and methodologies that are used to represent those risks to governments and the public through the IPCC, and by extension, the UNFCCC. It is also not pointless to argue for reform of the kinds of people empowered to represent our nations in these bodies, especially with regard to conflicts of interest in both the IPCC and UNFCCC, as well as the influence of major corporations and economically dominant nation states on UNFCCC deliberations (Bartlett Quintanilla and Cummins-Tripodi, 2018; Aronoff, 2018).

3. Expanding the range and integration of expertise in IPCC assessment processes

Climate-related research has proliferated across multiple disciplines over the last few decades, providing policy-makers, governments, business, industry and civil society actors an extraordinary array of intellectual resources to inform both mitigation and adaptation measures. But ever since anthropogenic climate change became a focus of global attention in the late 1980s and international negotiations to reduce emissions began in the early 1990s, the geosciences have dominated the policymaking process (Tables 1–6). Given the lack of research that had been undertaken on climate change prior to this period, and the need for governments to better understand the contribution of human activities to the relevant processes, it is understandable why the geosciences should have initially been preferred by governments as their main source of scientific advice, and that within the geosciences, climate modelling should have been accorded preeminent status: a status which continues to be reflected in successive IPCC reports (cf. Shackley and Wynne, 1995; Edwards, 2010; Paterson, 2019; cf. Callaghan et al., 2020). All of the IPCC's reports have prominently featured climate modelling, and the findings of all three working groups are heavily reliant on it for their key observations, scenario projections and recommendations.

Sociologists of science Simon Shackley and Brian Wynne noted long ago that political and policy elites are attracted to climate modelling because of its quantitative foundations, its predictive capabilities, and its easily digestible graphic representations of data (Shackley and Wynne, 1995). However, because most of the advice provided by geoscientists through the IPCC involves specialised technical discussions of complex probabilistic and statistical data, the interpretation of that data requires skills and knowledge that are very unevenly distributed, not only among policy- and decision-makers, but amongst academics more generally, as well as non-government organisations and the population at large. Consequently, the wisdom of continuing to maintain such a narrow disciplinary focus using highly technical and difficult-to-interpret representations of climate risk in international climate governance has long been questioned by scholars involved in climate-related research outside the geosciences, who call for a much greater diversity of disciplinary and epistemic inputs into climate change research and policymaking (Shackley and Skodvin, 1995; Shackley and Wynne,

Table 1

Discipline representation in IPCC assessment reports 1 – 6 Working Groups I–III, 1990–2018.

Natural Sciences	Engineering & Technology	Agricultural Sciences	Social Sciences	Medicine & Health	Humanities
65.9%	26.1%	10.3%	10.1%	1.9%	0.9%

Source: Callaghan et al. 2020: 122.

Table 2

Emphasis of scientific fields in IPCC Assessment Report 3, Working Groups I-III, 2001.

Geosciences	Meteorology	Environmental Science	Social Sciences	Multi-disciplinary Sciences	Biology	Energy & Resources	Medicine	Oceanography	Agriculture
20%	20%	16%	12%	9%	9%	6%	3%	3%	2%

Source: Bjurström and Polk (2011): 9.

Table 3

Breakdown of social science contributions by discipline in IPCC Assessment Report 3 Working Groups I-III, 2001.

Economics	Environmental Science	Geography	Planning & Development	Other
39%	35%	16%	4%	6%

Source: Bjurström and Polk (2011): 9.

Table 4

Gender & Discipline Representation in IPCC Assessment Report 5 Working Group III, 2014.

Female Researchers	Economists & Engineers	Social Scientists	Physical, Natural & Applied Scientists	Environmental Scientists	Humanities Scholars
18%	56%	22%	16%	4%	2%

Source: Corbera et al. (2015): 98.

Table 5

Discipline Representation in IPCC Assessment Report 5 by Coordinating Lead Authors in Working Groups I - III, 2014.

Working Group I	Almost all natural scientists
Working Group II	39 natural scientists (incl. 5 engineers) 25 social scientists 0 humanities scholars
Working Group III	12 natural scientists 23 social scientists (incl. 20 economists, 1 geographer, 1 political scientist) 0 humanities scholars

Source: Carey et al. (2014).

1995, 1996; Sunderlin, 1995; Malone and Rayner, 2001; Godal, 2003; Yearley, 2009; Hulme and Mahony, 2010; Bjurström and Polk, 2011; Castree, 2014; Ford et al., 2016; Lohmann, 2017; Paterson, 2019).

One cultural factor militating against such reforms has been the epistemological divide between the descriptive sciences and the interpretive social sciences and humanities, whereby incumbent researchers representing the dominance of the former disciplines argue that the latter are unhelpful to the task in various ways and therefore oppose reform (Malone and Rayner, 2001). There are, nonetheless, several compelling reasons why the geosciences should not be given continued primacy in the international policymaking process [see Fig. 1]. Perhaps most significantly, the continued privileging of the earth sciences in IPCC processes is problematic because it legitimates the framing of anthropogenic forcing as an environmental problem, rather than a social problem, which in turn downplays the normative, cultural and political dimensions of the issue (Bjurström and Polk, 2011: 14; cf. Yearley, 2009; Hulme and Mahony, 2010). Because it is based on probabilistic projections of future scenarios which require further interpretation to convey their full implications, the ability of climate modelling to provide policy- and decision-makers with tangible, compelling evidence of the need to act decisively in the present is arguably lacking. Although its quantitative basis may appeal to the technocratic and rationalist biases of policy- and decision-makers, it is just as subject to selective (mis-)representation and political influence as any other form of expert knowledge in contemporary societies (Shackley and Wynne, 1995; cf. Pielke, 2007; IAC, 2010; O'Reilly et al., 2012; Curry,

Table 6

Discipline Representation in IPCC Assessment Report 5 by Methods Chapter for Working Group III, 2014

Working Group III, Chapter 3	15 Coordinating Lead Authors, Lead Authors & Reviewers Coordinating Lead Authors: 2 economists Lead Authors: 7 economists 2 philosophers 1 anthropologist (economic) Reviewers: 3 economists
------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Source: IPCC (2014).

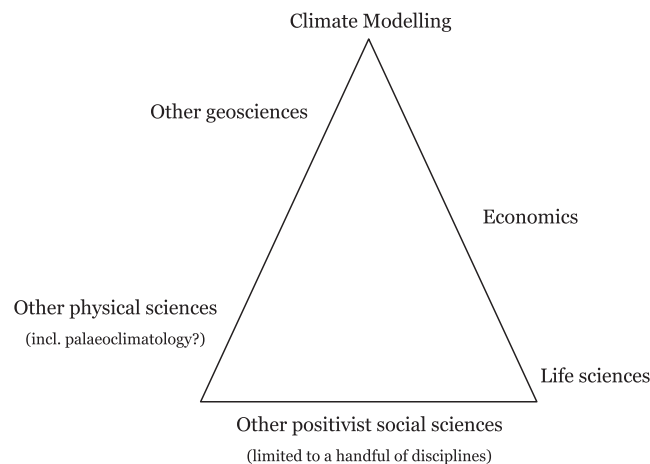


Fig. 1. The international climate policy pyramid of expertise.

2013; Stavins, 2014; Luton, 2015). For example, although the IPCC has acknowledged to some extent the technocratic fiction that it is possible to make hard and fast distinctions between facts and values, it has not been so open to acknowledging that once science escapes the laboratory, it is thoroughly imbued with politics. Nor has it been open to acknowledging that many bureaucrats conceal their value judgements and preferences behind the conceit of ‘rational administration’ (Luton, 2015). The IPCC is therefore susceptible to the charge that it is engaged in what Roger Pielke calls ‘stealth issue advocacy’, which is characterized by efforts on the part of the expert to conceal his/her advocacy of certain ‘solutions’ behind an objective claim to neutrality, unsullied by values or politics (Pielke, 2015). This issue will be taken up later in relation to the promotion by the IPCC of NETS and economic instruments as preferred policy responses to anthropogenic disruption of the Earth’s climate.

The inclusion of economists in the IPCC’s deliberations, along with the more recent concession to include a handful of philosophers and anthropologists, does not go nearly far enough to address the aforementioned concerns. It is also fundamentally at odds with observations concerning Mode 2 forms of knowledge developed by Gibbons et al. (1994), and post-normal science by Funtowicz and Ravetz (1993). Both argue that policymaking processes focused on complex issues with high decision stakes and urgent requirements for action need to be transdisciplinary in constitution and democratic in orientation. As John Broome noted in relation to his contributions to IPCC Working Group III with one other moral philosopher, ethical considerations came very close to being completely removed from AR5’s ‘Summary for Policymakers’ due to the objections of a single nation (Broome, 2014). The last time such issues were discussed in any detail in an IPCC report was almost twenty years ago (IPCC, 2001a: 365–6; cf. Hulme and Ravetz, 2009; Beck, 2012).

The current narrow disciplinary base from which the IPCC draw its expertise has not only resulted in the significance of observational data, the nonlinear behaviour of the climate and the paleoclimate record being consistently overlooked and/or minimized in the publications of Working Group III and in its summaries for policymakers (Glikson, 2012, 2019), it has emboldened the IPCC to develop and advocate efforts to combine economic modelling with probabilistic analyses of the biophysical evidence via ‘integrated assessment models’ (IAMs): a deeply contentious approach informed by questionable assumptions resistant to revision, and which tend to significantly underestimate the potential costs of delay and inaction (cf. Dietz et al., 2007; Mastrandrea and Mach, 2011; Paterson, 2019). Such approaches are emblematic of the reductionist and technocratic disciplinary composition of the IPCC, which endorses incremental and voluntary change and supposedly low cost but universally applicable economic ‘solutions’. It lacks the theoretical sophistication to recognize the importance of incorporating different disciplinary approaches, problem definitions, and user values and perspectives, or how to successfully weave them together (Adler and Hirsch Hadorn, 2014). The IPCC needs to be restructured in such a way that it is not only enabled to better represent the biological and physical evidence that DAI is already happening, it also needs to be empowered to represent the geographic and cultural diversity that exists in our societies, and the specificity of the socio-economic consequences of not acting sufficiently swiftly to avert the worst possible outcomes (Ford et al., 2016).

The adoption of more networked and interdisciplinary forms of policy input is more likely to produce the kind of socially relevant knowledge that can bridge the gulf which currently exists between scientific experts, decision-makers and the public, than a continuation of the current hierarchical format (Shackley, 1997). Implementing such reforms will require the integration of disciplines from within and outside the physical sciences into all three of the IPCC’s current working groups (cf. Hulme and Mahony, 2010; Hulme, 2010; Curry and Webster, 2011; Björström and Polk, 2011: 14–16; Ford et al., 2016; Obermeister, 2017; Strzałkowski, 2018). Because the interpretive social science and humanities disciplines are able to evaluate qualitative phenomena and identify alternative developmental pathways they should be given much greater prominence (Malone and Rayner, 2001).

4. Climate governance and the asymmetrical power of incumbent polluting interests

A long-standing strategy to delay action on climate change by conservatives in the United States, Canada, Australia and elsewhere

has been to polarize the debate by attacking and misrepresenting climate scientists' findings on the basis that the 'science is uncertain', and that acting too swiftly to reduce emissions will 'damage the economy' (Beder, 2000; Hoggan and Littlemore, 2009; Oreskes and Conway, 2010; McCright and Dunlap, 2010; Brulle et al., 2012; Brulle, 2014, 2018; Sapinski, 2015). Investigative journalists and researchers from multiple social science disciplines have documented the close financial and ideological ties between these critics and carbon-intensive industries in those same countries (e.g. Hamilton, 2007; Farrell, 2015, 2019; Aulby and Ogge, 2016; Mayer, 2017). There is now a substantial and growing body of research in the social sciences detailing the organizational sophistication and extensive influence of the climate change counter movement (CCCM) in the United States and Canada (McCright and Dunlap, 2010; Antilla, 2005; Eilperin, 2007; Jacques et al., 2008; Hoggan and Littlemore, 2009; Brulle, 2014, 2018; Miller and Dinan, 2015; Farrell, 2016, 2019; Carroll et al., 2020). A number of studies have documented the activities and membership of similar (and related) counter movements in Australia (Pearse, 2007; Lucas, 2020; Wilkinson, 2020) and the European Union (Bartlett Quintanilla and Cummins-Tripodi, 2018). The main industries involved in funding these activities are the coal, oil, gas, automobile, electricity, cement, mining and aluminium industries, i.e., the same industries responsible for two-thirds of carbon dioxide and methane emissions since 1850 (Heede, 2014). Major corporations within these industries have actively sought to undermine fair discussion of any of the relevant issues through a range of diversionary and delaying strategies (Beder, 2000), including the framing of media coverage (McKnight, 2010; Bacon and Nash, 2012; Shehata and Hoffman, 2012; Cook et al., 2017), and covert efforts to shape the policies and actions of national and regional governments (Hamilton, 2007; Pearse, 2007; Mayer, 2017; Bartlett Quintanilla and Cummins-Tripodi, 2018; Aronoff, 2018; InfluenceMap, 2019; Lucas, 2020).

It is no coincidence that so-called 'climate scepticism' is most visible and influential in those countries whose economies remain heavily dependent on the extraction and burning of fossil fuels, and in which receptive conservatives have had their perceptions of climate science primarily shaped by 'ignorance-building strategies' (Hornsey et al., 2018; cf. Proctor and Schiebinger, 2008; Jacques et al., 2008; McKewon, 2012). The primary aim of such strategies is to provide individuals and the groups which support them with the financial and discursive resources to deny the validity of the climate sciences, delay the transition to low and zero emission technologies, and continue investments in, and subsidies for, polluting, dangerous and unsustainable activities. Significantly, this has included systematic efforts to produce favourable outcomes for carbon-intensive industries through the international institutions and negotiations most directly associated with global climate change governance, i.e. the IPCC and the UNFCCC. However, apart from Working Group III's Technical Report in 2001 (IPCC, 2001a: 46, 365–6, 619), there has been no substantive discussion of any of these issues in successive IPCC assessments. Nor has this research informed more general discussions at the intergovernmental level concerning the organisation of either the IPCC or UNFCCC and the influence exercised by these groups on the structures, functions and effectiveness of international climate governance (Readfearn, 2018).

The obvious motivation for the fossil fuel industry's financing of the CCCM and their opposition to meaningful action on climate change is the fact that the extraction and burning of fossilized energy sources are responsible for at least 57% of historic GHG emissions (IPCC, 2007: 36–7). If only 90 fossil fuel and cement producers are responsible for almost two-thirds of historic carbon emissions since 1850 (Heede, 2014), and only 20 fossil fuel companies are responsible for more than one-third of all carbon emissions since 1965 (Taylor and Watts, 2019), there is clear motivation for the companies concerned to limit any moves to rein in that contribution and hold them responsible for it. Carbon-intensive industries and their business and political allies have long recognized that the kinds of systemic changes required to mitigate anthropogenic forcing are not only likely to disadvantage them over the medium to longer term, but lead to their diminution and possibly their demise (Fletcher, 2012). Perhaps unsurprisingly therefore, we find strong empirical evidence from the United States and Australia that they have significantly ramped up their campaigns of lobbying, misinformation and denial over the last decade or so (Miller and Dinan, 2015; Hein and Jenkins, 2016; Brulle, 2014, 2018; Farrell, 2015, 2016, 2019; Lucas, 2018, 2020).

A recent detailed empirical study has revealed that 'the organizational power within the [climate] contrarian network [is] predicted by ties to elite corporate benefactors' (Farrell, 2015). As the research cited above clearly demonstrates, most of these benefactors are dominant corporations in fossil fuels and other polluting industries which have successfully enlisted politically-aligned mining and energy corporations, think tanks, media outlets, business and industry associations, academics and politicians to their cause. There is ample evidence from the United States, Canada and Australia of the fossil fuel and resource extraction industries' efforts to promote climate change denial, finance initiatives which promote the opposite of their publicly stated pledges, and engage in efforts to suppress views perceived to be contrary to their interests (cf. Leggett, 2001; Hoggan and Littlemore, 2009; Oreskes and Conway, 2010; Jankó et al., 2014; Supran and Oreskes, 2017; Carroll et al., 2020; Lucas, 2020).

There is also a long and well-established history of national governments within the United States, Australia, Japan, Canada, Saudi Arabia, China and India acting as spoilers within the UNFCCC negotiations, and exerting their influence in the name of 'economic practicalities'. These seven countries are responsible for well over half of the world's carbon emissions (Ghosh, 2019). Five of the seven are the world's leading fossil fuel producers (Swann, 2019), and all of them remain heavily dependent on fossil fuels for their energy needs. The biggest publicly-traded oil and gas firms that are based in these countries must reduce their combined production by over one-third over the next two decades in order to meet world climate commitments (Climate Action Tracker, 2019). It should therefore come as no surprise that many credible accusations have been made by participants in international governance negotiations that these same nation states and the transnational corporations located within them have prevented the endorsement of scientific findings and policy proposals which they deem unfavourable (Eilperin, 2006; US House of Representatives, 2007; InfluenceMap, 2016, 2019). There is also a substantial body of credible evidence that, since the mid-1990 s, peak industry bodies such as the Global Climate Coalition, Australian Industry Greenhouse Network and the International Emissions Trading Association have been successful in having the unfavourable contents of IPCC summaries for policymakers removed or rewritten to cast their own failures in a more favourable light (Leggett, 2001; Tully, 2005; Eilperin, 2007; Pearce et al., 2018; Pearce, 2007; Monbiot, 2007; Gitlin, 2007; Wasdell,

2007; Herro, 2013; Ahmed, 2014; Stavins, 2014; Aronoff, 2018).¹

By ensuring that they continue to control the rules of the energy game (Bichler and Nitzan, 2017), the world's major oil, coal and gas companies have carefully orchestrated global fossil fuel dependence over more than a century (Mitchell, 2009). There are strong grounds for concluding that, as a result of these activities, the current civilizational order and the global power structures which it sustains cannot be maintained without fossil-fuelled forms of production and consumption (Di Muzio, 2012, 2015; Malm, 2012, 2016). Major global corporations in the fossil fuel industry and other highly capitalized sectors of our economies have developed a range of techniques for ensuring their influence on government policy- and decision-making remains strong.

A recent study by InfluenceMap has revealed that the five largest publicly owned oil and gas companies (i.e. BP, Shell, ExxonMobil, Chevron and Total) have spent more than \$200 million a year since the signing of the Paris Agreement 'in direct lobbying to tackle global warming', i.e. more than \$1 billion over five years (InfluenceMap, 2019). Although these activities constitute less of a problem in a well-functioning democracy, in a weak regulatory environment in which dominant corporations are the main contributors of policy advice to governments, it is their interests which predominate in most circumstances (Mikler, 2018). More than fifteen years ago, the legal scholar Stephen Tully documented the means by which the strategic objective of the fossil fuel industry 'to prevent or favorably shape regulatory development [within the UNFCCC] has been inadvertently assisted by an incoherent business voice', by which he meant those business interests that stand the most to gain from maintaining the status quo have managed to dominate the proceedings (Tully, 2005). This has also been true in Australia for more than two decades (Pearse, 2007; Wilkinson, 2020). Although it was only two years ago that a Shell executive openly boasted that his industry group had written some of the wording of the final declaration in Paris (Aronoff, 2018), this topic has so far received no focused attention within the IPCC and UNFCCC deliberations (Readfearn, 2018).

5. Consequences of the undemocratic influence of polluting industries on climate governance

Pluralist democratic theory holds that if diverse interests are to be equally and adequately represented, strong, transparent and accountable institutions are required (cf. Held, 2006; Schattschneider, 1960; Lindblom, 1977, 1979). However, to the extent that different countries' political and economic systems have succumbed to neoliberalism, their climate and energy policies can be expected to reflect the dominant corporate interests within that country. This is because it is an axiom of neoliberalism that the private sector can always perform social and economic functions more efficiently than the public sector. It follows from this axiom that the private sector will always provide the best advice, including advice relating to climate and energy policy (Springer et al., 2016). The best resourced and organized to provide that advice are the most highly capitalized global corporations in the energy and resources industries and the countries in which they are located (Mikler, 2018). These same entities have been actively pursuing and achieving major concessions with respect to tax regimes, environmental regulations, labour conditions, and investment and infrastructure concessions at the international level for decades. The most insidious and anti-democratic influence which they exercise is conducted covertly through individuals serving as public officials but who are effectively acting on behalf of corporate players (cf. Hamilton, 2007; Pearse, 2007; Mayer, 2017; Farrell, 2016, 2019; Brulle, 2018; Bartlett Quintanilla and Cummins-Tripodi, 2018; Lucas, 2020).

This situation has arguably arisen because dominant groups and individuals in our societies have been enabled by our judiciaries and legislatures to use their political and financial power to block and sabotage efforts to make governing institutions more democratic (Nitzan and Bichler, 2012). In Australia, these structural biases are well illustrated by political donations. It was recently revealed that between 2013 and 2016, the coal industry provided \$3.7 million in officially declared donations to the governing Liberal, National and Labor parties, obliging all three parties to look favourably upon any requests it made of governments (Slezak, 2016). However, it is possible that significantly larger sums of money from the fossil fuel industry have been flowing into party coffers for many years. Federal political donation laws have allowed the sources of more than half of the private incomes of the Liberal and Labor parties to be concealed from the public (Edwards, 2017). During the last federal election in 2019, the fossil fuel industry's declared donations to the major parties were \$1.89 million (Karp et al., 2020). According to 350.org, the fossil fuel industry received \$2,000 in subsidies for every \$1 it donated to the major political parties (Slezak, 2016), which may be an exaggeration given the amount of 'dark money' flowing into political party coffers. In the 2018–19 financial year, the major parties received more than \$100 million in political donations which remain hidden from public view, and more than \$1 billion in undisclosed income since 1999 (The Centre for Public Integrity, 2020). Australia's Centre for Public Integrity has also found that Australian state and federal governments have cut \$1.4 billion from the budgets of accountability institutions since 2010, from \$4.8 billion to \$3.4 billion (The Centre for Public Integrity, 2020a). In such a poorly regulated environment, the opportunities for undemocratic influence, graft and corruption remain strong.

Most natural scientists have neither the motivation nor the inclination to engage with any of this research, which was a primary motivation for the author's efforts to publish in this journal. Nor are natural scientists trained to recognize the existence of asymmetrical power relations and the subtle ways in which political and financial power is routinely exercised in contemporary societies. However, there is no good reason why the IPCC and its research community should continue to ignore this research and exclude it from consideration. Furthermore, rather than confronting the necessity of radically reducing fossil fuel consumption over the next two decades and publicly acknowledging the undemocratic influence of the fossil fuel industry on international climate governance, the IPCC has instead placed its faith in the (not-yet-realized) potentials of 'negative emission technologies' (NETs) – a.k.a. 'geoengineering' – to achieve the required emission reductions (Johnston 2017).

¹ According to Aronoff (2018), 'IETA is a business lobby comprised of corporations including fossil fuel producers that pushes for "market-based climate solutions," including at United Nations climate talks.'

According to climate scientist Kevin Anderson, the IPCC's scenario database in 2015 contained 400 scenarios that met the global climate goal, well over three-quarters of which assumed large contributions to decarbonisation from NETs (Anderson, 2015). It should be remembered that the original rationale for pursuing the development of 'drawdown technologies' was to ensure that the 2 °C target is not exceeded before the end of the century due to inertia in the climate system and the precipitation of cooling pollutants from the atmosphere, which were initially estimated to be masking the atmospheric temperature rise by around 0.5 to 0.8 °C (Hansen et al., 2000, 2013). Recent research has revised this figure to −0.9 °C (Xu and Ramanathan, 2017), indicating that were it not for this masking effect, we would have already crossed the 2 °C threshold. Drawdown technologies as initially conceived were intended to bring emissions down *after* they had been stabilized at 1990 levels, not as a substitute for mitigation and stabilization. It is difficult to understand why the significance of this point seems to escape some natural scientists.

The IPCC's faith in technologies which do not yet exist as a means of avoiding DAI arguably demonstrates that the fossil fuel industry has had, and continues to have, a disproportionate and unhealthy influence on the IPCC, which routinely engages in stealth advocacy of economic instruments and other 'climate solutions' without acknowledging their politically contentious implications. Consequently, in order to acknowledge its undemocratic influence in global climate change deliberations, the IPCC should be required to incorporate into its research the many studies which demonstrate the linkages that have been explored in detail in the literature cited above. Furthermore, even though many scientists are aware that 'special interests' have been a significant factor in delaying major reforms of international climate policy and governance, the scientific community as a whole needs to acknowledge that special interests are not the same as the collective or public interest, and that some special interests are currently dominating the international policy agenda and therefore need to have that influence significantly curtailed.

6. Opening climate governance to structural reform

National governments have built the legitimacy of their climate change policies and support for specific emission reduction targets on the evidence substantiated and promoted by the IPCC. They are therefore reluctant to acknowledge the credibility of scientific evidence that has not received the IPCC 'stamp of approval' (Hoppe et al., 2013). Nor are they keen to countenance in the deliberations of IPCC working groups the validity of any critical research from outside the physical and biological sciences and a handful of economics professions, along with some token social scientists from philosophy and anthropology. Given the institutional and communicative constraints outlined previously, which favour a continuation of current processes, there are strong grounds for concluding that it is not in the short-term political interests of certain powerful nation states, or the disciplines and professions which benefit from the existing structures, to undertake reform of either organization.² Nor is it in their short-term interests to publicly endorse research from outside the IPCC framework which might oblige their governments to commit to socio-economic changes which most of them are extraordinarily reluctant to accept.

These attitudes betray a willingness to sacrifice the good of the many for the benefit of a very small minority. In 'ordinary' circumstances, the majority of the population may be willing to tolerate such behaviour, but such tolerance becomes increasingly problematic as the stakes get higher. The IPCC and UNFCCC, for all their merits and achievements, are flawed institutions to the extent that they have been captured by those industries and nations which are not prepared to change their habits and instead continue to oppose the kinds of changes necessary to avert future catastrophes. It is therefore necessary to create some rules of distance and independence in both organisations to render them both more democratic and accountable to the world's citizens and other living beings.

To follow are a handful of suggestions for reform of both bodies which speak to three critical issues: how international targets for emission reductions are framed, how the IPCC's working groups are configured, and how the UNFCCC characterizes climate risks and requires different entities to be accountable for their GHG emissions. There is a vast and proliferating critical literature in the humanities and social sciences that discusses climate change governance, much of which has already been cited, which could be productively applied to the task (see also: Falkner et al., 2010; Tol, 2010, 2011; Curry and Webster, 2011; Curry, 2011, 2013; Eckersley, 2012; Beck et al., 2014; Ervine, 2014; Kallbekken et al., 2014; Hjerpe and Nasiritousi, 2015; Beck and Mahony, 2018). This literature should be a topic of systematic review in any revised structure of the IPCC and UNFCCC, because it would reveal many useful insights for achieving the kinds of transformational changes that will be required. The emergence of new research capabilities proffered by bibliometrics, big data and machine learning make these tasks easier (cf. Jankó et al., 2014; Minx et al., 2017; Einecker and Kirby, 2020; Callaghan et al., 2020).

With regard to how the IPCC's working groups are configured, many of the problems with risk representation by the IPCC outlined in Part 1 could arguably be overcome by restructuring its consultative framework to include inputs from traditional knowledge practitioners, first responders, and a greater diversity of academic disciplines, while corralling its findings and communications from the veto powers of self-interested nation states (cf. Lindblom, 1979; Ford, et al., 2016; Hulme, 2010; Hoppe et al., 2013). Suitably trained teams of humanities and social science scholars working with natural scientists are arguably more likely to translate complex scientific data and probabilistic analyses into forms that are convincing and useful to policymakers, other researchers and the public, than teams consisting predominantly of natural scientists and economists (Bjurström and Polk, 2011; Paterson, 2019). Such interdisciplinary teams are also less likely to 'err on the side of least drama' when communicating potential risks and the possible outcomes of inadequate responses (Brysse et al., 2013).

² See Jordan (1994) on the difficulties of achieving organizational reform of the Global Environment Facility.

IPCC contributing author, Eduardo Zorita, has suggested that the selection of personnel and the governance structures under which Working Group I operates should be completely independent of governments, and directly elected by the members of national and transnational scientific organizations (Zorita, 2010). The former director of the Tyndall Centre for Climate Change Research, Mike Hulme, has made a more radical suggestion, i.e. that the IPCC be completely dissolved and its three current functions separated into three institutions that act relatively autonomously at different scales and with different foci. Hulme proposed that one of these new institutions should be international in its organization and focused on global science. It would operate in a similar fashion to Working Group I, but instead of producing comprehensive reports every six years, its primary function would be to produce a larger number of regular reports that focus on topics of particular salience and urgency (Hulme, 2010). Hulme's suggestion regarding the structure of the second working group is that it would consist of five to ten related institutions located at the regional level which are focused on cultural, economic, and development issues. It would draw on a much greater range of expertise, knowledge and scholarship than the first group, and involve a consortium of national governments, civil society organizations and businesses. The third group would be focused on policy analysis, consisting of a global panel of 50 to 100 experts 'with interdisciplinary skills and a diverse analytical capacity'. It would 'undertake focused and rapid (6–12 months) analyses of specific proposed policy options and measures that have global significance.' These could be brought forward by NGOs, UN bodies, national governments and businesses, or combinations of different groups and institutions (Hulme, 2010; cf. Hoppe et al., 2013).

A different kind of innovation which the IPCC could undertake that would arguably help it win public support and therefore political approval to make broader reforms would be the creation of an independent deliberative body of international citizens. They would be fully briefed about each of the different working groups' reports, and empowered by the UNFCCC to represent the working groups' findings to the public in a wide range of forums. They would be completely independent of political interference by nation states and global corporations and funded by compulsory contributions from those same entities. Funding would be based on a moving three-year average of each entity's GHG emissions, with candidates selected randomly by region from a pool of self-nominated individuals who meet certain eligibility criteria determined through democratic deliberation.

With regard to how the UNFCCC characterizes climate risks and requires different entities to be accountable for their emissions, the compromised state of its governance structures is well illustrated by the efforts of various countries to subvert its original intent by gaming the complexities in reporting and accounting associated with the Kyoto Protocol. One of the most egregious examples of such efforts involves successive Australian delegations to the COP negotiations, which have in most cases been informed and driven by fossil fuel and other polluting interests (Pearse, 2007; Wilkinson, 2020). The developed countries collectively agreed to reduce their emissions by an average of 5% against 1990 levels over the five-year period between 2008 and 2012 (UNFCCC, 2011). But, due to the failure of the US to ratify the treaty, and various concessions made for Australia, Japan and a handful of other developed countries to increase their emissions over the reporting period, that commitment reportedly fell to an average of –4.2% relative to the base year (Olivier et al., 2011: 24–26). Even though it was argued at the end of the reporting period that the target would be, or was actually, met (e.g. Olivier et al., 2011: 26), it is difficult to evaluate the quality and accuracy of the data provided by nation states and the different methodologies for calculating emissions which they have deployed. For example, apart from the fact that Australia's climate negotiators controversially and repeatedly sought (and won) modifications to the Kyoto accounting rules, such as the infamous 'Australia clause' (Hamilton and Vellen, 1999; Alberici, 2009; Stephenson, 2009; Purtill, 2015), there are significant inconsistencies in Australia's reported emissions year on year, and evidence that it did not meet its Kyoto obligations without engaging in 'creative accounting' (Hamilton, 2015; cf. Talberg and Meinshausen, 2015; Maraseni and Reardon-Smith, 2019). Most recently, in an effort to win another undeserved concession from the international community, Australia has been seeking to use what it is calling its 'Kyoto credits' (sic) to help it achieve its 2030 Paris commitments (Kuramochi et al., 2017).

Rather than repeatedly capitulating to special pleading from developed nations, reform of the UNFCCC charter and articles should be informed by recent research in the physical and social sciences which points to the need to reconsider some fundamental issues concerning how the current international climate governance regime is configured. For example, what further measures should be put in place to standardize how GHG emissions are recorded and reported by nation states and large emitters, and how can citizens and neighbouring nations be confident that those measurements are relatively comprehensive and accurate? Why is it not possible to hold nation states responsible for their historic emissions? Would it make sense from an equity and ethical perspective to hold nation states responsible for the embodied emissions of their imports and exports? What levels of responsibility should be attributed to state- and privately-owned energy firms and other carbon-intensive entities such as metals processing and cement production for their historical emissions? Is it time to start imposing trade sanctions and financial penalties on recalcitrant nation states and transnational corporations?

Given the reluctance of most nation states to conduct research which explores the normative dimensions of climate risks and the associated dangers to their socio-economic systems, it is also essential to create new regional and national structures of governance which systematically integrate relevant insights from the interpretive social sciences and humanities, as well as the expertise of health professionals, indigenous knowledge practitioners, first responders and other 'unaccredited experts' (Collins et al., 2019). Opening up the policy process to such inputs will significantly broaden the knowledge base and political impetus for action. It can thereby enable the implementation of context-dependent, socially just and ecologically sustainable reforms using techniques such as adaptive management (Holling, 1978, 1993; Walters, 1986, 1997; Arvai et al., 2006) and adaptive governance (Brunner et al., 2005; Brunner and Lynch, 2010; Adler and Hirsch Hadorn, 2014; cf. IPCC, 2014, 2014a, 2014b, 2019, 2020).

The challenge for the social sciences and humanities scholars who are engaged in climate-related research is to develop more systematic methods for evaluating and learning from existing scholarship, synthesizing those insights collectively within and across relevant disciplines, and integrating them into solutions-oriented policy frameworks and options across multiple portfolio areas (Minx et al., 2017; Callaghan et al., 2020). This is certainly one area in which the natural sciences can provide models and lessons for the

social sciences and humanities. If the impetus for the creation of such governance structures cannot be built at the national level through conventional parliamentary politics, those processes need to be sidestepped and created *de novo* by civil society actors in concert with those businesses, industries and political parties that are convinced of the necessity for change.

7. Conclusion

Current international policy processes enable the minimization of how climate risks are represented by downplaying some of the more severe risks and failing to emphasize the speed at which many of the changes are occurring. As long as policymakers continue to be primarily dependent on earth scientists and economists to provide them with the parameters of climate risk, unfiltered by non-science disciplines and forms of knowledge, we are unlikely to see the full spectrum of risks being openly discussed and planned for. Because the earth sciences have dominated IPCC research since the inception of both the IPCC and the UNFCCC, the culturally-conditioned reticence which is a feature of physical science training has acted as a dampener on communicating to policymakers and the public how genuinely alarming are many of the findings of their research. It has become increasingly apparent that reducing international ambitions to an accounting exercise quantifying molecular flows through the biosphere's various layers has enabled nation states to shirk their international obligations by engaging in various obfuscatory, delaying and denial strategies, while the sheer abstraction and technical complexity of the sciences relied upon militates against their full comprehension by policymakers and the public. Thus, if we want to have some hope of averting the worst possible consequences of DAI, the UNFCCC must be reformed to minimize the veto powers of major polluting nations and corporations, while the IPCC (or its replacement) needs to be reconfigured to include regional committees, citizen and professional representatives, and genuinely interdisciplinary research teams chosen through a range of deliberative democratic processes.

Despite their public pronouncements acknowledging the science and the need to act decisively, most of the nation states which should be more proactive at reducing the risks of DAI remain wedded to pathways of development which will, to the contrary, further exacerbate it. However, unlike much of the literature on the topic which routinely cites 'rent-seeking' and 'special interests' as causal factors in slowing progress on climate action but seldom explores the implications, this paper has drawn on a large and growing body of scholarship which primarily attributes this disjunction to the actions of powerful incumbent actors at the supra-national and national levels which continue to benefit financially and politically from obstructing the public communication of the relevant risks, and/or downplaying their importance and significance. Calls for more diverse disciplinary and professional inputs into the expertise from which the IPCC draws, together with greater democratic oversight of UNFCCC negotiations, can help to allay some of the problematic and potentially dangerous practices which currently prevail in both organisations. There are many collaborative and interdisciplinary models that can be drawn upon to inform these changes, most of which have been discussed in detail in the literature already cited.

A plurality of interests can only be represented fairly if different individuals, groups and institutions have some level of equality in how their interests are acknowledged and expressed by governments. There is no equality of representation in countries where state and regulatory capture is the norm. If the kinds of reforms discussed in this paper are to be achieved, deeper structural reforms of our governing institutions are required, and that must of necessity focus on reducing the power of dominant corporations to shape government policy and expenditure across every domain of contemporary governance.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Thanks to Darrin Durant (University of Melbourne), Brett Bennett (Western Sydney University), Douglas Kahn (UNSW), the late Stewart Williams (University of Tasmania), the editors-in-chief of this journal and the anonymous reviewers of this paper for their extremely helpful comments and feedback.

References

- Adler, C.E., Hirsch Hadorn, G.H., 2014. The IPCC and treatment of uncertainties: topics and sources of dissensus. *WIREs Clim. Change* 5, 663–676.
- Ahmed, N., 2014. IPCC reports "diluted" under "political pressure" to protect fossil fuel interests. *The Guardian*, 15 May.
- Alberici, E., 2009. France accuses Australia of cheating on carbon emissions. *The World Today*, ABC Radio National, 14 December.
- Anderson, K., 2015. Duality in climate science. *Nat. Geosci.* 8 (December), 898–900.
- Antilla, L., 2005. Climate of scepticism: US newspaper coverage of the science of climate change. *Global Environ. Change* 15, 338–352. <https://doi.org/10.1016/j.gloenvcha.2005.08.003>.
- Aronoff, K., 2018. Shell Oil executive boasts that his company influenced the Paris Agreement. *The Intercept*, 8 December.
- Arvai, J., et al., 2006. Adaptive management of the global climate problem: bridging the gap between climate research and climate policy. *Clim. Change* 78, 217–225.
- Aulby, H., Ogge, M., 2016. Greasing the Wheels: The systematic weaknesses that allow undue influence by mining companies on government - a QLD case study. Australian Conservation Foundation/The Australia Institute, Canberra.
- Bäckstrand, K., Löwbrand, E., 2007. Climate governance beyond 2012: competing discourses of green governmentality, ecological modernization and civic environmentalism. In: Pettenger, M.E. (Ed.), *The Social Construction of Climate Change: Power, Knowledge, Norms, Discourses*. Ashgate, Aldershot, pp. 123–148.
- Bacon, W., Nash, C., 2012. Playing the Media Game. The relative (in)visibility of coal industry interests in media reporting of coal as a climate change issue in Australia. *J. Stud.* 13 (2), 243–258.
- Barnes, B., 1985. Expertise in society. In: *About Science*, Basil Blackwell, pp. 90–112.

- Bartlett Quintanilla, P., Cummins-Tripodi, P., (Eds.), 2018. *Revolving Doors and the Fossil Fuel Industry: time to tackle conflicts of interest in climate policy-making*. The Greens/EFA Group in the European Parliament, May.
- Bauer, M.W., 2009. The evolution of public understanding of science: discourse and comparative evidence. *Sci. Technol. Soc.* 14 (2), 221–240.
- Beck, S., 2011. Moving beyond the linear model of expertise? IPCC and the test of adaptation. *Reg. Environ. Change* 11, 297–306. <https://doi.org/10.1007/s10113-010-0136-2>.
- Beck, S., 2012. Between tribalism and trust: the IPCC under the public microscope. *Nat. Cult.* 7 (2), 151–173.
- Beck, S., Mahony, M., 2018. The IPCC and the new map of science and politics. *WIREs Clim. Change* 9, c547.
- Beck, S., et al., 2014. Towards a reflexive turn in the governance of global environmental expertise. The cases of the IPCC and the IPBES. *Gaia* 23 (2), 80–87.
- Beder, S., 2000. *Global Spin: The Corporate Assault on Environmentalism*, 2nd ed. Scribe, Melbourne.
- Bichler, S., Nitzan, J., 2017. Growing through Sabotage: Energizing Hierarchical Power', Working Papers on Capital as Power, No. 2017/02, July.
- Björström, A., Polk, M., 2011. Physical and economic bias in climate change research: a scientometric study of IPCC Third Assessment Report. *Clim. Change* 108, 1–22.
- Blue, G., 2015. Public deliberation with climate change: opening up or closing down policy options. *Rev. Eur. Commun. Int. Environ. Law* 24 (2), 152–159.
- Broome, J., 2014. A philosopher at the IPCC. *The Philosopher's Magazine* 66, 10–16.
- Brulle, R.J., 2014. Institutionalizing delay: foundation funding and the creation of U.S. climate change counter-movement organizations. *Clim. Change* 122 (4), 681–694.
- Brulle, R.J., 2018. The Climate Lobby: a Sectoral Analysis of lobbying spending on climate change in the USA, 2000–2016. *Clim. Change* 149, 289–303.
- Brulle, R.J., Carmichael, J., Jenkins, J.C., 2012. Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Clim. Change* 114 (2), 169–188.
- Brunner, R., et al., 2005. *Adaptive Governance: Integrating Science, Policy, and Decision Making*. Columbia University Press.
- Brunner, R.D., Lynch, A.H., 2010. *Adaptive Governance and Climate Change*. University of Chicago Press.
- Bryse, K., Oreskes, N., O'Reilly, J., Oppenheimer, M., 2013. Climate change prediction: erring on the side of least drama? *Global Environ. Change* 23, 327–337.
- Callaghan, M.W., Minx, J.C., Forster, P.M., 2020. A topography of climate change research. *Nat. Clim. Change* 10, 118–123.
- Carey, M., James, L.C., Fuller, H.A., 2014. Correspondence: a new social contract for the IPCC. *Nat. Clim. Change* 4 (December), 1038–1039.
- Carroll, W.K., Daub, S., Gunster, S., 2020. Regime of Obstruction: fossil capitalism and the many facets of climate denial in Canada. In: Dunlap, R., Stoddart, M.C.J., Tindall, D., (Eds.), *Handbook of Anti-Environmentalism*, Edward Elgar (forthcoming).
- Castree, N., 2009. Crisis, continuity and change: neoliberalism, the left and the future of capitalism. *Antipode* 41 (S1), 185–213.
- Castree, N., 2014. The anthropocene and the environmental humanities: extending the conversation. *Environ. Human.* 5, 233–260.
- Chan, G., et al., 2015. Reforming the IPCC's assessment of climate change economics. *Clim. Change Econ.* 7 (1), 1640001.
- Climate Action Tracker, 2019. *Balancing the Budget: why deflating the carbon bubble requires oil & gas companies to shrink*. November.
- Cook, J., Lewandowsky, S., Ecker, U.K.H., 2017. Neutralizing misinformation through inoculation: exposing misleading argumentation techniques reduces their influence. *PLoS ONE* 12 (5).
- Collins, H.M., Evans, R., Durant, D., Weinel, M., 2019. *Experts and the Will of the People*. Palgrave Macmillan.
- Corbera, E., et al., 2015. Patterns of authorship in the IPCC Working Group III report. *Nat. Clim. Change*, 6(January), 94–100.
- Curry, J., 2011. Reasoning about climate uncertainty. *Clim. Change* 108, 723–732.
- Curry, J., 2013. Kill the IPCC: after decades and billions spent, the climate body still fails to prove humans behind warming. *Financial Post*, 30 September.
- Curry, J.A., Webster, P.J., 2011. Climate science and the uncertainty monster. *Bull. Am. Meteorol. Soc.* December, 1667–1682.
- Devès, M.H., et al., 2018. Rethinking IPCC expertise from a multi-actor perspective. In: *Communicating Climate Change Information for Decision-Making*. Springer, pp. 49–63.
- Dietz, S., Hope, C., Patmore, N., 2007. Some economics of “dangerous” climate change: reflections on the stern review. *Global Environ. Change* 17, 311–325.
- Di Muzio, T., 2012. Capitalizing a future unsustainable: Finance, energy and the fate of market civilization. *Rev. Int. Polit. Econ.* 19 (3), 363–388.
- Di Muzio, T., 2015. *Carbon Capitalism: Energy, Reproduction and Social Order*. Rowman & Littlefield.
- Eckersley, R., 2012. Moving forward in the climate negotiations: multilateralism or minilateralism? *Global Environ. Polit.* 12 (2), 24–42.
- Edwards, P.N., 2010. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. MIT Press.
- Edwards, B., 2017. Dark Money: The hidden millions in Australia's political finance system. Inquiry into and report on all aspects of the conduct of the 2016 Federal Election and matters related thereto Submission 81 - Supplementary Submission 1.
- Eilperin, J., 2006. Climate Researchers Feeling Heat From White House. *The Washington Post*, 6 April.
- Eilperin, J., 2007. U.S., China Got Climate Warnings Toned Down. *The Washington Post*, 7 April.
- Einecker, R., Kirby, A., 2020. Climate change: a bibliometric study of adaptation, mitigation and resilience. *Sustainability* 12, 6935.
- Ervine, K., 2014. Diminishing returns: carbon market crisis and the future of market-dependent climate change finance. *New Polit. Econ.* 19 (5), 723–747.
- Falkner, R., Stephan, H., Vogler, J., 2010. International climate policy after copenhagen: towards a “Building Blocks” approach. *Global Policy* 1 (3), 252–262.
- Farrell, J., 2015. Network structure and influence of the climate change counter movement. *Nat. Clim. Change* 6 (April), 370–374.
- Farrell, J., 2016. Corporate funding and ideological polarization about climate change. *Proc. Natl. Acad. Sci.* 113 (1), 92–97.
- Farrell, J., 2019. The growth of climate change misinformation in US philanthropy: evidence from natural language processing. *Environ. Res. Lett.* 14, 034013.
- Fletcher, R., 2012. Capitalizing on chaos: climate change and disaster capitalism. *Ephemera* 12 (1–2), 97–112.
- Fløttum, K., et al., 2016. Synthesizing a policy-relevant perspective from the three IPCC “Worlds”—a comparison of topics and frames in the SPMs of the Fifth Assessment Report. *Global Environ. Change* 38 (38), 118–129.
- Ford, J.D., et al., 2016. Including indigenous knowledge and experience in IPCC assessment reports. *Nat. Clim. Change* 6 (April) 349–353.
- Funtowicz, S.O., Ravetz, J.R., 1993. Science for the post-normal age. *Futures* 25 (7), 739–755.
- Ghosh, I., 2019. All the World's carbon emissions in one chart. *Visual Capitalist*, 31 May.
- Gibbons, M., et al., 1994. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. Sage.
- Gitlin, J.M., 2007. Diplomats force IPCC to water down report on climate change. *arstechnica*, 4 June.
- Glikson, A., 2012. ‘The geological dimension of climate change: Current greenhouse rise rates are the fastest in 65 million years’, 28 April. Australian National University, School of Archaeology and Anthropology.
- Glikson, A., 2019. North Atlantic and sub-Antarctic Ocean temperatures: possible onset of a transient stadial cooling stage. *Clim. Change* 155, 311–321.
- Godal, O., 2003. The IPCC's assessment of multidisciplinary issues: the case of greenhouse gas indices. *Clim. Change* 58 (3), 243–249.
- Hamilton, C., 2007. *Scorcher: The Dirty Politics of Climate Change*. Melbourne, Black Inc/Agenda.
- Hamilton, C., 2015. Australia hit its Kyoto target, but it was more of a three-inch putt than a hole in one. *The Conversation*, 16 July.
- Hamilton, C., Vellen, L., 1999. Land-use change in Australia and the Kyoto Protocol. *Environ. Sci. Policy* 2 (2), 145–152.
- Hansen, J., 2007. Scientific reticence and sea level rise. *Environ. Res. Lett.* 2, 024002.
- Hansen, J., et al., 2000. Global warming in the twenty-first century: an alternative scenario. *PNAS* 97, 9875–9880.
- Hansen, J., et al., 2013. Climate forcing growth rates: Doubling down on our Faustian bargain. *Environ. Res. Lett.* 8, 01106 (9 pp.).
- Heede, R., 2014. Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854–2010. *Clim. Change* 122, 229–241.
- Hein, J.E., Jenkins, J.C., 2016. Why does the United States lack a global warming policy? The corporate inner circle versus public interest sector elites. *Environ. Polit.* 26 (1), 97–117.
- Held, D., 2006. *Models of Democracy*, 3rd ed. Stanford University Press.
- Herro, A., 2013. Government Attempts to Tamper With IPCC Report Don't Muffle Message. *Worldwatch Institute*, Washington DC.
- Hjerpe, M., Nasiritou, N., 2015. Policy-makers' and practitioners' views on forums for effectively tackling climate change. *Nat. Clim. Change* 5 (9), 864–867.
- Hoggan, J., Littlemore, R., 2009. *Climate Cover-Up: The crusade to deny global warming*. Greystone Books.

- Holling, C.S. (Ed.), 1978. *Adaptive Environmental Assessment and Management*. John Wiley & Sons, New York.
- Holling, C.S., 1993. Investing in research for sustainability. *Ecol. Appl.* 3, 552–555.
- Hoppe, R., Wesseling, A., Cairns, R., 2013. Lost in the problem: the role of boundary organisations in the governance of climate change. *WIREs Clim. Change* 4, 283–300.
- Hoppe, I., Rödder, S., 2019. Speaking with one voice for climate science — climate researchers' opinion on the consensus policy of the IPCC. *J. Sci. Commun.* 18 (03), 1–24.
- Hornsey, M.J., Harris, E.A., Fielding, K.S., 2018. Relationships among conspiratorial beliefs, conservatism and climate scepticism across nations 2018. *Nat. Clim. Change* 8, 614–620.
- Hulme, M., 11 February 2010. IPCC: cherish it, tweak it or scrap it - split into three panels. *Nature* 436, 730–731.
- Hulme, M., Mahony, M., 2010. Climate change, what do we know about the IPCC? *Prog. Phys. Geogr.* 34 (5), 705–718.
- Hulme, M., Ravetz, J., 2009. "Show Your Working": What "ClimateGate" means. *BBC News*, 1 December.
- IAC (InterAcademy Council), 2010. *Climate change assessments: review of the processes and procedures of the IPCC*. IAC Secretariat, Committee to Review the Intergovernmental Panel on Climate Change, Amsterdam.
- InfluenceMap, 2016. An investor enquiry: how much big oil spends on obstructive climate lobbying. April.
- InfluenceMap, 2019. Big Oil's Real Agenda on Climate Change: How the oil majors have spent \$1Bn since Paris on narrative capture and lobbying on climate, March.
- IPCC (Intergovernmental Panel on Climate Change), 1990. *Climate Change: The IPCC Response Strategies*. WMO/UNEP.
- IPCC, 1990a. *Climate change: the IPCC scientific assessment - report prepared for IPCC by working group 1*. In: J.T. Houghton, G.J. Jenkins, J.J. Ephraums (Eds.), WMO/UNEP, Cambridge, University Press.
- IPCC, 2001. *Climate Change 2001: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- IPCC, 2001a. *Climate Change 2001: Mitigation. Contribution of Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- IPCC, 2007. *IPCC Fourth Assessment Report: Climate Change 2007 – Synthesis Report*. Cambridge University Press.
- IPCC, 2007a. *IPCC Fourth Assessment Report: Climate Change 2007 – Impacts. Working Group II, Cambridge University Press, Adaptation and Vulnerability*.
- IPCC, 2007b. 13.3.3.3 Implications of regime stringency: linking goals, participation and timing. In: *IPCC Fourth Assessment Report: Climate Change – Mitigation of Climate Change 2007 Working Group III WMO/UNEP*.
- IPCC, 2007c. *IPCC Fourth Assessment Report: Climate Change 2007 – The Physical Science Basis, Working Group 1*. Cambridge University Press.
- IPCC, 2013. *IPCC Fifth Assessment Report: Climate Change 2013 – The Physical Science Basis, Working Group 1*. Cambridge University Press.
- IPCC, 2013a. Summary for policymakers. In: Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- IPCC, 2014. *Climate Change 2014 – Mitigation of Climate Change*. WMO/UNEP.
- IPCC, 2014a. *Climate Change 2014 – Impacts, Adaptation and Vulnerability, Part A: Global and Sectoral Aspects*. WMO/UNEP.
- IPCC, 2014b. *Climate Change 2014 – Impacts, Adaptation and Vulnerability, Part B: Regional Aspects*. WMO/UNEP.
- IPCC, 2019. *Special Report on the Ocean and Cryosphere in a Changing Climate*. WMO/UNEP.
- IPCC, 2020. *Special Report on Climate Change and Land*. WMO/UNEP.
- Jacques, P.J., Dunlap, R.E., Freeman, M., 2008. The organisation of denial: conservative think tanks and environmental scepticism. *Environ. Polit.* 17 (3), 349–385.
- Jankó, F., Möriz, N., Vancsó, P., 2014. Reviewing the climate change reviewers: exploring controversy through report references and citations. *Geoforum* 56, 17–34.
- Johnston, I., 2017. World has missed chance to avoid dangerous global warming – unless we start geo-engineering the planet. *The Independent*, 21 August.
- Jordan, A., 1994. The global environment facility. *Global Environ. Change* 4 (3), 265–267.
- Kallbekken, S., Saelen, H., Underdal, A., 2014. Equity and spectrum of mitigation commitments in the 2015 agreement. *TemaNord*.
- Karp, P., Knaus, C., Evershed, N., et al., 2020. Liberal party received \$4.1m in donations from property tycoon's company. *The Guardian*, 3 February. <https://www.theguardian.com/australia-news/2020/feb/03/liberal-party-donations-property-tycoon-company-isaac-wakil>. (Accessed 10 December 2020).
- Kuramochi, T. et al., 2017. *Greenhouse gas mitigation scenarios for major emitting countries: 2017 update*. Cologne & Berlin, New Climate – Institute for Climate Policy and Global Sustainability gGmbH.
- Lahsen, M., 2013. Anatomy of dissent: a cultural analysis of climate skepticism. *Am. Behav. Sci.* 57 (6), 732–753.
- Leggett, J., 2001. *The Carbon War: Global Warming and the End of the Oil Era*. Taylor & Francis.
- Lewandowsky, S., et al., 2015. Seepage: climate change denial and its effect on the scientific community. *Global Environ. Change* 33, 1–13.
- Lindblom, C., 1977. *Politics and Markets: The World's Political-Economic Systems*. Basic Books.
- Lindblom, C., 1979. *The Policy-Making Process*, 1st ed. Prentice Hall.
- Lohmann, L., 2017. Toward a political economy of neoliberal climate science. In: Tyfield, D. (Ed.), *The Routledge Handbook of the Political Economy of Science*. Routledge, London, pp. 305–316.
- Lucas, A., 2018. Revealed: the extent of job-swapping between public servants and fossil fuel lobbyists. *The Conversation*, 5 March.
- Lucas, A., 2020. Fossil networks and dirty power: the politics of decarbonisation in Australia. In: Dunlap, R., Stoddart, M.C.J., Tindall, D. (Eds.), *Handbook of Anti-Environmentalism*, Edward Elgar (forthcoming).
- Luton, L.S., 2015. Climate scientists and the intergovernmental panel on climate change: evolving dynamics of a belief in political neutrality. *Admin. Theor. Praxis* 32 (3), 144–161.
- Malm, A., 2012. China as chimney of the world: the fossil capital hypothesis. *Organization Environ.* 25 (2), 146–177.
- Malm, A., 2016. *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming*. Verso.
- Malone, E.L., Rayner, S., 2001. Role of the research standpoint in integrating global-scale and local-scale research. *Clim. Res.* 19, 173–178.
- Maraseni, T., Reardon-Smith, K., 2019. Meeting national emissions reduction obligations: a case study of Australia. *Energies* 12, 438.
- Mastrandrea, M., Mach, K., 2011. Treatment of uncertainties in IPCC assessment reports: past approaches and considerations for the Fifth Assessment Report. *Clim. Change* 108, 659–673.
- Mayer, J., 2017. *Dark Money: The Hidden History of the Billionaires Behind the Rise of the Radical Right*. Anchor Books.
- McCright, A.M., Dunlap, R.E., 2010. Anti-reflexivity: The American conservative movement's success in undermining climate science and policy. *Theor. Cult. Soc.* 27 (2–3), 100–133.
- McKewon, D., 2012. Talking points ammo: The use of neoliberal think tank fantasy themes to delegitimise scientific knowledge of climate change in Australian newspapers. *J. Stud.* 13 (2), 277–297.
- McKnight, D., 2010. A change in the climate: the journalism of opinion at News Corp. *Journalism* 11, 693–706.
- Mikler, J., 2018. *The Political Power of Global Corporations*. Polity Press.
- Miller, D., Dinan, W., 2015. Resisting meaningful action on climate change: Think tanks, "merchants of doubt" and the "corporate capture" of sustainable development. In: Hansen, A., Cox, J.R. (Eds.), *The Routledge Handbook of Environment and Communication*. Routledge.
- Minx, J.C., et al., 2017. Learning about climate change solutions in the IPCC and beyond. *Environ. Sci. Policy* 77, 252–259.
- Mitchell, T., 2009. Carbon democracy. *Econ. Soc.* 38 (3), 399–432.
- Monbiot, G., 2007. The real climate censorship. www.monbiot.com, 10 April.
- Nitzan, J., Bichler, S., 2012. Capital as power: toward a new cosmology of capitalism. *Real-World Econ. Rev.* 61, 65–84.
- Obermeister, N., 2017. Addressing interdisciplinary epistemological barriers to inclusive knowledge governance in global environmental assessments. *Environ. Sci. Policy* 68, 80–86.
- Okereke, C., 2007. *Global justice and neoliberal environmental governance: ethics, sustainable development and international co-operation*. Routledge.

- Okereke, C., 2017. A six-component model for assessing procedural fairness in the Intergovernmental Panel on Climate Change (IPCC). *Clim. Change* 145, 509–522.
- Olivier, J.G.J. et al., 2011. Long Term Trends in Global CO₂ Emissions, 1970–2008. PBL Netherlands Environmental Assessment Agency/JRC European Commission.
- O'Reilly, J., Oreskes, N., Oppenheimer, M., 2012. 'The rapid disintegration of projections: the West Antarctic Ice Sheet and the Intergovernmental Panel on Climate Change'. *Soc. Stud. Sci.* 42 (5), 709–731.
- Oreskes, N., Conway, E.M., 2010. *Merchants of Doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. Bloomsbury.
- Pateron, M., 2019. Climate-as-condition, the origins of climate change and the centrality of the social sciences. *Dialogues Hum. Geogr.* 9 (1), 29–32.
- Pateron, M., et al., 2011. Micro foundations of global climate governance: an analysis of the transnational emission trading network. Princeton Conference on Research Frontiers in Comparative and International Environmental Politics.
- Pearce, W., Mahony, M., Raman, S., 2018. Science advice for global challenges: learning from trade-offs in the IPCC. *Environ. Sci. Policy* 80, 125–131.
- Pearse, G., 2007. *High and Dry: John Howard, climate change and the selling of Australia's future*. Viking.
- Pielke, R.A., 2007. *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.
- Proctor, R., Schiebinger, L.L., 2008. *Agnostology: The Making and Unmaking of Ignorance*. Stanford University Press.
- Purtill, J., 2015. How Australia's emissions can go up while looking like they go down. Hack, JJJ FM, 8 December.
- Readfearn, G., 2018. "Vast Blind Spot": IPCC Accused of Ignoring "Decades Long" Fossil Fuel Misinformation Campaign on Climate. *Desmog*, 12 October.
- Sapinski, J.P., 2015. Climate capitalism and the global corporate elite network. *Environ. Sociol.* 1 (4), 268–279.
- Schattschneider, E.E., 1960. *The Semi-Sovereign People*. Holt, Rinehart & Winston.
- Shackley, S., 1997. The Intergovernmental panel on climate change: consensual knowledge and global politics. *Global Environ. Change* 7 (2), 77–79.
- Shackley, S., Skodvin, T., 1995. IPCC gazing and the interpretative social sciences. *Global Environ. Change* 5 (3), 175–180.
- Shackley, S., Wynne, B., 1995. Integrating knowledges for climate change: pyramids, nets and uncertainties. *Global Environ. Change* 5 (2), 113–126.
- Shackley, S., Wynne, B., 1996. Representing uncertainty in global climate change science and policy: boundary-ordering devices and authority. *Sci. Technol. Human Values* 21, 275–302.
- Shehata, A., Hoffman, D.N., 2012. Framing Climate Change. *J. Stud.* 13 (2), 175–192.
- Slezak, M., 2016. Fossil-fuel industry gets \$2,000 in "subsidies" for each \$1 in party donations. *The Guardian*, 17 February. <https://www.theguardian.com/environment/2016/feb/17/fossil-fuel-industry-gives-37m-to-major-parties-and-gets-big-subsidy-in-return>. (Accessed 10 December 2020).
- Springer, S., Birch, K., MacLeavy, J., 2016. *The Handbook of Neoliberalism*. Routledge.
- Stavins, R.N., 2014. 'Is the IPCC Government Approval Process Broken?', An Economic View of the Environment. Belfer Center for Science and International Affairs, Harvard Kennedy School, 25 April.
- Stephenson, H., 2009. Cheating on climate change? Australia's challenge to global warming norms. *Austr. J. Int. Affairs* 63 (2), 165–186.
- Stirling, A., 2008. "Opening up" and "Closing down": power, participation, and pluralism in the social appraisal of technology. *Sci. Technol. Human Values* 33 (2), 262–294.
- Strzalkowski, A., 2018. Beyond reductionism – multidisciplinary insights approach for an effective climate change and sustainability policy. *Econ. Environ. Stud.* 18 (4), 1351–1379.
- Sunderlin, W.D., 1995. Global environmental change, sociology, and paradigm isolation. *Global Environ. Change* 5 (3), 211–220.
- Supran, G., Oreskes, N., 2017. Assessing ExxonMobil's climate change communications (1977–2014). *Environ. Res. Lett.* 12, 084019.
- Swann, T., 2019. High Carbon from a Land Down Under: Quantifying CO₂ from Australia's fossil fuel mining and exports. The Australia Institute, Canberra.
- Talberg, A., Meinshausen, M., 2015. FactCheck: has Australia met its climate goals, while other nations make "airy-fairy promises"? *The Conversation*, 16 July.
- Taylor, M., Watts, J., 2019. Revealed: the 20 firms behind a third of all carbon emissions. *The Guardian*, 9 October.
- The Centre for Public Integrity, 2020. Hidden money in politics: What the AEC disclosures don't tell us. The Centre for Public Integrity - Briefing Paper, February. <https://publicintegrity.org.au/wp-content/uploads/2020/06/Briefing-paper-Hidden-money-in-politics-2019.pdf>. (Accessed 10 December 2020).
- The Centre for Public Integrity, 2020a. Accountability Deficit: the \$1.4 billion funding cut of accountability institutions. The Centre for Public Integrity - Briefing Paper. <https://publicintegrity.org.au/wp-content/uploads/2020/10/Briefing-Paper-Budget-2019-2020.pdf>, 2020. (Accessed 10 December 2020).
- Thorpe, A., Figge, F., 2018. Climate change and globalisation as 'Double Exposure': implications for policy development. *Environ. Sci. Policy* 90, 54–64.
- Thorpe, A., 2017. The political economy of the manhattan project. In: Tyfield, D. (Ed.), *The Routledge Handbook of the Political Economy of Science*. Routledge, pp. 43–56.
- Tol, R., 2010. IPCC reform, now. *Irish Econ.* 27 January.
- Tol, R., 2011. Regulating knowledge monopolies: the case of the IPCC. *Clim. Change* 108, 827–839.
- Tully, S., 2005. Commercial contributions to the climate change regime: who's regulating whom? *Sustain. Dev. Law Policy* 5(2), 14–27, 76–79.
- UNFCCC, 2011. Fact Sheet: The Kyoto Protocol. February.
- US House of Representatives, 2007. Political Interference with Climate Change Science Under the Bush Administration. *Committee on Oversight And Government Reform*, December.
- Walters, C.J., 1986. *Adaptive Management of Renewable Resources*. The Blackburn Press.
- Walters, C.J., 1997. Challenges in adaptive management of riparian and coastal ecosystems. *Conserv. Ecol.* 1, 1.
- Waddell, D., 2007. Political Corruption of the IPCC Report. *The Meridian Programme*, 16 February.
- Wilkinson, M., 2020. *The Carbon Club: How a Network of Influential Climate Sceptics, Politicians and Business Leaders Fought to Control Australia's Climate Policy*. Allen & Unwin.
- Wohlgezogen, F., McCabe, A., Osegowitsch, T., Mol, J., 2020. The wicked problem of climate change and interdisciplinary research: tracking management scholarship's contribution. *J. Manag. Organization* 1–25.
- Xu, Y., Ramanathan, V., 2017. Well below 2 °C: mitigation strategies for avoiding dangerous to catastrophic climate changes. *Proc. Natl. Acad. Sci.* 26 September 114 (39), 10315–10323.
- Yearley, S., 2009. Sociology and climate change after Kyoto: what roles for social science in understanding climate change? *Curr. Sociol.* 57 (3), 389–405.
- Zorita, E., 2010. IPCC: cherish it, tweak it or scrap it – independent agency needed. *Nature* 11 February, 436, 731.